39/85

IN THE PRIVY COUNCIL NO. 28 of 1985

ON APPEAL
FROM THE COURT OF THE SUPREME COURT OF WESTERN AUSTRALIA

B E T W E E N :

HAMERSLEY IRON PTY LIMITED	Appellant (Respondent) (Plaintiff)
- and -	
1. THE NATIONAL MUTUAL LIFE ASSOCIATION OF AUSTRALASIA LIMITED, 2. LANGLEY GEORGE HANCOCK, 3. ERNEST ARCHIBALD MAYNARD WRIGHT, 4. HANCOCK PROSPECTING PTY LTD, 5. WRIGHT PROSPECTING PTY LTD AND 6. L.S.P. PTY LTD	Respondents (Appellants) (Defendants)

RECORD OF PROCEEDINGS

PART I
VOLUME II

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SOLICITORS FOR THE RESPONDENTS (APPELLANTS) (DEFENDANTS)

IN THE PRIVY COUNCIL NO.

ON APPEAL

FROM THE FULL COURT OF THE SUPREME COURT OF WESTERN AUSTRALIA

B E T W E E N :

HAMERSLEY IRON PTY LIMITED	Appellant (Respondent) (Plaintiff)
- and -	
LANGLEY GEORGE HANCOCK, ERNEST ARCHIBALD MAYNARD WRIGHT, HANCOCK PROSPECTING PTY LTD, WRIGHT PROSPECTING PTY LTD AND L.S.P. PTY LTD AND THE NATIONAL MUTUAL LIFE ASSOCIATION OF AUSTRALASIA LIMITED	Respondents (Appellants) (Defendants)

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INDEX OF REFERENCE

PART I
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ARTHUR NOEL PRITCHARD, sworn:

EXAMINED BY MR HULME QC:

MR HULME: Mr Pritchard, your full name is Arthur Noel Pritchard and you live at 5, The Lee, Middle Cove, New South Wales?---Correct.

You are the manager, Consultancy Services, and marketing manager for South-East Asia for Allis-Chalmers Aust. Ltd?---That is correct.

That company being a wholly-owned subsidiary of Allis-Chalmers of the United States?---That is correct.

You say in your affidavit you have worked on engineering matters in relation to the mining industry for some 45 years, particularly involving material handling and screening processes?---That is correct.

With, successively, the New South Wales Railways, Alluvial Mining Equipment, CSR (as it is now called), Gibson Battle and, since 1961, Allis-Chalmers?---That is correct.

MR HULME: With Allis-Chalmers being the leading manufacturer of vibrating screens in Australia - - -

MR HULME (Continuing): - - - in Australia and having approximately 90 per cent of the vibrating screen market? ---That is so.

The company having provided screens and advice on sizes, water requirements etc., to such companies as Comalco, Broken Hill, Mt Isa, Mt Newman, Goldsworthy, Robe River, Savage River, Alcoa, Western Mining, EZ, Cleveland Tin, Renison Goldfields, Agnew Mining, Bougainville Copper and Oktedi?---Yes.

You say you have been associated in varying degrees with screening aspects in every major iron ore mine and iron ore processing plant in Australia since the Second World War and have visited the mines of all the iron ore producers among the companies I have read out just a moment ago?---Correct.

You last visited Tom Price in February 1983. You have sworn an affidavit in these proceedings, sworn 24th May 1983. (Could that be handed to Mr Pritchard?)

WITNESS: That is correct.

MR HULME: Are the contents of that affidavit true and correct? ---Yes.

I tender the affidavit.

EXHIBIT EXHIBIT 12 .... Affidavit of A.N. Pritchard, dated 24th May 1983.

MR HULME: You are familiar with the pulping box and screening arrangements in the concentration plant at Tom Price? ---Yes.

You say in para.4:

> "The scrubbing effects at Tom Price are distinct from the screening.... (reads)....without some further process in view."

MR HULME (Continuing): Would you just explain your view as to the scrubbing effects and their distinction from the screening as you say here?---The addition of water to the pulping box or chute is primarily to break down the clays, the gang, which are adhering to the ore particles so that the vibrating screen will be able to carry out a proper and effective separation. If the clay and the gang is not removed from the clay particles, then the conglomerated lumps, as they could be in most instances, could pass onto the screen and then would present a size of particle, once the particle has grown in size because of the agglomeration of clays and gang around the particle, which could create an inefficient screening so that particles will not be diverted into their various channels because of the top deck and the bottom deck. There is a limitation, of course; I used the word "often"; there has to be a compromise, there has to be some degree of washing of these clays and that is limited on the basis of economic considerations. Too much clay could also cause the screen decks, particularly the bottom deck, to completely blind up and of course the whole exercise would be a disaster - so it just would not work unless those clays are thoroughly slurrified. The material must be in a slurrified form and very effectively "broken up" (if we like to use those words). The clays, the gang and the ore particles must be segregated so that the screen can carry out an effective screening job.

Are you familiar with feed boxes, used where the scrubbing process is not important?---Yes.

You say at the bottom of that paragraph:

> "I agree that the pulping box would not have been designed the way it is.....(reads)..... before the feed moves onto the screen deck."

Can you tell his Honour just why you say that?---I say that because the chute, in a dry screening operation (that is without the addition of water - if that was to be applied) would consist of, in a simplified fashion, a chute without the addition of water and would be simplified so as to allow the material to be directed onto the screen deck. Normally it is directed in a dry form in the direction of flow. In a wet process, or where we want to scrub the material, the material is generally directed from the chute after being slurrified and agitated by that water - - -

WITNESS (Continuing): - - - by that water, high pressure water, and that material is then directed onto the screen deck in a reverse flow; that is, in the opposite direction from which it enters in the case of a dry screening operation. It is going in the reverse direction and then allowing the vibrating screen to carry the material through. There are other reasons, of course, and that is that this helps to contain the water but give longer retention time for the material, once it is received on the screen deck. It maximises on the retention time for the material on the screen deck to allow more work or the maximum amount of work to be done on that vibrating screen.

MR HULME: Is there any difference in the wear and tear on the chute, the screens, according to whether or not you are putting wet or dry material?---Yes. This is dependent, of course, on the particle size, the maximum particle size in the feed, but it is generally accepted that in a wet process you can get a greater wear, a higher wear rate, in all the equipment to the extent of up to 20 per cent on iron ore, so, to answer that question, yes, there is a wear consideration to take into account.

Are you able to tell us the normal moisture content of Pilbara ore?---It varies, naturally, but in the time that I have been associated with both Hamersely Iron and other plants up in the Pilbara the ore is in the vicinity of 1½ per cent moisture, that is total moisture; it could be up to around 2 and possibly 2½, but it is very dry.

You describe that 1½ to 2 per cent as very dry?---Yes, that is so. It is considered a very dry material in any screening operation.

Can you tell us, in relation to screening, does the ease and practicability of screening vary according to how wet or dry the material is?---Yes. If we are talking in terms of a dry screening application which means, of course, that it can have varying moisture from bone dry, if it is coming out of a kiln up to a moisture content of, say, 10 or 20 per cent, that is without the addition of water, and the very dry screening application, and the application at Tom Price would be considered a dry application; if we were dealing with a minus 1½ per cent moisture material entering the screen, then that would be a relatively easier screening application to perform as compared with a damper material. We call it damp rather than wet, of course, in this case. A damper material would result in serious blinding or plugging or pegging conditions, pegging of the openings in the screen deck and the screen is either very inefficient or - - -

WITNESS (Continuing): - - - very inefficient or inoperative.

MR HULME: If all that were involved were screening that Hamersley ore, would you recommend wetting it or screening it dry?---In the case of Hamersley you only have 1½ or 2 per cent moisture. In normal circumstances, if you just simply wished to screen this material, you would certainly not add water to the screen, unless that was for dust suppression, but that would be kept to very, very minimal quantities. Dust is a very serious problem in these plants so if you were adding water it would be used for dust suppression only.

In the case of that Hamersley plant, what degree of importance do you attach to the scrubbing and washing functions that happen?---In its present form in the beneficiation plant, I consider that a very essential part of the operation. Without that, the plant would not function - the whole plant would not function. The clays must be disintegrated at an early stage and it does that in this particular instance at Tom Price.

Can you tell us roughly how flat, or alternatively how tilted, the screen used there is?---At Tom Price, at the beneficiation plant, the screens are horizontal. They are all horizontal; where there is a wet process involved the recommendation is to always use a horizontal screen.

Why is that recommendation made?---The reason for that in a wet process is that we have a longer retention time for the particles to be treated in their path from the beginning of the pulping section where the material is slurrified, down its path, down to the discharge end of the screen. The retention time is approximately - - the reason why we use a horizontal screen is that the retention time is approximately 2½ or close to 3 times the retention time on an inclined screen where dry screening is normally used. In dry-screening applications we normally recommend inclined screens sloped at 20 degrees and a different action of the machine.

Are you able to tell us whether the Hamersley dry screen slope in the way you have just said?---That is correct. The same applies in other Pilbara plants as well on dry processing.

R67. 12.37

MR HULME: You will be given exhibit 3, which is the paper on beneficiation of iron ore by heavy medium separation, by Uys & Bradford. Would you look at the first typescript page? Unfortunately the pages are not numbered. The bottom paragraph says:

> "Iron ore deposits vary in their mineralogical characteristics and it therefore.....(reads).....at the required grade at optimum economy."

Would you agree with that proposition?---Yes.

Would you perhaps expand a little to his Honour on the relationship of each ore body to the design and equipment that you put there for that ore body?---Yes. If we take the Pilbara ore bodies alone, we even have some variations in the ore bodies there. If we take the case of the Goldsworthy ore and even the marandoo ore, which is known in the Pilbara area, we have some extreme fines. I can only speak, incidentally, for the physical characteristics and not the metallurgical characteristics of this ore, but it is the physical characteristics with which I am mainly concerned in screening to a large extent; there are minor considerations in the metallurgical sense. The ore does have physical variations to the extent that the ore is in some places, like Goldsworthy, much finer and contains some very sticky material depending on the moisture content. As it becomes finer you have greater surface area over the finer particles and therefore moisture content and the stickiness characteristics are increased. So there is one example. If we take examples away from the Pilbara there could be extreme moisture in some of these other deposits. Deposits with which I have been associated in years past are Francis Creek in the Northern Territory and Mount Bundy (although they have since been completed). The Northern Territory does experience a little more rain than the Pilbara area, as you can imagine, and the moisture content is much higher so that there is serious clay content and stickiness problems to contend with.

If you are asked to advise as to screening for particular mines, what is the first thing you want to see?---The first thing I want to know is the physical characteristics of the ore, and I normally look for a sample - - -

EX154. 12.41

WITNESS (Continuing): - - - for a sample, I request a sample. It may not be very much, it might be a barrelful or a bagful, but I physically study this ore before I make a recommendation on what should be done on the screens. I must know, of course, the moisture content because moisture content in the ore sample received may not be a specific moisture but I like to have a dry, if I can have a dry then I will, more or less, assimilate the conditions that I am expected to encounter in the field.

MR HULME: I will take you to the bottom of this second page where the author is saying:

> "Many ores require some form of beneficiation other than that naturally achieved by crushing and screening in order to meet the grade and impurity levels....(reads) ....the total iron ore recovery from the ore body."

The first part of that sentence, "Many ores require some form of beneficiation other than that naturally achieved by crushing and screening" - what kind of screening would you undertake to be referred to in the second line of that paragraph? Do you see the paragraph?---Yes. If we are beneficiating, and this generally means a wet processing, then I would use definitely a horizontal screening.

That is if you want the form of beneficiation other than that naturally achieved by crushing and screening?---Yes.

What form of crushing and screening do you take the author to be referring to as that naturally achieved? I am not sure whether I am making my question plain. He is saying, "Many ores require...beneficiation other than that naturally achieved by crushing and screening." To what process do you undertake him to be referring when he is referring to the beneficiation which is naturally achieved by crushing and screening?---That is a wet process.

I follow; at the top of the next page it says:

> "In Western Australia, until recent years, the iron ore producers other than Robe River....(reads)....after careful selection of grade blocks in the mine."

Can you just help us there as to what is meant by the careful selection of grade blocks?---It is certain areas - - -

227A. 12.46

WITNESS (Continuing): - - - areas - -

MR SHER: I have not objected till now. I intend to cross-examine this witness about his qualifications. On the most generous view of his qualifications he would appear he is not expert in this area.

OLNEY J: No, I do not think that question really is within the field of his proven expertise.

MR HULME: I will withdraw that question. (TO WITNESS): At the end of para.4 of your affidavit you made the statement, as Dr Lynch had made, that you were not aware of any iron ore processing plant where a wet process was in use in 1962 or is in use now solely as an adjunct to crushing and screening without some further process in view. Mr Beukema has expressed disagreement with that sentence in your affidavit and has referred to mines in the Mesabi Range in Minnesota in the US and an article which is exhibit CFB1 to Mr Beukema's affidavit at present. (Could the witness please have exhibit CFB1?) Would you go first to p.111 where, down at the bottom of the right-hand side, there is a reference to - - -

MR HULME (Continuing): - - - reference to "wash ore" which Mr Beukema refers to in para.9 and a reference to the flow sheet which is just over the page. The operation is described at the top of p.112:

> "The scalping screen usually is a vibrating screen with openings from 4 to 6 inches....(reads).... and the oversize goes to shipment."

The flow sheet is down the left-hand side of fig.19. Do you see it there?---Yes.

Do you regard that example as being inconsistent with what you have said; that you know of no iron ore processing plant where a wet process was in use solely as an adjunct to crushing and screening without some further process in view?---This flow sheet would indicate that there is some further process in view since the fine waste that is produced is giving every indication, because of the limitations in the article, that there is a beneficiation process taking place and, therefore, there is a further process in view after the screening.

If one goes down the right-hand side of fig.19 we have mine material going into a feeder, scalping screens, the oversized on the left going to waste, the undersized coming to the washing screen; from there the undersized going to a mechanical classifier and going down the other stream the oversized from the washing screen going to a crusher, further washing screen, the undersize from which joins into the mechanical classifier while the oversized goes down a bin into the railway car and from the mechanical classifier the fine going off to waste and the oversized coming into the loading bin. It is slightly more complex than the one on the left. Do you regard that example as being, in any way, inconsistent with what you have said?---No, it is not inconsistent - - -

WITNESS (Continuing): - - - not inconsistent. I am sorry - it is consistent.

MR HULME: Consistent with what you have said, not inconsistent? ---Not inconsistent.

Could I ask you to look again for a moment at exhibit 3, which is the paper? Could I ask you to go over about eight pages to a page which begins "This does not change"? You will see there a mine mentioned, Aguas Clarus in Brazil?---Yes.

I would just ask you to follow the details there:

> "The run of mine ore is crushed to 200 in a primary, gyratory crusher....(reads)....to about 9 per cent moisture to meet pelletising feed requirements."

WITNESS: I am familiar with this. I have read this particular section. That is consistent with what I have been saying and that is that there is a further process in view.

That further process in this case being what?---The final process or the final result in this process is that we have a beneficiated ore and we have taken out the slimes in this particular instance, and essentially that is the basic requirement or the basic thing that we should note in this instance. The other material that is left, going through to a pelletising plant - it is very essential that in a pelletising plant you rid the ore initially of the impurities and with the lower grade that means the rock and the material which is not iron ore. It is important to remove that so that you finish with a material going through to the pelletising plant, which will then give you a higher grade of iron ore in the pelletised. That is the whole purpose of pelletising, or one of the reasons for pelletising. You achieve a higher grade ore in pelletising.

R241

LUNCHEON ADJOURNMENT

UPON RESUMPTION:

MR HULME: Could Mr Pritchard be given exhibit NEG4, please? It should be item 4 in part I of volume 2.
TO WITNESS: This is a publication I take it with which you are familiar?---That is correct.

Would you go to p.4? Half-way down the left-hand column it says:

> "In commercial sizing or screening, two basic processes take place."

One it describes as "stratification" - the process whereby the large-size particles rise to the top of the bed while the smaller-size particles sift through the voids and find their way to the bottom. Then there is the probability of separation, the process of the particles presenting themselves to the apertures and being rejected or passed through according to their fortune.

Could you just explain a little to his Honour about stratification - how it happens and why it becomes important?---Right. Stratification is an actual separation of the large particles and the fine particles, brought about by the action and the motion of the vibrating screen. By virtue of the momentum induced into the larger particles and the momentum being greater in the larger particles compared with the fine particles, the large particles will rise to the top and the fine particles go to the bottom where we want them to go, because that is where the apertures are and the finer particles will fall through.

The degree of stratification is very important in any screening application and it varies - the degree of stratification varies - depending on the condition of the ore, whether it is dry, wet, or whether the bed depth, the depth of material lying on top of the screen - - -

WITNESS (Continuing): - - - the screen and the size of the particles, the weight of the particles - that is the specific gravity of the solids, so that there are a number of factors involved but it is the stratification process which is very essential to the whole process of screening.

MR HULME: In para.6 of your affidavit you discuss sieve bends, and you set out there the principle on which they work. You say that the sieve bend is quite different from the vibrating screen which depends on natural gravity and throw, upward and forward movement, caused by vibration to break surface tension between particles of feed and the deck surface and to present the articles to the apertures with the desired frequency and in stratified form. Does stratification have any part in the sieve bend process?---I would say extremely little if any at all. Stratification on a sieve bend is not considered as something which is actually taking place because there is no vibration imparted to the sieve bend; it is a static machine. Because there is no vibration in the sieve bend and because of the speed of flow stratification does not, in my opinion, take place - and the speed of flow, of course, is much greater than the speed of flow that we would have on a horizontal screen where you do get the stratification.

I would ask you to turn over to p.17 of the Allis-Chalmers document, exhibit NEG4. It says at the top of the right-hand column:

> "There is a vast difference between wet screening of feed containing clay.....(reads).....and rinsing a material - -"

Stopping there - can you tell us what is meant in the screening parlance by "rinsing"?---Rinsing is a spraying condition or application applied but normally considered to a lesser extent than in the case of washing. Rinsing is merely applied to particles, or considered as water applied to particles, for the purpose of removing the extreme fines which are not tenaciously held to the ore particle.

It then goes on to talk about the number of sprays and the quantity of water, and the third paragraph says:

> "If the feed contains a large quantity of clay the sizing may be.....(reads).....in a flume ahead of the screen."

Could you expand a little on that?---I might add, in expanding on that particular point, that we do not (and it is specifically not stated) make any reference

to chutes or any form of chutes; this is outside of the scope of this article. It therefore merely comments on the fact that water must be added, and it does not elaborate on that to any large extent. However, that does not mean to say that we do not become involved in the application of water and the scrubbing effect on the screen. Excuse me - what was the main question?

MR HULME: I was looking at the sentence - - -

saying that sizing may be improved by pre-soaking or adding water into the feed before you get to the screen. Could you just explain why that is and how it works?---Yes. The water added to the particles or the feed before it enters the screen is where you have a material where you have conglomerates of clay, gang, with the solids, with the ore, and it is necessary to dissolve or break those up. The tenacity of the clay is something that cannot be measured. There is no device for measuring the tenacity of clay so that there is an experience factor that comes into the determination of water, the quality of water, the pressure of water, and so forth, that is required for a particular ore. It must be added otherwise if you do not and the extent of the pressure of water that is applied is such that it must break up the gang and the fines and the clays from the ore particles so that, as I have said previously, the screen is allowed to function as a screening machine - -

What happens if that does not get removed?---If that material, the gang and the fines, are not removed from the particles, you may finish up with particle sizes which are maybe twice or many times greater than the actual ore particle that we are concerned with and, therefore, the whole process of screening is completely disorganised because you are having the larger particles going over in one particular area from the screen instead of going through in another area of the screen. You get a wrong misplacement of particles as well as very serious consequences for the screen operation itself because of the clays that will accumulate from coming off the larger particles, adhering to the vibrating screen body and there are many circumstances where the screen will plug, peg or blind - blinding meaning the accumulation of fines over the apertures until it closes off the aperture altogether.

CROSS-EXAMINED BY MR SHER QC:

MR SHER: Mr Pritchard, you swore your affidavit after you had seen the affidavit of Dr Lynch?---That is correct.

I take it you could have sworn it before you saw the affidavit of Dr Lynch?---If I had been asked, yes.

Were you not asked?---No, not before. I do not recall.

It did not take you long to swear your affidavit after Dr Lynch swore his because his was sworn on 22nd May and yours was sworn on 24th May, two days later. Had you seen a draft of Dr Lynch's affidavit before you gave your version of the events to somebody to - -? ---Yes.

MR SHER: You had?---Yes.

I am not asking you what you said but before you gave instructions for your affidavit you knew what Dr Lynch was saying?---That is correct - I believe that is correct.

Had you waited yourself for Dr Lynch's opinion before you expressed your own?---Definitely not.

But somebody else had, apparently, thought fit to acquaint you with it before you gave instructions?---No, not acquaint me with the facts of Dr Lynch's affidavit.

But your affidavit deals at some length with what Dr Lynch says? ---That is correct, that is right, but my opinions were as I have stated.

So that as far as you were concerned, there was no point in waiting for Dr Lynch?---No. I would have stated that.

In dealing with the matters that are under discussion in this case, one of the matters that you appreciate is under discussion is "What does the word "screening" mean?" Is that right?---Yes.

Do you understand that to be in issue?---Yes, screening, that is correct.

And part of the affidavit you swore is directed to that very issue?---That is so.

What the word means?---Yes.

Now and in 1962?---Yes.

Do you use the word yourself - - -

MR SHER (Continuing): - - - yourself consistently with what you say others understand the word to mean?---I do believe I do.

If I were to look at your affidavit - - I withdraw that. In para.4 of your affidavit you start off by agreeing with the conclusion expressed by Dr Lynch and his reasons and then you say:

> "In particular, crushing and screening usually refers, and referred in 1962, to a dry process."

WITNESS: That is so.

MR SHER: You are agreeing with that opinion expressed by Dr Lynch?---That is so.

And it is your own opinion?--That is my own opinion. It happens to coincide.

So, if outside this litigation I had walked up to you in the street and said "My name is so-and-so. I understand you are an expert in screening" you would have thought to yourself "This man wants to talk to me about dry screening"?---Not necessarily. It could apply to any form of screening. Screening comes in many forms.

You mean including wet screening?---Including wet screening.

So if I sort of ambled up to you in the street one day and said "Mr Pritchard, I understand you are one of the top men in Allis-Chalmers. I want to talk to you about screening" you would think I wanted to talk to you about wet screening or dry screening or both?---That is so. There are many facets.

That is the way the word is understood in this particular industry, is it not?---That is correct.

And it has been so understood for years, has it not?---That is so.

Back in 1962?---Yes.

You, yourself, in your affidavit have used it in that dual capacity, have you not?---Yes.

Would you look at para.1(a) in particular? In giving your qualification you have told us:

> "I have worked on engineering matters in relation to the mining industry....(reads).... and particularly involved with screening processes."

Do you see that paragraph?---That is correct.

MR SHER: When you used the word "screening" there you meant wet and dry screening?---All forms.

Over the page in para.1(b) you gave us some details of your background and you told us that from 1937 to 1949 you were a design draughtsman with Alluvial Mining Equipment Ltd, which designed complete gold and tin dredging equipment for plants in use in Australia and New Zealand and Malaysia and you went on to say:

> "The processes used in those plants were heavily dependent on screening."

WITNESS: That is correct.

MR SHER: You meant there wet and dry screening, did you not? ---I do not recall specifically saying wet and dry because in a dredging plant it is all wet.

Certainly, so you meant then,when you referred to screening, wet screening?---No. I would have indicated that in general I am talking about screening and the screening principles were applied with regard to my affidavit.

In tin dredging the screens used are wet screens?---That is correct.

In gold mining wet screens are commonly used?---That is so.

So when you were talking of your experience in gold and tin dredging and you referred to those plants "heavily dependent on screening" you there were referring to wet screening?---That is so.

I take it then that you did not mean to say that the word screening - - I withdraw that. In para.4, when we look at the expression that you say usually refers to and referred in 1962 to a dry process, "crushing and screening", you were talking about a composite process, were you not?---Yes, crushing and screening is normally - - yes, when we are talking about aggregate plants, crushing and screening.

Certainly. So you were talking there about a composite process, crushing and screening?---Correct.

Because you can have crushing on its own - - -

MR SHER (Continuing): - - - on its own; is that right?---Generally they are combined; if you have crushing you have screening.

Do not worry about generally - you can in fact have crushing just on its own, can you not?--On rare occasions, yes.

Is not a grizzly - - a grizzly is a screen, is it not?---Correct.

Well, that is the other point; you can have screening on its own?---That is so.

You meant there, when you say "crushing and screening", it usually means a dry process, but you did not mean when you deal with them separately it usually means a dry process, did you?---No. They are generally combined in a dry process.

I know; I know you have said that. However, you used the expression "crushing and screening", and you can do them separately, can you not?---In one case, screening, definitely yes; you can do it separately. In the case of crushing, it is rarely done.

That is sufficient for my purposes. You can do screening on its own, can you not?---Yes.

And commonly do?---Yes.

In this plant that is what happens?--I would not agree with that statement.

Well, there is no crushing going on round about the wet screens which this case is about?---It is prior to that.

But once we get past the crushers - they are in a separate plant, are they not?---I think you do have an 80 by 30 product which is recycled.

Yes, but once it has been recycled it goes onto a conveyor belt and then goes to the screening and washing plant, does it not? Is that not right?--Yes.

There is no crushing there, is there?---No, but in the - - no, not afterwards.

No, so you can have screening on its own as a separate part of a process, do you agree?--Yes.

And you do have that in fact at Tom Price?--That is a difficult question to answer, I think. I am thinking of the process; this is a process.

Let us forget about the process and just talk about words for a minute. That is all you were talking about in para.4.

You were only talking about words, were you not? ---More than that, sir.

MR SHER: Well, what did you mean, then, by saying that "crushing and screening" (putting them in inverted commas) referred to a dry process? Were you not just trying to tell the reader of the affidavit what the words meant?---No, I am talking not about the words but the process: "Crushing and screening is normally referred to a dry process".

Then in para.4 you were not trying to convey what the words meant?---Well, it is the process and the words. Sure you have to crush and screen as well.

You can have screening on its own?---Yes.

If you, in 1962, were asked about screening - not about crushing, just about screening - you have already agreed with me that that word screening could mean wet or dry or both?---Correct.

So if you saw somebody talking not about "crushing and screening" but "crushing or screening", in other words not a composite process but perhaps alternatives, the screening could mean wet screening or dry screening or both?---That could be so.

You say in para.6 that in 1962 sieve bends were a relatively new product developed by a Netherlands Company, Dutch State Mines: "They were not called screens." Do you see that?---That is correct.

They are called screens now, are they not?---They were not called screens within the industry.

When?---Back in 1962 within Australia.

When did they start calling them screens - - -

MR SHER (Continuing): - - - them screens?---I think it is a very loose term. I cannot give you the exact date but it is a loose term which has been used on and off. If anyone were to confront me with a sieve bend - not only me but anyone in the industry - they would always refer to that as the sieve bend.

You are talking about now?---Now and even in 1962.

So you would say now an expert in this field would not call this sieve bend a screen?---No.

What about people selling them - would you think they would refer to them as screens?---People selling them, just like the deck surfaces of a screen - - they call that a screen also. It could be used loosely and referred to as a screen.

So a sieve bend could be referred to as a screen?---It could be, yes.

And it is?---Anything that separates one particle could be.

We are not talking about anything. We are just talking about sieve bends now. Sieve bends are called screens, are they not? ---As I say, it is not a usual terminology.

Have you heard of Dorr-Oliver?---Yes.

Are they rivals of yours?---No.

Are they competitors of yours?---No.

Do they sell screens in Australia?---They sell sieve bends.

Do you not sell sieve bends?---No, we do not.

That explains it. You really do not know what people who do call them then, do you?---Yes, I do.

Have a look at this brochure from Dorr-Oliver and see what they call them? Do Dorr-Oliver call them screens?---They do.

What about Heyl & Patterson - have you heard of them?---Yes.

They sell sieve bends, do they not?---That is correct.

What do they call them?---Well, I would call them a sieve bend like a lot of people in the industry would call them sieve bends.

But they refer to them as things that do screening, do they not? ---Yes. There could be good reasons for that, of course.

It does not matter what the reason is. At the moment we are just wondering about the words. Just have a look at that?

Do you recognise that as one of their brochures? ---Yes.

MR SHER: They refer to them as "screening devices" there, do they not?---They call them " H & P sieve bends".

Read on. What else do they say?---They call them "High-screening, capacity-efficient, de-watering".

I tender those two brochures, if your Honour please.

EXHIBIT EXHIBIT 13 .... Two brochures.

MR SHER: Just to get back to your affidavit, when you say they were not called screens, you are talking in strictly technical language, are you not?---That is correct.

You would understand that within the industry people would refer to them as screens?---I think they would want to differentiate between a sieve bend and a screen.

They may, but within the generic term "screen" or "screening" sieve bends are included, are they not?---Yes, you could. If you got a dictionary you would probably find that is so.

Let us not worry about a dictionary. Let us go to Dr Lynch. Have you heard of Dr Lynch?---I have.

Have you read his book called "Mineral crushing and grinding circuits" volume 1 published in 1977?---No, I do not know whether I have read it. I might have scanned through sections of it.

At p.101 he says this:

> "Wedge-wire screens, the most common form of which....(reads)....size-separation device in coal-washing plants."

I would like you to look at that to check that I have not misled you in any way. Do you see the passage I have read?---Yes.

Dr Lynch seems to be calling them screens, does he not?---He does.

Would he not know?---Yes, but again it is a loose term.

Loose or tight or whatever way you like to have it, people in the industry call sieve bends, on occasions, screens?---Yes.

And they do screening?---Anything that has an aperture in it is called a screen.

Do not worry about "anything". Just stick to sieve bends. Sieve bends and their activities are referred to commonly in the industry as screens and what they do is screening. Do you agree?---Right.

Can we have that book back now thank you - - -

MR SHER (Continuing): - - - now, thanks. Your comment, "They were not called screens", is really that you are being very precise and technical in your language when you say that?---That is so, yes; using the normal terminology that is used in the industry.

I would not doubt for a moment that you have a lot of practical experience and you have picked up a lot of knowledge about the mining industry over the years but your actual expertise is really in the actual screen itself, is it not?---That is correct.

The question of actually designing a process is not really your job, is it?---That is not correct. I am involved very much in the process with regard to what comes before the screen and what comes after the screen.

But you do not design what comes before and what comes after, do you?---For many, many years I have been involved in the actual discussions and planning stages - -

But when it gets down to the hard nitty-gritty of designing it, you do not do that, do you?---Our recommendations are often followed in respect of what comes before and what comes after.

No doubt but the actual design of something that comes before or after is not Allis-Chalmers job, is it?---As I say, in some cases it is to the extent that we even draw out the type of pulp boxes.

Then I suppose you were involved in the design of the plant at Tom Price?---At Tom Price? I cannot recall how far - that was some seven or eight years ago, but in discussions - -

Just a moment; we are talking about design now, not discussions. Were you involved in the design of it? ---As I say we normally provide - -

No, not normally; you would remember if you were?---I cannot recall - to answer your question - whether I made a drawing of the chute or not.

You may have; you may not have?---I may or may not have.

You probably talked about it?---Most certainly.

I suppose you talked about things such as that on other plants throughout Australia where Allis-Chalmers have sold screens?---That is correct.

Are your words religiously followed by the people with whom you talk or do they sometimes, like barristers, ignore the advice you give?---I think our recommendations are generally well accepted.

MR SHER: But they are not always followed?---Not necessarily.

And if we were to go a little to the north, perhaps a bit east or west, I am not sure which, from Tom Price to Mount Newman, that was a case where your advice was not followed in relation to these matters. Is that not so?---It was not necessarily on the beneficiation plant but it certainly was on many other occasions.

Yes, but it has been ignored on other occasions, has it not? ---On that one occasion, yes.

When you were advising BHP about Mount Newman, tendering advice, they chose to ignore your advice, did they not?---I would not say they chose to ignore our advice. They chose to ignore our offer to supply the equipment.

They also designed it differently from the way you recommended, did they not?---But there could be good reason for going the way that they did.

Who would suggest for a moment there was not, but that is what happened? Is that not right?---I presume so because, as you say, I was not involved in the beneficiation plant supply.

But you were involved in providing screens up there, were you not?---In the dry processing section, yes.

And in that section when you tendered advice about certain things the advice was ignored?---Not necessarily so.

Was it not? It was not followed, was it?---Yes. I have offered many sketches and drawings giving recommendations for the chutes and things like that on screens.

I do not know what we are arguing about. Your advice was either ignored or it was not - - -

MR SHER (Continuing): - - - or it was not. Was it or was it not? ---I believe it was; many aspects of it.

I see - and many aspects were not?---That is so. We give recommendations and not hard and fast directions.

Coming back now to Tom Price, did you design the chute for the primary wet screens in the beneficiation plant?---That is one in question that I mentioned. I cannot recall supplying any definite design, but there would have been discussions and recommendations.

But you do not know whether the recommendations were ignored or not?---As far as I am concerned the design would fit in with my recommendations.

It really should not be too hard for you to tell us whether your recommendations were followed at Tom Price or not. I mean, you ought to know and it is not that long ago, is it?---Seven years, sir.

Are you telling us you do not remember?---It is a long time and a lot of water has gone under the bridge.

A lot of water has probably gone over the screen, too! However, do you not remember?---I cannot remember specifically.

This is a big case, is it not - do you not think?---Yes.

Pretty important?---Yes.

And you have been enlisted as an expert for Hamersley?---Yes.

I suppose you have gone through your files to see what you have in your files about this particular plant?---No, I did not.

You have not?---No.

Do you have a file?---Yes, we have a file.

I see. Has anyone suggested to you that you go back through the file and see if you have any designs or drawings or recommendations for the chute of this plant?---No.

Have you thought to do it yourself?---No.

For all we know the design may be there?---It could be; it could be there.

That is if you did design it?---If we did design it.

But you cannot remember whether you did or not?---No.

Correct me if I am wrong, but to get feed onto a wet screen you have to have some sort of device to do it, do you not? ---Yes.

MR SHER: You just cannot let it just flop loosely onto the screen?---No.

So you have, what - usually a chute?---Yes.

If you are wet screening do you normally put some sort of spraying device in such a chute?---Most definitely.

So in this respect this chute at Tom Price is no different from the average feed to a wet screen; it is a chute and it has a spraying device in it?---No, I could not agree with that statement.

Is it similar to this extent: It is a chute?---Yes.

It has four sides and an open top and a relatively open bottom? ---Correct.

The feed sort of falls down through it?---Correct.

And it has some sprays in it?---That is right.

That is a pretty common arrangement, is it not, for a wet screen? ---Yes.

It also has at the bottom a sort of a ledge for the feed to land on so it does not hit the screen directly?---Correct.

That is, amongst other reasons, to prevent wear on the wet screen itself by the impact of the fall?---That is one of the reasons.

Certainly. In this particular case the fall is 1½ metres, we are told. Is that in accord with your recollection? ---Yes, from looking at this and the inspection I do remember - -

Forget looking at it at the inspection; you ought to remember it because you had something to do with it in the first place?---Well, I cannot remember the exact dimension in terms of millimetres, but it would be of that order.

In that regard, having something to break the fall, it is again a fairly common thing to find in a wet feeder chute? ---It is different, though, in the direction in which it is facing.

That is another question; let us just get breaking the fall sorted out first. That is fairly common, is it not? ---Yes.

Now let us talk about the direction of it. Sometimes you put the feed coming through the feeder box going on frontwards, sometimes backwards. Is that right?---That is correct.

A good reason to put it on backwards, that is towards the head of the screen rather than further down it, is if the velocity of the feed coming through because of the fall

is going to be considerable?---Yes.

MR SHER: The further it falls the faster it will go?---Yes.

This is where Mr Hulme's formula is right, 32 feet per second per second; it is going to accelerate at 32 feet per second per second?---Yes.

And some of this feed is 80mm in size?---That is right.

Pretty big stuff?---Yes.

And heavy?---Yes.

Because it is iron ore, as to a larger part of it?---Yes.

Indeed, just to remind us of what we are talking about - - -

MR SHER (Continuing): - - - talking about, if we look at the exhibit which is the photographs and photograph No.1 which you may or may not have seen - - Have you seen the photos?---Yes, I have.

You will notice on photograph No.1 it has some pretty big lumps in it?---Correct.

That sort of lump dropping freely a distance of one and a half metres, about 5 feet, _ is going to be going pretty fast when it gets to the bottom?---Right.

And if you let it go on forwards onto this screen it would just whip right across it, would it not?---Not necessarily. It depends on the combination of fines and coarse material that you have in the feed.

But if you have turned all this into a slurry as well as it comes down the chute, it is going to get onto that screen at a very fast pace?---In both cases, yes; dry or wet. It will go onto it at a fast pace.

But even faster when it is wet because it will slip?---Not necessarily. We do not have to take slipping into consideration at all. You do have the clay content to consider and that can give you a reverse situation .

Except this; you do not know the clay content of these ores, do you?---No, but that is where flexibility must be allowed in the ore operation.

But a good reason to reverse the direction of this chute is so that when it hits the bottom and goes backwards instead of forwards, instead of, as it were, just sliding straight through, you put it at a right angle and it slows up?---It slows up, yes.

Considerably?---Yes; we want it to slow up.

Exactly; you want it to slow up?---For other reasons besides what you are referring to.

But to reverse the direction of the fall is,at least in part, due to the fact that you want to slow up the speed of this particular feed?---Yes, for time retention purposes.

Time retention meaning the amount of time it is on the screen? ---Correct.

I will just leave that topic for a moment and come back to it. I will just ask you some general questions about screens and screening, wet screening in this particular instance?---Yes.

MR SHER: Wet screening is more efficient as a sizing operation than dry screening?---Generally, yes.

With iron ore feed, 80 by nothing, it would be more efficient to size it wet than to size it dry?---Generally, yes. I say generally because you must consider the clay content.

But, of course, you do not know the clay content of this ore?---Not specific figures but I am aware of the clay content.

It is not always the same, is it?---No, it varies.

The clay content itself changes?---Correct.

Clays can be sticky?---Yes.

Or dry?---Correct.

And more or less?---Yes.

Do you use the word "clay" as synonymous with shale?---Yes, because some of the clays emanate from the shale.

But the shale is distinct from clay, is it not?---In its solid form, yes.

Indeed, if we look at some of these photos you will see there are lumps of shale like a solid bit of white rock?---Right.

You do not refer to that as clay, do you?---No. Some of the clays do come and rub off, degrade, from the shales.

In any event, generally speaking, if you want to size,wet screening is more efficient than dry screening?---Generally yes.

That is what Allis-Chalmers say in their brochures, is it not? ---Yes. It is a guideline only though, we must remember.

Guideline or not, you agree with what your company puts out, do you not?---Correct.

To go to that exhibit for a moment, the Allis-Chalmers brochure that is exhibited - do you have it there?---Yes.

At p.3,under the heading Introduction, you are talking of screen uses, size separation is the first thing mentioned?---Correct.

It is generally accepted, is it not, in the industry that wet screening is more efficient than dry screening - - -

MR SHER (Continuing): - - - dry screening for size separation? ---Correct.

That is what Allis-Chalmers generally tell people?---Yes.

And you believe that to be true?---Yes.

That is a function of screening - size separation?---Yes.

With wet screening, you cannot wet screen without getting the feed wet, can you?---That is correct - not only wet but also removing the clays from the solids.

So you cannot wet screen without both getting it wet and doing some removal of clay?---That is correct.

Which you would, I suppose, describe by using words such as cleaning or washing or scrubbing?---Yes.

So you would agree that the inevitable consequence of wet screening is some degree of washing or cleaning or scrubbing?---Yes.

Using those three words synonomously?---Right.

If I said to you "We are going to wet screen this ore" you would assume that what would happen would be that it would get wet, firstly - is that right?---I would want to know the ore, first of all, before I did that.

Do not worry about the ore. I am just talking in general terms. I come to you and say "Mr Pritchard, I am going to wet screen some of this iron ore." That would tell you, firstly, that I was going to wet it?---Yes.

That I was going to put it on a screen?---Correct.

That I was going to separate it by size?---That is correct.

That some cleaning would occur?---Yes.

That some scrubbing would occur?---Yes.

That some washing would occur?---Yes.

And washing, screening and scrubbing in that context are synonomous terms, all meaning much the same thing?---Yes.

I mean to say "washing, cleaning and scrubbing". Did I not say that?---I am not sure whether you used the word "cleaning".

Which screening includes some washing, cleaning and scrubbing - those words meaning much the same thing?---Yes.

You might, perhaps, think of scrubbing as a more vigorous form of washing or cleaning?---Yes.

MR SHER: If I really wished to scrub some ore, would Allis-Chalmers be able to sell me a scrubber?---They could.

That is something different from a wet screen, is it not?---Yes.

If I really wished to wash the ore, could you sell me a washer? ---I would sell you a scrubber if I wanted to wash the ore.

Could you sell me a log washer?---No.

Someone else would have to sell me one?---That is correct.

Could you sell me a trommel?---No.

I would have to go elsewhere for that, would I?---That is right.

There are other means of washing or scrubbing ore as well as those? ---That is correct. We can provide features on the screen for extra washing.

Let us face it. You would try and sell me what you had available? ---We have that available.

Yes, but if you did not have it available and I really wanted it, you would have to send me somewhere else?---Yes.

That happens, I suppose?---That is so.

Can we just go through this brochure, not at any great length but just a little more? This part which Mr Hulme drew to your attention in the middle of the second column on p.17 about the sizing - can I just take you to that? ---Right.

It reads: "If the feed contains a large quantity of clay, the sizing may be improved ....(reads)....in a flume ahead of the screen."

WITNESS: Yes.

MR SHER: What that means, I suffest, is that, depending upon the amount of the clay - and that is the real test is it not?---That is right.

Apart from what happens on the screen itself, you can, as it were, pre-condition it by pre-soaking or adding water to the feed in a flume?---Correct.

That would be, in effect, part of the sizing process which you were seeking to achieve on the actual screen itself? ---Yes, that is part of the process.

Because, to get that sizing - - -

MR SHER (Continuing): - - - to get that sizing more effective you really have to get it wetter than it would be by the wetting which happens as it comes onto the screen? ---The wetting and disintegration of the clays.

Yes. This particular device about which we are talking is about 1½ metres long or deep, the sprays are about half-way down it; is that right?---That is so.

It is spraying the free-falling material?---Yes.

And using all the appropriate formulae it is exposed to water (I have been told, and Dr Lynch agreed) for about .25 of a second. Do you quarrel with that, or does that seem right to you?---I would add that there is a lot of work which goes on in that chute, otherwise they would not provide the liner plates, the hard abrasive-resistent liner plates, at each side so that impact is - -

It may hit the sides on the way down, but until it gets half-way down it is dry?---There is some pre-wetting in the area above because the whole chute is enveloped in water spray splashing.

In any event, although we might be splitting hairs a bit about whether it is .25 of a second or perhaps .35 or even half a second, that is the maximum, is it not? ---Yes. I would have thought that it was a little longer, but we would be splitting hairs I agree.

Yes. The moment it hits the screen, however, it gets flooded with water again, does it not?---Yes.

So that the only degrading effect which takes place as a result of the water in the chute is taking place within that short period of time we have just discussed? ---Yes. That could be quite severe, though.

When you say it could be quite severe, could it be any more severe than the spraying of that material as it actually comes onto the screen and is hit by the water at that point, with the vibrating screen?---It could be.

But is it?---Yes, I believe it is. Of course, normally there is a greater quantity of water added in that chute.

How much water is added in this chute?---I do not know the exact - - I do not think I can answer that question.

Can you answer it at all? Do you really know?---I have a rough idea but I am afraid that would not be good enough for you.

MR SHER: You would really want to know exactly, would you not? ---We would work to the recommendations which we give in this brochure.

Why would you do that?---Because that is what has been proven over decades to give effective treatment of the ore.

If you were really seeking to achieve something by the addition of water on this wet screen, you would expect your recommendations to be followed, would you not?---Yes, broadly.

Broadly - but if anything was to happen you would expect to find more rather than less water?---Unfortunately we find the reverse situation, sir.

Oh - you have let the cat out the bag, have you not, Mr Pritchard? That is the fact, is it not? They are putting less water on than they should in this particular screen, are they not?---No. I believe the total amount is really a lot less than it should be.

That is what I just put to you?---Yes. I believe that, but I cannot be sure of the figures.

We have been given the figures, and one of our people with mathematical skills has worked it out, and apparently there is less water going on than there should be. You knew that, did you not?---No, I did not.

Did you not know that?---No. I wasn't sure.

But you thought that?---I thought there might have been less.

So what Hamersley are doing here, apparently, is putting less water onto this - - -

MR SHER (Continuing): - - - onto this than they should be according to your recommendations. Is that right? ---That could be.

You think that is what is happening?---Yes. I think it could be the case. As I say, that's a figure I can't say - -

Why do you think it could be?---Just from simple observation of the clays that we have coming through. It could be, of course, a result of the clay content being relative to the type of ore that is coming in also.

But if somebody said, "I asked Hamersley for the figures and they gave them to me and I converted them from kilopascals per whatever it is into your figures which are gallons per minute and they are not putting the amount of water on that is recommended", that would accord with your observations?---Yes.

The effect of that would be that the wet screening was not, in so far as water was necessary, as good as it could be if they had followed your advice?---As I say, I cannot answer that because I am not sure but I would think that it would be less.

Assume that they are not putting on the amount of water you recommend, they are not getting as good a result as they could get if they followed your advice?---That would be right, I think.

At the risk of perhaps repeating myself, just to get it clear, if we look at this document back at p.3 it is apparent that wet screening can involve all of the different uses as set out in that list at the bottom of p.3?---Yes.

Surely you are going to agree with your own publication?---That is right, yes.

We had a publication by Mr Taggart referred to yesterday and today. You were in court I suppose?---I was.

You have heard of Taggart?---Yes.

Did you hear that passage read to Dr Lynch by my learned friend, Mr Hulme, at p.10-09 which read as follows:

> "Vibrating screens are used for most modern sizing and washing ....(reads)....are preferable if scrubbing must be done."

Do you remember that bit?---Yes.

That just confirms what you have said to me earlier, that some scrubbing is often included in the operation of the screen?---That is so.

MR SHER: Similarly, if we logically follow back to p.10-08, the author said:

> "Washing usually involves more or less scrubbing."

That sort of expression is why you regard the words scrubbing and washing as being synonymous?---That is so.

Washing really is synonymous with cleaning?----Yes, but I would not use the word cleaning. I would prefer to use the word scrubbing because I am thinking in terms of the clay removal.

You have heard, I suppose, of this body of screen manufacturers which are in Lexington Avenue, New York City, New York State - I did not quite get it right?---I have.

The Vibrating Screen Manufacturers Association known as VSMA?---Correct.

If I showed you a photostat of their terms and definitions published in 1967, you would be able to identify it for me, would you not?---Correct.

Would you look at this document, Mr Pritchard? Would you look at the definition of wet screening, dry screening and screening - - -

MR SHER (Continuing): - - - and screening? They are on different pages. I have marked them in yellow. Just read it to yourself. Just check them so I can ask you whether you agree that they are definitions used in the industry? ---Correct.

Those definitions are known to you, I take it?---That is so.

They are definitions which are used commonly by manufacturers of vibrating screens?---Yes.

They would be, in the iron ore industry in so far as screening was involved, used in that industry as well?---Yes.

I tender those terms and definitions, if your Honour please.

EXHIBIT EXHIBIT 14 .... Terms and definitions of VSMA.

MR SHER: As to sieve bends, we are going to rely on evidence other than this, your Honour, but it is referred to as a screening surface.
TO WITNESS: In your affidavit you not only refer to and express concurrence with Dr Lynch, but you looked at and made some comments on some of the material filed on behalf of the defendants?---That is so.

One of the things you said, about which I wish to ask you, is this: This concept of having this pulping box, as you call it, several hundred metres away - do you remember that?---Yes.

Page 6, comment on sentence 3 in para.10 of the affidavit of Mr Grosvenor.

> "The pulping box would be just as effective if it were located.... (reads)....before the screen in the operating circuit."

WITNESS: That is correct.

MR SHER: To get this feed onto the screen, the wet screen, we have to wet it first, have we not?---Yes.

For the purpose of the screening?---Correct.

Whatever other purpose it serves, you have to wet it first to get it onto a wet screen?---Yes.

That is common practice?---That is so.

We have to wet it into a form of slurry?---Yes.

That is what happens in the pulping box. Its gets wet into the form of a slurry?---That is correct.

MR SHER: If we took this pulping box, as you suggest, and put it several hundred metres before the screen, we then have to get the slurry onto the screen, have we not?---That is correct.

How did you envisage we would do that?---That would be pumped. This was a hypothetical case and it would have to be pumped - - -

WITNESS (Continuing): - - - to be pumped, although large lumps of course would make it a ridiculous situation - but that is what would have to happen. It does not matter how remote - - or it may be by chute, of course.

MR SHER: Right. This is not a practical proposition of yours? ---No.

It is meant to demonstrate a point hypothetically?---Correct.

However, by saying you would pump it - -?---Or chute it.

- - you have in the back of your mind that it has to get onto that screen in the slurry form?---Correct.

We cannot put it on a conveyor belt in this sort of sloppy condition; it would go everywhere?---That is correct.

We have to contain it so that it gets onto the wet screen as a slurry?---Correct.

And if we did not do that we would have to wet it again to get it into a slurry form?---That is so.

I just thought I would clear that up with you. When you say, as you do, that scrubbing begins in the pulping box, you mean this degrading of the clayey material as a result of the water going onto the feed?---The disintegration - I would rather use the words "the disintegration of the clays".

Right - that is the bit you have in mind; the disintegration of the clays in this part of a second between when it gets wet as it goes through the pulping box until it gets wet on the screen?---That is so.

It is apparent to you from the affidavits on which you comment that there are other people of some experience in the iron ore industry who disagree with you?---No, I would not accept that statement.

Do you think Mr Grosvenor, Mr Booth and Mr Beukema agree with you, do you?---If I can explain?

Certainly?---The situation I believe is shown as different from the Hamersley job in respect of the lump size of material entering the chutes, and that makes a large amount of difference, besides other aspects of the operation and the physical characteristics of the ore.

Are they not saying in their affidavits that all that is happening in this pulping box, which they call something different, is wetting the feed for the purpose of wet screening? Is that not what they are saying?---It is more than that. They have to disintegrate the clays

and with a finer feed there is much greater surface area.

MR SHER: No, I think you misunderstand my question: I am just seeing if you are prepared to acknowledge that your opinion is not shared by other people who have sworn affidavits in this case - your opinion that scrubbing begins in the pulping box. That is not shared by the affidavits on which you are commenting. Do you agree with that?---I accept what you have said.

I suppose you had a look at the people that you were disagreeing with to see who it was you were disagreeing with. Did you do that?---Yes, I think I have. Do you mean here, or - -?

Oh no; just when you read the affidavits. I suppose you did not know Mr Grosvenor by name, or Mr Beukema - or you may have?---No.

You knew Mr Booth, though?---Yes.

Mr Booth is the man who worked with Mitchell Cotts to design Mt Newman, is he not?---Yes, I believe so.

He is a very knowledgeable man?---Yes.

His job is really to design this sort of plant, is it not?---Correct.

Leaving Mr Booth to one side for a moment, here were these two American gentlemen with a pretty long list of credentials. Did you notice that?---Yes.

I suppose you wondered, when you read their opinions, whether you really were right - or did you have no doubts? ---I had no doubts, sir.

Are you prepared to acknowledge that opinions may differ about this particular matter, whether scrubbing begins in the pulping box?---Where conditions differ, yes.

But they were not talking about different conditions; they were talking about this pulping box, as a result of them inspecting it?---Yes.

So they were not talking about different conditions, were they - - -

MR SHER (Continuing): - - - were they?---But they did make reference to Mt Newman.

It does not matter what they made reference to. They were saying in their affidavits that they disagreed with you?---That is correct.

A gentleman who had been pretty close to the top of US Steel was one of them?---Correct.

Another gentleman who was clearly very experienced in the iron ore industry, in academic positions and practical experience?---Yes.

And Mr Booth, the local man?

MR HULME: My learned friend this time has added Mr Booth and I object. Mr Booth does not differ from this witness on what happens in the pulping box. I read the passage this morning. He disagrees as to how he describes it but your Honour will remember this phrase "to accelerate the breaking down". He specifically says that in relation to the pulping box sprays. What he is arguing about is terminology or something else. It is utterly wrong to put him up to this witness as saying something different as to what is happening in the pulping box.

OLNEY J: The cross-examination was proceeding on the basis that views were expressed as to when scrubbing commenced.

MR HULME: That is a matter of terminology.

OLNEY J: Yes.

MR HULME: Of course I disagree, but when it is put on the basis of - - my learned friend specifically left Mr Booth out when he listed them before, because Mr Booth does not go all the way with the other gentlemen. (In this last question you added him in.)

MR SHER: That is not why I left him out but I now want him in and perhaps I can just explain to your Honour? One cannot, with respect, switch from what is in substance happening to what is said to be happening by the use of certain terminology and unless I have misunderstood Mr Booth's affidavit and a number of conferences, I apprehend he is saying something quite different from this particular witness.

If I am wrong, then the question will be to that extent unhelpful, but it is submitted that I am entitled in cross-examination to put it on the assumption that I am right and that Mr Booth is disagreeing with this witness.

OLNEY J: Yes, very well.

MR SHER (TO WITNESS): If Mr Booth is agreeing with you then he will say so when he gives evidence. I suspect he is not and I wish you to assume he is not. Here you have a local expert whose opinion, I take it, you would not treat lightly?---That is so.

And two American gentlemen of clear experience and expertise?---Yes.

Differing from you?---Yes.

They are differing from you about the use of words in the iron ore industry, are they not?---In certain respects maybe that would be so.

Because you are saying what happens in the pulping box is scrubbing and they say it is not scrubbing as the word is understood in the iron ore industry. Is that right?---That could be so.

These three gentlemen, two in particular, really just live iron ore their whole working lives, but iron ore is only one part of your activities, is it not?---Concerning screening it is a very big part.

Big or not, you are involved in screens for all aspects of the mining industry?---Yes.

You are not confined to iron ore?---That is so.

When it comes to what iron ore men mean by certain words, who do you think would know better - somebody who has been in the iron ore industry all his working life or somebody who has been in and out of it like you have been, in a particular activity, namely the selling of screens? Who do you think would know better what the words mean?---What the words mean - just iron ore - yes, I think you would be right in your assumptions.

The iron ore men would know better?---But not on screens.

But we are not talking about screens here. We are talking about scrubbing, are we not?---And even on scrubbing, possibly.

I see. From your knowledge of this industry, the terminology is used differently from one person to another?---There are differences that do creep in; sure.

Do you think that is the explanation for the difference between what you say is the word one should use to describe what happens in the pulping box, as opposed to what Mr Grosvenor, Mr Beukema and Mr Booth say on the other hand? Do you think that is the explanation for the difference between you, that you are using the same words to mean different things?---I would have to have a specific word brought before my attention before I would be able to answer that question.

They disagree with your use of language - - -

MR SHER (Continuing): - - - use of language. They do not agree that this is scrubbing in the pulping box, and that really turns on what people in the industry mean by the word "scrubber" or "scrubbing". Is that not right?---No. In my opinion "scrubbing" of course is - -

You have made your opinion clear. I am merely putting to you, and you have agreed so far, I understand, that people in the iron ore industry would have a better knowledge than you, perhaps, of the use of language - but I am merely asking you whether you would agree that the difference between the two of you, you and, say, Mr Beukeman, is this honest difference of opinion which can occur between people as to what a word means? ---There could be some degree of misunderstanding or misinterpretation, or interpretation of terms.

Some people in this case are saying the word "screening" does not include wet screening. Are you one of those? ---No. I believe screening applies to wet screening, dry screening and the whole lot.

Have you read the affidavit of Mr Herkenhuff?---No.

You do not know about his affidavit?---I have not read it. I have not received that one.

What about Mr Horseman?---No, I have not seen Mr Horseman's.

Would it surprise you to learn that some people being called by Hamersley say screening does not include wet screening?---It would surprise me.

I would take you to p.9 of your affidavit. Do you see the comment in para.(d), where you refer to para.11, sentence 1 of the affidavit of Mr Booth?---Is this p.9?

Page 9, para.(d). You refer to para.11, sentence 1, of the affidavit of Mr Booth?---Yes.

There you say:

> "At Tom Price the water preconditions the feed for later concentration in the drums.....(reads).....also assists passage through the screen."

WITNESS: That is correct.

MR SHER: One of the purposes of adding water to the feed is to assist passage through the screens?---Yes.

So it is not incidental that the water assists passage through the screens; it is one of the purposes of adding the water?---It is one, but I consider that as incidental.

MR SHER: Incidental to what?---As I said, to assist the passage of the particles through the screen, so I consider that as additional and incidental. It is only a minor part.

Your own brochure suggests that the adding of water makes for more efficient screening. Is that right?---That is so.

And makes for more efficient sizing?---That is correct.

So the addition of water is directed specifically to more efficient sizing?---Yes, in the general terms.

Therefore it could not be said to be incidental; it is the very reason, or one of the reasons, for adding the water? ---I consider this as secondary after the breaking down - -

Let us not give it any ranking at all. It is absolutely essential to wet screening to add water to it, because that facilitates the screening?---Yes.

Therefore the purpose of adding the water, whatever else it does, is to facilitate the screening?---That is one of the objectives.

There is no doubt of it, is there?---No, that is right - as one of the objectives, there is no doubt.

You could not wet screen effectively without it. Is that not right?---Yes, that is right.

You are saying that the water preconditions the feed for concentration in the drums, cyclones and whims?---That is correct.

Does it do that by cleaning?---By the breaking down of the clays and segregating.

Which cleans it?---Yes, cleans it.

Did you know that on occasions some of the feed was not put through the drums, the cyclones and the whims?---No, I was not aware of that.

You did not know that?---No. I have not been involved in the circuitry entirely.

For the feed which does not go through the drums, the cyclones and the whims - - -

MR SHER (Continuing): - - - the whims, because it is not going through them. Do you agree with that?---If that is the case that would be so.

What is the purpose of the water in the case of that particular feed; that is, the feed that does not go through the drums, the cyclones and the whims?---I was not aware of that.

Now that you are, what would be the purpose of adding the water in respect of that feed?---It may have some purpose so far as standardising the procedures, the process procedures, so it could be that they still carry out wet screening.

In other words, they are doing it because they always do it? ---Also to retain some consistency in the operation.

Because they always do it?---Yes.

But it could not be explained on the basis of pre-conditioning it for the drums, the whims and the cyclones, could it? ---But it would have to be pre-conditioned in any case to - -

For what?---Because of the clay content.

But I thought you were saying here that the pre-conditioning, because of the clay content, was to get it through the drums, the cyclones and the whims?---That is correct.

So it is not going to go through that, we cannot explain the water on that basis, can we?---No, but - - You can explain the water in so far as we have a horizontal screen in that location and if we were to put that material on dry, then that screen would not function in a proper manner.

So the water in that instant would be to facilitate the screening?---That is correct.

Does your knowledge extend to the operation of dry screens?---Yes.

Do you sell dry screens?---Yes.

Have you seen dry screens in action?---Yes.

When you dry screen iron ore, do you sometimes use vibrating screens? ---Almost universally, yes.

To dry screen you would have to have the ore very dry, would you not?---Yes; preferably dry if it is possible.

And you describe the ore that comes from this mine with its 1 to 2 per cent water, I think those figures, as dry ore? ---That is very dry.

MR SHER: That is very dry?---Very dusty.

You might, on analysis, find you have 1 to 2 per cent water but to everyone in the industry that is dry ore? ---Very dry.

And dusty ore?---And dusty, yes.

I suppose in layman's language you would call it bone-dry, would you not?---Practically, yes. We often use that term.

You would agrée, would you not, that to screen ore it either has to be very dry or very wet?---Yes, I agree entirely.

And between the two are different stages of disaster from a screening viewpoint?---Very much so.

You can get the whole thing clogged up and it will not work too well at all?---Yes.

When you see ore on a dry screen, bouncing around as it goes along, I suppose you notice, apart from being screened it breaks up a bit as well?----It is something that you cannot visually determine.

But you know it is happening though, do you not?---There must be a small amount. It would be a small amount, marginal.

But it would be happening, would it not?---Yes, a small amount of degradation does take place.

So if we were to define scrubbing as degradation,you would say there was scrubbing going on with dry screening?---Yes, in a rather odd manner you would - - -

WITNESS (Continuing): - - - you would-- could refer to it.

MR SHER: Would you think people in the industry would refer to degradation as scrubbing?---No it is not referred to, I have never heard of it being referred to, as scrubbing.

That is degradation?---It is referred to as degradation.

Wherever it occurs?---Yes.

If I said to you that scrubbing was going on on the conveyer belts in this particular plant, if you were polite you might just disagree with me but it is really laughable, is it not?---What - if scrubbing was going on?

If I said to you that in this particular beneficiation plant scrubbing was going on while the ore was being conveyed in its wet form along the conveyer belts, you would be too polite to laugh at me but you would feel like laughing, would you not?---It would be very small indeed.

It is not the way in which people in the industry would use the word at all?---No. You would get it at the discharge end, the transfer points of the conveyer.

Because it is hitting and falling and abrading?---Right.

OLNEY J: Can I just ask you this? In this VSM document, the terms and definitions, screening is described as a mechanical process which accomplishes something?---Correct.

What is the significance of the word "mechanical" there? Is it a distinction from a technical or some other process?---Yes, that is so. It is using a machine to actually make the separation, so it is a mechanical process.

So even with a stationary screen like a grizzly, would you describe that as a mechanical separation?---Yes. There are various types of machines to make physical separation mechanically, as compared with, say, a hydraulic situation where you float and make separation.

Here you have a structure which has no moving parts, apart from the ore falling into it?---In the case of the vibrating screen, of course - -

Yes, I can understand that, but if you have a stationary screen where things just fall through?---That would still be referred to as a mechanical separation.

MR SHER: Just while I have you here, have you been overseas in the course of your work?---Yes.

MR SHER: Have you been to the USA?---Yes.

And spoken to the Allis-Chalmers people there?---Yes.

Have you ever got around to discussing the Mesabi Range?---
Only briefly.

And what goes on there?---No, I do not know the details of Mesabi.

When you said in your affidavit, in agreement with Dr Lynch, that you did not know of any wet screening which did not have some further process in view, you were not basing that on anything you knew about America?---I was making reference to the plants that I know of, as I think the wording said.

That is not too many out of Australia, is it?---Plus those I have read about overseas.

Is that much?---I could not tell you the number.

Have you read much about the plant on the Mesabi Range?---Yes, I have read articles on the Mesabi Range.

You will recall me referring to Mr Beukema from US Steel and his affidavit in which he talked about - - in other words, disagreeing with you?---Yes.

Are you in a position to point to plants on the - - I withdraw that. I think Mr Hulme drew your attention to this article in this publication exhibited to his affidavit?---Correct.

Did you have a look at the publication by Taggart about any of the plants on the Mesabi Range?---No.

When you looked at that exhibit to Mr Beukema's affidavit - - I will just get it if you will bear with me - this article in the United Nations publication. You will see there he referred to what is described as wash ores - - -

MR SHER (Continuing): - - - as wash ores. Do you recall that? ---Vaguely.

There are two things I want to ask you about this particular reference. The passage that he relied on out of this article by a gentleman named Erickson referred to "simple wash or treatment" and then described it. One of the things it referred to was a classifier?---Yes.

Did you notice that the author relied upon by Mr Beukema referred to a classifier - and I do not think this was read to you by Mr Hulme - that the classifier is essentially a screening device?---It is also a scrubber.

I did not ask you that, did I?---No.

I just asked you whether, in the article - whatever else it may be called by anyone else - Mr Erickson was saying a classifier was essentially a screening devidce?---That is correct.

You noticed that, did you?---I am aware of that.

If, in fact, that is a correct description of a classifier, then what Mr Beukema said is correct, is it not?---Not if you say it is a correct description. It is not a correct description.

Right, but I am asking you to assume that it is a correct description; if it is a screening device, if you can properly say a classifier is a screening device, what Mr Beukema said is correct, is it not?---It is a separation device, I suppose, to put it in a more - -

You are not answering my question. I am asking you to make an assumption. This Mr Erickson must be an authority because he has written an article in conjunction with Mr Herkenhoff. Have you noticed that?---Yes.

Mr Erickson apparently regards a classifier as a screening device. You noticed that, did you not?---Yes.

I want you to assume that Mr Erickson is right, that it is a screening device?---Yes.

Then Mr Beukema's examples are, in fact, examples of wet screening without any other process in view other than wet screening?---Correct.

The argument really is, whether you agree or disagree with this gentleman called Erickson, as to whether a classifier is a screening device?---Yes, I agree with that.

There is one other point that comes out of this particular flow sheet which I would like you to look at. Do you have it before you?---No, I do not.

MR SHER: This is exhibit CFD 1, your Honour.
TO WITNESS: Do you see that flow sheet in fig.19?---Yes.

Do you recall Dr Lynch saying, in his affidavit and in evidence, that the crushing was normally done dry?---Yes, that is correct, he does.

In other words, he not only said it was normally done, he said it was always carried out in dry form?---That is correct.

Do you agree with that?---Yes. There may be one case here and there in the world but you can say almost 99 per cent of crushing applications are done dry.

"There always is",to that 1 per cent, an overstatement, is it? ---I could not answer that one. I would not know.

Let us not worry about that. Let us go back to the Mesabi range. You know about the Mesabi range, do you not?---Yes.

It is a very big range, very long and has countless iron ore plants in it. Is that right?---So I believe.

And has produced an enormous amount of iron ore over the years?---So I believe.

Let us have a look at that flow sheet, fig.19 again, shall we?---Right.

This is said to be, as I understand the publication, a typical flow diagram of the wash ores from the Masabi range? ---Correct.

Which we can assume, and Mr Beukema will, no doubt, tell his Honour, there are more than just one or two; there are quite a few of them?---Right.

Have a look at the minedmaterial flow sheet on the right-hand side of the page and follow the flow down?---Yes.

The feeder?---Yes.

The scalping screen?---Yes.

You get the oversized going to waste?---Right.

The undersized going to a washing screen?---Correct.

The undersized going down subsequently to a classifier?---Yes.

And the oversized going to a crusher?---Yes.

Immediately followed by a washing screen?---Yes.

That would be wet crushing, would it not?---No.

MR SHER: Would it not?---No.

Are you telling us that they dry the ore out between the first washing screen and the second washing screen?---What happens there, if I can explain - -

Just before you explain - I certainly will not stop you, Mr Pritchard, I just want to get one thing clear - - -

MR SHER (Continuing): - - - thing clear: You are saying that the crusher referred to there is a dry crusher?---Correct.

Notwithstanding the fact that it has a washing screen immediately before it?---Correct.

And a washing screen immediately after it?---Correct.

You mean by a "dry crusher" not this sort of damp material; you mean "dry" as generally understood, do you?---It means ore which is entering that crusher has no water added to it. In other words, the water has been drained on the washing screen ahead of the crusher, and that is common practice.

You mean by "dry crusher" a crusher which does not use water as part of the crushing system?---Correct.

But if it is wet ore being crushed you describe that still as a dry crusher?---That is very dry; you would most likely get dusty conditions from it.

But assuming it has come through a washing screen and goes to a crusher and it is wet but not sloppy - -?---It is not even sloppy.

All right - wet, then; you say that is still dry crushing, do you?---Very much so.

So when Dr Lynch and you say that crushing is always carried out in dry form, you mean by that that "dry" means wet but not sloppy?---That is right.

By the way, your observation about what actually happens on the Mesabi Range in this flow sheet - is that based upon any personal knowledge?---In regard to figure 19?

Yes?---Yes. This is typical of any of the flow sheets that I have encountered over many years.

In the Mesabi Range and elsewhere?---Well, not in Mesabi, but this is typical, as I say, of what I have experienced in Australia.

If we call a "classifier" a "screen", then this is, you would say, a typical flow diagram of a beneficiation process? ---But today that would not be considered typical.

However, it was at some time?---It was at one time, yes.

And certainly in 1962 it would have been?---Yes, most certainly.

And that, I suggest to you, if you use "classifier" as a "screen", is a process of wet screening without any further process?---Yes - except, I would add if I may, it is separating the fine waste so there is a beneficiation

process which is carried out there.

MR SHER: But screening is separation, is it not?---It is.

In Australia wet screening is carried out in industries other than the iron ore industry?---That is correct.

Such as coal?---Yes.

And mining?---Yes.

Gold?---Yes.

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And tin?---Yes.

In all of those cases there would be a feed box leading into the wet screen?---I think that is right to say, yes.

In many of them there would be water added in the feed box?---Oh yes.

Indeed, you would say, would you not, that in almost all of them water is added in the feed box?---When you say "all the water", there is water added at the sprays above the screens as well.

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But in the feed box you would find in all these industries where wet screening takes place, water added in the feed box? ---I think that would be right to say. I can't recall all the details I have dealt with.

Yes. Amongst your process of learning what this case was about on materials before the court, did anybody draw your attention to an affidavit sworn by a gentleman named Baker?---No.

It might be easier for you to follow if you have it before you. Mr Baker told us that for 17 years he had been the manager of Mineral By-Products Ltd, and prior to that - - - 30

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MR SHER (Continuing): - - - to that, except for a brief period of employment as a works manager for Universal Milling, he had worked solely in the far north of WA in the tin and lead mining industries, and for several years had worked for companies owned by Messrs Hancock and Wright, and he had been involved with screening operations, wet and dry, in the mining industry all his working life. So that was his background. In para.2 he says this:

> "In 1953 Hancock and Wright acquired the Ragged Hills lead mine....(reads) ....50 kilometres south-west of Marble Bar."

That apparently was owned by my clients. He says:

> "In 1959 I left them to manage a tin mine owned by a company" - and he worked for that until Christmas 1962.

That is his background, from 1953 to 1962. Then he says this:

> "Wet screening was used at every mine I worked at or visited.... (reads)....with the exception of the asbestos mine."

Then he goes on to describe the wet screening processes. He obviously has an experience which is different from yours, or closer to the actual scene of operations, but that conveys the message, does it not, that certainly in this part of Australia, in the 1950s and up to 1962, speaking from personal experience in the mining industry, including tin and lead, wet screening was carried on.

You have been in the screening industry for quite some time, including those years?---Correct.

What Mr Baker says is correct, is it not?---It could apply in very small operations.

But you have no reason to doubt the truth of what he says, have you?---I would not doubt it, no.

Would you not agree then that in this part of the country, in the 1950s and in 1962, screening to someone in the mining industry clearly included wet screening?---Yes.

RE-EXAMINED BY MR HULME QC:

MR HULME: Stay with that affidavit if you would. I ask you to assume that what Mr Baker says is that following the wet screening there was going to be a gravity separation.

The water required for the separation, that is the concentration process, was introduced in the feed chutes to the screens and utilised during sizing. The water assisted sizing of the ore and was useful in dust control.

"Nevertheless, it was possible to employ dry screening....(reads) ....the water was added before the screening stage."

MR HULME (Continuing): Do you follow that?---Yes.

If the downstream processes are wet and water is going to have to be added, would you think of adding it before the screening stage?---Yes, before the screening stage.

If it is going to have to be added?---If you are going to add water, by all means add it ahead of the screen.

Would you go to Mr Sullivan's article?---I do not have that.

The article as to the Mesabi range ore?---Yes.

What kind of process is involved in a mechanical classifier? ---Do you want me to give a description?

Just very briefly, yes?---A brief description of the equipment is that it consists of a rectangular or semi-circular tank inclined uphill in which there is a centre shaft and an actual spiral fitted onto the shaft. The container is filled with the ore and the function of the spiral is to move the solids slowly up the incline extracting the heavy ores, and in the process of the agitation and the slow movement there is the beneficiating of the material which is fed to the classifier, with the result that you have the fine clays which are removed floated off on the water, and that will discharge at the back of the classifier. The result is that you have the water with the fine slurries, the fine clays, discharging over one end of the classifier and at the other end you have the solid washed ores discharging with no water.

You referred to the water; that is a wet process?---Yes, it is a solely wet process.

The author tells us it was "being used because there were not adequate fine mesh screens available for the purpose"? ---That is correct. We are normally dealing with a very fine separation where the screening is either impractical or uneconomical to employ.

Where you are intending to use plant of that kind after screening would the fact that you were going to add water to the material after screening affect your decision as to whether to add it before the screening?---If I understand your question correctly there, the water is incidentally already - - -

WITNESS (Continuing): - - - already included in the classifier because it is the underflow from the preceding washing screen.

MR HULME: Yes, but when you are having to decide whether to have a dry screening or a wet screening, if you are going to wet the substance afterwards for your mechanical classifier, would that affect your decision whether to have wet or dry screening?---Yes.

Why is that?---The wetting is carried out for a specific purpose, as we mentioned earlier, to break down the clays.

In the kinds of washed ores being discussed here, where the process is going to finish with a wet mechanical classifier, if you were going to have to wet the material afterwards - if you were going to have to wet the material in the mechanical classifier - would that affect your decision whether to have a dry screening process or a wet screening process? ---Normally that would require a decision saying yes, you would need to add water ahead of the screen. That would be the more logical approach.

In relation to your dry crushing, as far as you are concerned does it make any difference how wet the material is when you are bringing it across to be crushed?---Yes. There is a limitation generally with regard to the amount of moisture in the ore being fed to a crusher. Otherwise we get what is called "packing", or if we put it into simple terminology it will just block up the chamber of the crusher, particularly if there are clays involved.

As between the definitions of wet crushing and dry crushing, you have said to his Honour that wet crushing was when water was being added in the process?---I think what I said there in reference to wet crushing was that no wet crushing applications - - at least there may be a very rare case but I am not aware of any and it is not normal to have a crusher operating as what has been referred to as "wet" crushing. The material could be wetted but it has no free water with it. That is referred to as a dry crushing operation.

You said this morning that crushing alone is rare?---Wet crushing.

No. Can we just go to crushing? You said this morning that crushing on its own without screening was rare or very rare?---Yes. You do not see it frequently carried out, unless there is some specific reason for just simply crushing.

OLNEY J: One example given was when ore is mined underground. I think that was mentioned yesterday, was it not? It may be crushed before it is taken to the surface?--- Yes, if it is sold in that form. As I say, that could be a special - - -

WITNESS (Continuing): - - - be a special reason for just crushing it on its own but it means that you have everything that comes from the crusher. There it is, with the rubbish and whatever, contained in the crusher product.

MR HULME: I think his Honour suggested to you that a grizzly was a screen without a crush, as it were?---That is right. I think I mentioned that that is a mechanical device, a grizzly is a mechanical device for screening.

In the plant you have here, it was put to you that here we had screening without crushing in this plant at Hamersley. Do you agree with that? It was put to you this morning that the Hamersley plant could be regarded as an example of screening without crushing?---No, I cannot comprehend really that being so; there has to be crushing normally where there is screening - not always but in this particular case, as far as the Hamersley/Tom Price situation is concerned, there must be crushing preceding the screening.

It was put to you, I think, that the crushers were not next to the screening activities?---No, it is not necessary to have them adjoining and adjacent.

You used the phrase, "It is a process"?---Correct.

That was your phrase. Will you just explain what you meant there?---I refer to the whole of the operation as a beneficiation process so I suppose that is the reason why I have automatically used the word "process". Crushing right through, in all its forms, in the beneficiation process, I consider as the process and the beneficiation process.

It was then suggested to you that being concerned with screens you would not be much concerned with what went before and you would not be much concerned with what came after. Do you remember those questions being put to you?---Yes. That is true.

I think you said that on the contrary you were interested?---That is right; immediately preceding the screen and immediately following, very much so.

If you are advising as to the screening that is to be installed, do you need to know what is going to happen to the material afterwards?---I like to, yes. It is necessary to have a complete picture, a complete understanding of what this is all for, the material, its final destination, so that we can make the correct recommendations in the vibrating screen in terms of screening efficiency. That is the important part there.

MR HULME: Is it necessary to know,when you are at an intermediate stage, what end product is being sought? ---Correct. It is necessary to know that.

Have your activities extended to advising as to what happens immediately before the screen as well as what happens on the screen?---That is most important, yes; it is most important because of the need to ensure that the vibrating screen is going to function in the way in which we intend it to function.

You said you were unable to remember whether or not you put in drawings of what you recommended for the chute?---That is correct.

When you are advising in these matters - - -

MR HULME (Continuing): - - - these matters, are drawings often used? Is your advice verbal or are drawings used?---Very much so. We ask for participation in the details of the design associated with the vibrating screen and we are often asked to provide our own recommendations on the arrangement concerning what comes before and what comes after. As I say, I could not remember whether I had provided any such sketches or arrangement drawings at that time. It would not have been an arrangement drawing, I feel sure, but it may have been a sketch. I cannot remember that, however.

You have seen Tom Price fairly recently?---Yes, in February.

To the best of your recollection, is the set-up in this regard consistent with or inconsistent with the - -

MR SHER: I am sorry. I did not follow the question. With what?

MR HULME: Whether what was done was consistent or inconsistent with the recommendations made by Allis-Chalmers?

MR SHER: But he does not recall what the recommendations were and he does not even know if in fact the actually made them.

MR HULME: He does not know whether he put in sketches.

MR SHER: He has given no evidence of the recommendations at all.

OLNEY J: I thought he had no real recollection of making any recommendations at all. (TO WITNESS): Is that right? ---That is true. There would be limitations on the extent of what I recall. There would be other information, of course, which is given in the submission, in the proposal or quotation submissions, but I would have to refer back to that to determine the exact details.

MR HULME: I am willing not to take it further. TO WITNESS: It was put to you that wet screening is generally more efficient for sizing in the iron ore industry?---In all industries, yes.

I just wish to be clear as to why it is more efficient?---It is more efficient generally because of the assistance of the water. It creates a greater efficiency, but that is only one aspect. In this case, where we are dealing with a wet process, with an objective, we have to break the clays down, so we have more efficiency also in relation to the breaking of the clays from the larger particles. When I say it is more efficient, therefore, it is efficient for a number of different reasons.

OLNEY J: If it is convenient, I will now rise.

HEARING ADJOURNED UNTIL 10.30 AM

FRIDAY, 10TH NOVEMBER, 1983

EX73. 10.32

OLNEY J: Yes, Mr Hulme?

ARTHUR NOEL PRITCHARD:

RE-EXAMINED BY MR HULME QC (Continuing):

MR HULME: Mr Pritchard, you will remember my learned friend asked you some questions yesterday about sieve bends? ---That is so.

When you are working in your job, in your industry, what do you call them?---Sieve bends.

What do other people at Allis-Chalmers call them, in your experience?---Sieve bends.

In your experience, what do other people in the screening industry call them?---In Australia, sieve bends.

You deal with mining companies, miners, the actual"diggers-out" of the material?---Yes.

What do you find that they call them?---Always sieve bends.

You were shown yesterday two brochures which together constitute exhibit 13?---Yes.

One of them is by Heyl and Patterson?---Correct.

Does that brochure circulate in this country,as far as you are aware?---Yes. That would be one of the catalogues.

It will speak for itself. I would ask your Honour to look at it. It says H & P Sieve Bends and its contents are expressed in terms inside of the H & P sieve bend.
TO WITNESS: Does Dorr-Oliver circulate in this country at the present time?---Yes.

Your Honour will see they describe it as a rugged stationary screening device.
TO WITNESS: You said, and indeed the Allis-Chalmers booklet produced to you referred to wet screening in association with assisting sizing?---Could you repeat that again?

Wet screening assisted sizing on the screen?---Yes.

MR SHER: Your Honour, I am sorry but that is not what he said at all. I object to the question. The document speaks for itself. It says, "One of the uses of wet screening is sizing" - one of them.

MR HULME: I am happy to go to the document. I simply wanted to take the witness to the topic and ask him how this is - -
TO WITNESS: Are you able to say how it is that water assists in the sizing process?---Yes. Water assists in two ways, by ridding the clays from the larger ore particles - - -

WITNESS (Continuing): - - - ore particles and eliminates some degree of stickiness; and in addition to that water acts as a lubricant, so in passing through the apertures the material is better able to pass through.

In addition to that, because of the cleaner material that has been achieved by the water removing the clays, the particles on the screen deck are able to perform this stratification to which I have referred previously, with the larger particles coming up and the finer particles coming down.

If you have material that has a lot of clay with it, there is greater friction between the particles and therefore stratification is not as effective as in the case of particles that are clean and free to segregate out in their respective positions on the screen deck.

OLNEY J: You have just been telling me about sieve bends and, I think, establishing that sieve bends are called sieve bends. How would you describe the process which goes on within - the process or processes in connection with a sieve bend?--- There are a number of processes. Sieve bends, incidentally, in many, many cases, precede a vibrating screen. That is one of the reasons why people in the industry refer to and differentiate between the two items, the sieve bend and a vibrating screen. Otherwise there would be confusion.

It does carry out, however, a screening function, but I consider that screening function is a preliminary. That is the reason why it is ahead of the vibrating screen. It is a preliminary screening function and essentially, in the majority of installations, the screen is used to extract the very, very fine and the water content of the feed that is coming in, so as to provide less water in the feed on the vibrating screen. This then allows the screen to function in a proper manner without being completely flooded. At the same time, it allows this stage condition, where you have a series of sprays - spray bars and jets - on the vibrating screen, to be able to successively wash and drain, wash and drain, along the length of the vibrating screen.

Often, too, when I indicate it does carry out a screening function - - if we take the case of where we have a sieve bend ahead of a vibrating screen - to quote this as an example if I may - the apertures in the sieve bend are larger and generally twice the size of the apertures that we have in the vibrating

screen because that is, as I say,primarily a rough screening function.

OLNEY J: Thank you very much. Is there anything arising out of that question, gentlemen?

MR SHER: Just one matter, if I may?

OLNEY J: Yes.

FURTHER CROSS-EXAMINED BY MR SHER QC:

MR SHER: A sieve bend is a type of screen, is it not?---I did indicate that it carries out a screening action, yes.

There are many different types of screens?---Yes, there are flat screens as well as sieve bends, vibrating screens, static, whatever.

MR SHER: And a sieve bend is a type of screen?---Is a type of screen.

Thank you.

OLNEY J: Mr Hulme?

MR HULME: No, sir.

WITNESS WITHDREW

ROBIN JOHN BATTERHAM, sworn:

EXAMINED BY MR HULME QC:

MR HULME: Mr Batterham, is your full name Robin John Batterham, do you live at 9 Moorna Court, Mount Eliza, Victoria and you are a research scientist, a senior principal research officer of CSIRO and section leader of the chemical engineering section of CSIRO mineral engineering division?---That is correct.

Have you sworn an affidavit in these proceedings?---Yes.

(Could Dr Batterham be given his affidavit, please?)

MR SHER: Before the affidavit is tendered there are certainly passages which we would contend are inadmissible. I would like to be heard on that.

OLNEY J: Yes, very well. If you wish to be heard on that perhaps you could indicate?

MR SHER: There are two passages, your Honour. The first is the whole of para.3 which reads:

> "I say without hesitation that in my opinion Dr Lynch is the leading authority in Australia on mineral processes."

Your Honour has, no doubt, read it and it goes on to deal with Dr Lynch's standing. Our objection to this paragraph is firstly that it is evidence given by one witness which merely goes to the credibility or standing or another witness called in the action and is not admissible, certainly not in evidence in-chief. The weight that is to be attributed to any particular witness is a matter for the court and it is not for one witness to, as it were, bolster up the weight that is to be attached to another witness by giving evidence of this nature.

Secondly, in relation to that paragraph, part of it - and I refer to the passage commencing with the third sentence and following:

> "His reputation is based on his close familiarity with the operations of.....(reads).... screening process and their application."

In our submission, it is self-evidently hearsay and inadmissible on that basis. Plainly, the sense conveyed is that the witness is talking about the basis of Dr Lynch's reputation, obviously on the basis of what other people have told him. I charitably assume that that does not include what Dr Lynch has told him. Unless he suggests that he follows Dr Lynch around the country and Dr Lynch's activities it must be based on what other people have told him.

The other paragraph to which we take objection is para.5 which reads:

> "In the context of iron ore processing it is artificial to exclude....(reads).....and would simply add that by way of edification."

MR HEENEY (Continuing): That paragraph, or certainly the part of it up to the last two sentences, is argumentative and travels beyond the proper province of an expert witness. A properly qualified expert witness can give evidence as to his opinion and as to the operation of processes within his field of expertise and he can give evidence as to the meaning of the technical terms used within the area in which he is qualified, but in the context of this case it is plain that the whole thrust of that article proceeds from the very terms of the agreement, which is a matter for the court to construe and argue a case as to why some particular process should or should not fall within particular words as used in the agreement. Those are our objections, if your Honour pleases.

OLNEY J: Yes. Mr Hulme, I do not really need to hear you. As to para.3, I would allow it to go in. I probably will take no notice of it. Having had Dr Lynch in the box for something upwards of two days, and his standing having been tested thoroughly in cross-examination, I am unlikely to be impressed by what his colleagues think of him. His soul has been laid bare in these proceedings and it does not really seem to matter much now what reputation Dr Lynch has.

It would have been different had this matter been tried solely on affidavit evidence, but that has not been the case and questions of credibility are, in the nature of this proceeding, entirely a matter for me. Had it simply been affidavit evidence I may have taken the view that Mr Paterson has advocated but I do not really think that anything much is advanced by para.3 and for that reason, having expressed that view, I do not really think we need argue about it.

As to para.5, I think myself that the initial thrust of that paragraph, saying "In the context of iron ore processing it is artificial to exclude crushing and screening from other forms of beneficiation", that seems to be a self-evident truth at this stage of the proceedings, but unfortunately it is an artificiality which the draughtsman of the contract adopted for one reason or another. Again, I do not think myself, that the paragraph is of much importance. I do not object to it in that I do not - -

MR HULME: It is not intended to pre-empt the legal decision or anything. It is simply that when one comes to deal with the distinction it is helpful to note that from the point of view of proper terminology an artificial distinction has been drawn. It is not a natural distinction; it is an artificial distinction.

OLNEY J: I would have thought that must be evident from the contract, because it does in fact make that distinction. The contract, on the face of it, is saying the same thing - that you take beneficiation and you exclude from it something which obviously, if it was not excluded - - -

OLNEY J. (Continuing): - - - not excluded would seem to be part of it.

MR HULME: Yes, and that is, of course, how we have put it. There is the word "beneficiation" and then it goes on and says it is not something simply from crushing and screening. What is being said here is the distinction drawn, as illustrated as your Honour says by the words of the contract, is an artificial one.

OLNEY J: The point I was making here is had this matter simply been tried on affidavit evidence then perhaps I would have ruled this out, but again that is not the way these proceedings are being conducted.

MR HULME: We would say it may become unnecessary now. It does not make it objectionable.

OLNEY J: Even at this relatively early stage (I assume it is an early stage though I would hope it would not be) of the proceedings, that being apparent, I do not propose to exclude the paragraphs but my decision not to exclude them is based upon the views I have expressed. That may be helpful to counsel.

MR HULME: If your Honour pleases.

OLNEY J: You are putting in the affidavit, are you?

MR HULME: Not for the moment. There is a qualification. TO WITNESS: I draw your attention to a later portion of para.5, the two sentences:

> "If water is added, a form of beneficiation results which is quite independent of upgrading on the basis of size. The chemical upgrading is also of a different order."

Do you regard those two sentences as not expressing accurately what you were intending to convey?

MR HEENEY: Your Honour, I am a little bemused as to what is occurring here. My learned friends have been good enough to provide us with another version of para.5 which contains two sentences substituted for the ones to which my learned friend has just referred. Those new sentences are underlined in red. In other words, it bears all the outward appearance of a proposed amendment to pleadings. In our submission one cannot amend an affidavit in the way one can, and does, with pleadings. The affidavit has been sworn in unaltered form. If my learned friend wishes to ask the witness questions with a view to qualifying or explaining or expanding something in

in his affidavit we would have no objection to that course.

OLNEY J: I thought that was what he was doing. When I posed the question to Mr Hulme as to whether he was putting the affidavit in, he said "Not just yet" or something to that effect. It seemed to me the questions he was asking were of the nature one often hears asked when a witness is going to later say "Yes, this affidavit is true with this following qualification" and I suppose it is open to any witness to say that a previous oath is not strictly accurate or that he was mistaken.

MR HEENEY: Yes, your Honour, but the fact is the witness has sworn an affidavit which either goes in or does not.

OLNEY J: It must go in in a sworn form, but leaving it to the witness to say whether or not that is still his view.

MR HEENEY: Yes, and needless to say it has to be done in non-leading fashion.

OLNEY J: Yes. I thought that was what you stood up to object to, because the way the question was put, apart from containing a double negative, did seem to be leading.

MR HEENEY: Yes. Not only was there a double negative but there was a double opposition, your Honour.

OLNEY J: Was that it?

MR HEENEY: Yes.

MR HULME: The point is, your Honour, if we were simply on affidavit something would have to be said but this witness is about to be asked whether the contents are still true and correct and there is a sentence which does not say accurately what he is trying to say and that puts him in the embarrassing position.

OLNEY J: I think it is important, as this is evidence in-chief, if the witness could perhaps be redirected to the particular sentences and asked to make his own comment - - -

OLNEY J. (Continuing): - - - own comment on those sentences.

MR HULME: I will have to do that, your Honour, without him having sworn as to his belief in the two sentences - - It is a common enough situation, if a witness - -

OLNEY J: He has identified the document as his affidavit, I think he has, and it is quite open to you to draw his attention to a paragraph and ask him whether the particular words there - -

MR HULME: Your Honour, we did have leave under the orders to file further affidavits. He could have filed a further affidavit saying, "There's my earlier affidavit; those two sentences are inaccurate. This is the accurate expression of it." We have tried to save time by simply bringing the amended sentences and asking him to swear to the contents of the affidavit on the basis of those two sentences being in this form, just as if he said the temperature of something was 78 and he had since discovered it was 76, he would say, "Subject to that alteration I believe the contents - -" and that is what we are seeking to do. We can file another affidavit or I can ask him - -

OLNEY J: I think you can ask him whether the particular sentences reflect his current opinion or whatever it might be.

MR HULME: That is exactly what I am setting out to do.

OLNEY J: Then ask him, if you get a negative answer, what his current opinion is on those matters, if he can do it without the aid of some pre-prepared memorandum.

MR HULME: What we have, of course, has been written out, approved by him and we have simply, for what we thought was convenience, retyped the paragraph putting the two sentences in so that everyone would have a copy of the whole thing rather than just of the alteration.

OLNEY J: Could you ask him the question and we will see what his answer is, then it may be convenient to ask him to have a look at the - -

MR HULME: The question as to those two sentences as they stand?

OLNEY J: Yes.

MR HULME (TO WITNESS): Would you look at the third last and second last sentences of para.5, the passage beginning, "If water is added a form of beneficiation results which is quite independent of upgrading on the basis of size. The chemical upgrading is also of a different order"? Do you see those two sentences?---Yes, I see them.

MR HULME: Are you happy with the way in which your intended meaning is expressed in those two sentences?---I feel that those two sentences reflect one of the difficulties that someone who works primary or conceptually with mathematics rather than with words often facts, that the intention of the words can be clear to the author but, of course, may not quite communicate what I was trying to express. When, in further re-reading several times of those words, I look at them they do not fully convey the meaning that I was intending which I am happy to, without any priming, convey to you. It will not be as well put as the version which obviously I have additionally since spent some time myself writing out.

OLNEY J: Perhaps you could just give me the thrust of the reservation that you have?---It is a reservation only on wording. The intent that I was trying to convey there was to say that there is beneficiation going on whether there is water or not. The extent of that beneficiation is greatly increased, or is additional, and is manifest in the chemical analyses of the streams. I did not wish to distinguish between chemical beneficiation and physical beneficiation. I wish to say that the physical beneficiation can be quantified by chemical measurement.

This reservation that you have now explained to me - do you believe you have expressed it adequately in a document that has been made available to Mr Hulme?---I think so, yes. I hope so, is a more precise answer.

I think, gentlemen, in those circumstances I would be happy for the witness to be shown the amended paragraph and for his view to be asked on that - - -

T254. 11.01

OLNEY J. (Continuing): - - - on that.
TO WITNESS: Have you read what is numbered 5?---Yes.

Are you happier with that as para.5 than the one you have previously sworn to?---Yes.

Are you saying anything different in the amended para.5? You may be saying something differently?---I hope that I am only saying what I intended differently rather than saying something which is quite different.

MR HULME: Dr Batterham, if instead of the two sentences on the affidavit as originally typed one looks at these two sentences, do you regard the contents of your affidavit as true and correct?---Yes.

OLNEY J: You tender the affidavit, Mr Hulme, do you?

MR HULME: I now tender the affidavit, your Honour.

EXHIBIT EXHIBIT 15(1) .... Affidavit of R.J. Batterham.

EXHIBIT 15(2) .... Amended paragraph 5.

MR HULME: Your Honour will see in para.1(a) Dr Batterham's academic and institutional qualifications. He has spent time in the laboratories of ICI in England and then returned and took up duties with CSIRO, first in the sugar industry and, for 10 years since 1973, in the mineral area. That chemical engineering section of which he is the section leader concentrates on the optimisation and control of large scale mineral processing in Australia with the development of mathematical models and the validation of their predictions against the actual operating plants, both the development of those models and the validation of them necessitating the detailed and accurate measurement of operating plants and a thorough knowledge of their practical working which has required lengthy visits to iron ore processing facilities including those at Tom Price, Paraburdoo, Dampier, Whyalla, Port Latta, Savage River in Tasmania and Newcastle as well as to non-ferrous concentration and smelting plants at Cockle Creek in Mount Isa. In the course of his duties in that division Dr Batterham has visited other iron ore crushing, screening, concentrating and processing operations in Sweden, the Netherlands, France, Belgium, the United Kingdom, Canada and the USA and has visited research centres concerned with crushing, screening and processing in most of those countries. He is the author of approximately 50 technical reports and a greater number of technical papers covering various projects in which that section has been involved. He has presented seminars at university departments including those at the Imperial College, London, University of British Columbia, California, Pennsylvania, State

University of Utah and various Australian universities and co-chaired an international conference on comminution in Hawaii. Your Honour will see in (d) that he was a consultant to Mitchell Cotts Minenco, the joint venturer responsible for the design of the Tom Price concentrator and one of the projects referred to in para.(c) involved him in a detailed study of the screening and ore handling operations at all the plaintiff's operational sites including the running of screening tests over a long period on the sites and research into the effect of moisture on screening He has inspected the Tom Price concentrator in detail on a number of occasions, his most recent visit being in March 1983.
TO WITNESS: In those projects - - -

MR HULME (Continuing): - - - those projects in relation to Hamersley generally and the concentrator subsequently, has that involved the making of tests and analyses etc. on ore being handled?---They have involved considerable test work, both personally by myself, by people from CSIRO - my colleagues working with me and under my direction - and equally by people from Hamersley Iron who work collaboratively in this sort of test work with us. Such test work, of necessity, involves samples being taken of streams, measurements being taken - very detailed measurements, and, of course, much observation of actual plant practice.

In para.4 of your affidavit you expressed your agreement with the conclusions expressed by Dr Lynch in his para.9 and with the reasons he gives for those conclusions, those reasons having been set out in the preceding paragraphs of Dr Lynch's affidavit. You express your concurrence with certain paragraphs of Mr Pritchard's affidavit and you say that you are not aware of any iron ore processing plant where a wet process was in use in 1962 or is in use now solely as an adjunct to crushing and screening, without some further process in view.

Are you acquainted with the device known as a mechanical classifier?---Yes.

Would you describe a mechanical classifier as a screen?---I think that to describe a classifier, mechanical or otherwise, as a screen is to immediately indulge in fairly imprecise - -

MR HEENEY: I object. That is a non-responsive and argumentative answer. It is a simple question which calls for a simple answer, I would have thought?---In scientific terms, no.

OLNEY J: You have the answer, "In scientific terms, no."

MR HULME: Yes. (TO WITNESS): Can you tell us for what reasons you have that view?---I am not sure how much I am permitted to expand, so perhaps you will pull me up if - -

OLNEY J: Just answer the question why, in your view, in scientific terms, is a mechanical classifier not a screen - - -

OLNEY J. (Continuing): - - - a screen?---A mechanical classifier is a device which involves several processes but the prime purpose of the device would generally be accepted as being to make a classification, or to make a sorting into classes. Whilst that could also be used as a definition of a screen, a screen could also, if you chose but I would not, be described as a device for making a sorting into classes - and on that basis you might argue that the two are therefore the same, that is arguing that the intersection of two sets - - because it is a partial intersection, says that the two sets are equal. That is, of course, nonsense. They are only equal in the area of overlap. One has, therefore, to go a little further and say what processes are going on in whichever device or overall group of processes you are talking about.

In a mechanical classifier we would normally (if it were a spiral or a rake classifier it would be called a mechanical classifier - a spiral screw classifier) be looking at a sinking of particles on the basis of size and specific gravity and their subsequent flow through some mechanical arrangement which allowed finer material to flow with a liquid stream and coarser material to gradually be scraped from, perhaps, the bottom of whatever the geometry was, with, perhaps, a middling section being taken off.

Our separation is, therefore by size. It is in a liquid, continuous medium largely but it is also equally important by specific gravity.

If we come to screening, to finish that side off, if we chose to define screening in the same loose way as a separation on the basis of size or sorting into classes, it is doing that largely on the basis of size. Specific gravity is not playing any major role in it. It is a solid, even in wet screening. Whether dry or wet, screening is a largely solid, continuous process, whereas classifying tends to be more of a liquid continuum with solids in it.

MR HULME: What is the basis of separation in a heavy media drum? ---A heavy media drum bears many similarities to what I have just described for a classifier, a mechanical classifier, particularly if we were referring to a rotary screw mechanical classifier, in that we are looking at separation or making of classes. We are looking at doing that on the basis of the relative movement of particles against each other, or one from the other, in an essentially liquid, continuous medium which is identical to what I have described, save for whatever the rotating and lifting hardware might be. With the heavy medium though we can effect much finer sortings because we adjust both the density and the flow characteristics of the liquid by adding a so-called heavy media. This then means that the particles of a certain specific gravity - - -

D18. 11.16

WITNESS (Continuing): - - - specific gravity and size have a certain chance of being entrained with the liquid and flowing out, exactly as with a classifier. However, because we have made the liquid very thick and very dense, it is able to entrain out much larger and much denser particles.

MR HULME: Would you describe a heavier media drum as a screen? ---I would come back to my intersection of sets and I would not. Should I elaborate or not?

OLNEY J: The answer is no.

MR HULME: Have you heard people in the mining industry refer to a heavy media drum as a screen?---Many things but not a screen.

In para.5 of your affidavit you say:

> "Crushing and screening are beneficiation processes concerned with size as opposed to beneficiation processes concerned with some other characteristic such as the removal of impurities."

So that it is on the record, where you are simply having crushing and dry screening, how does the beneficiation occur?---I am implying there what I believe is common knowledge, that with many ores the mineralogy of the ore is a function of the size of the ore particle and that ores, as mined, are a mixture of minerals and in some cases in the Pilbara - not in all but in some cases in the Pilbara - there is quite a marked change in the mineralogy as one goes from the larger sizes to the smaller sizes. The consequence of that is, of course,very obvious, that if one crushes to a certain amount and separates out two streams, a coarse stream and a fine stream, by any process but let us assume, for the moment, that it is dry screening, then the two resulting streams represent a beneficiation used in the literal sense of making something better. The coarser rock stream will have a chemical analysis which, if we are talking Hamersley ores, is of a higher grade of iron, significantly higher grade of iron, than the finer fractions and as such we have effected, through crushing and dry screening, a beneficiation. Such is my usage of the language and is certainly Hamersley Iron's usage of the language in that respect.

MR HEENEY: The last answer that the witness gave - - -

MR HEENEY (Continuing): - - - the witness gave, in my submission is not admissible.

OLNEY J: Yes - as to Hamersley Iron's uses of the language. I understand the point. I do not think, really, whatever the witness may be able to say about how Hamersley use words is going to have any bearing upon what appears in the contract in 1962.

MR HULME (TO WITNESS): You then say, and I will look at the next two sentences in their form underlined in this morning's separate piece of paper:

> "If water is added, an element of beneficiation results....(reads) ....This will reflect in chemical analyses differing in the two cases."

I wonder could you expand a little on that?---What I am saying there is we have to admit that in a crushing and dry screening process there is a certain element of beneficiation or upgrading in any case. It is upgrading in the literal sense. It has to be because you have upgraded one stream.

It is beneficiation depending on what you subsequently decide to do with the other stream. If you throw it away dry then you have beneficiated the ore, because you have improved its grade.

If we add water then to this crushing and screening process then the beneficiation or upgrading, so defined, will be improved quite markedly, for a typical Hamersley ore from either Tom Price or Paraburdoo, on the basis of extensive tests that we have undertaken.

You say there that that beneficiation is causally distinct from that which results from size. What kinds of factors bring this element of beneficiation about?---What I am referring to there is getting down to the process level of what goes on on screens; that when we add the water we have two additional processes going on on the screen, which were not going on before to any significant extent. Those two additional processes are firstly the breaking down of competent rock of whatever type, which is water active - rock which, by definition, on being highly wetted will break down and lose its structure. Clay is an obvious choice of such a rock or mineral. That is process 1, which is additional and related primarily to the water being there, not to the fact that it is going on on the screen.

Secondly, there is the detachment of adhering fines from larger particles, an area where again we have made extensive tests down at the particle and mineral type level, and of the forces which hold these particles together - - -

EX125. 11.26

WITNESS (Continuing): - - - particles together and as large quantities of water are added - it has to be large - the adhering fines, whatever their nature, will tend to be dislodged. This comes about because of the types of forces involved in bonding. A small amount of water added will actually increase the extent of adhering fines and is commonly called granulation. It is another process which can be carried out on a screen, I might add. Adding lots of water though puts you into a regime which I hope in the affidavit I spelt out some of the mechanisms whereby particles would be dislodged. Whether they are then removed on the screen is a job for the screening process and is, of course, likely to happen.

MR HULME: In para.6 you talk of three different forces, Van der Waal's forces, electrostatic forces and capillary pressure. Which of those is connected with moisture?---The capillary pressure is connected with moisture.

You go on to talk of the addition of water by way of being added. The words "water sprays" have been used. Can you give his Honour some idea of the force with which water is applied in the pulping box and subsequently?---The water added in the pulping box in the Tom Price concentrator under discussion is pumped at quite high pressure into a series of sprays. This pressure is, from memory and allowing for the fact that it is from memory, of order 450 pascals or kilopascals. It is probably better to do it by comparison because I cannot remember the unit. I was brought up on Imperial units and still carry them in my head but they are not legal tender any more. It is something of the order of 7 to 10 times the sort of pressure that you have at the delivery point in a garden hose, a Melbourne garden hose. I do not know what the Perth situation is.

OLNEY J: I do not know what the Melbourne situation is either.

MR HULME: Are you able to express that approximately in pounds per square inch?---Yes. It is of order 70 pounds per square inch. That is several atmosphere's pressure. Achieving such a pressure - - -

WITNESS (Continuing): - - - a pressure is, of course, only done with considerable cost. To put such a pressure onto a nozzle is an engineering-type decision which is not taken lightly. Clearly, you only put the pressure there if you want a particularly forceful jet of water, as such. That would accord - the design where the water is added would accord - with my observation as being a successful design inasmuch it is a very forceful, double curtain of water under this pressure, which is a pressure sufficient so that you would not want to leave an appendage like a finger standing there for too long without perhaps suffering some bruising ultimately from it.

MR HULME: Are you able to state briefly the purpose for which the water is applied to the ore at that kind of pressure?---Yes, because I have had some collaborative work with Hamersley on the wetting of their ores and have published results of this work in the open literature. They are readily available for the low-pressure wetting of ores. The high-pressure wetting results are confidential to Hamersley, so they are not readily available, but the summary of the result would be that such high pressure is being used for significant wetting and for initial - -

MR HEENEY: I am sorry to interrupt but it is not clear whether the witness is giving evidence from his own experience of what is happening here, based on what he is told, or whether he is giving evidence of the purpose for which Hamersley operated their plant in a particular way. If it is the latter, given that he is not an officer of the company, in my submission it is inadmissible.

OLNEY J: I thought this answer was prefaced by the statement that he had done some consultancy work in this particular area. Perhaps that should be cleared up, as to your means of knowledge, doctor?---All of the comments I have made so far - and I hope that I will make - are from my own personal observations of Hamersley processes, largely got through working collaboratively, I prefer, rather than consulting - -

Yes, that is the word you used?--- - - with that company.

MR HULME: On that basis can you tell us what is the purpose for putting the water onto the ore stream at the kinds of pressures about which you have been telling us?---On the basis of looking at wetting of ores with low-pressure water for dust containment, and taking considerable measurements thereof of the rate of wetting and how the water penetrates so as to minimise water addition, I can only comment that the purpose of putting water on in such a grossly different way as happens in the scrubber boxes can only be for purposes other than simple wetting of the ore at the sort of level necessary - - -

L53. 11.36

WITNESS (Continuing): - - - level necessary to just wet the ore. It is a deliberate and fairly violent flooding of the ore which I would prefer to call scrubbing rather than wetting.

MR HULME: In para.9 you say that if the separation of the 30 to 80mm ore from the minus 30 were the only objective of the top primary screen water would be unnecessary because the screen apertures for a cut at that size would not become choked by the smaller particles, they would simply fall through as undersized. You go on:

> "Exhibit NEG 2 shows that more than half the water used in the washing and screening plant....(reads).... and a separation and cleaning of the fine particles is effected."

Can I take you to the first sentence there, that water would be unnecessary on the top screen in connection with the purpose of separating the 30 to 80 from the minus 30? If you are screening at 30 is water of assistance in the screening?---On the basis of some hundreds, literally hundreds of screen tests that I have taken at Hamersley the results of which are published in the open literature, those results indicate that dry screening of Hamersley ores as received from secondary crushers on a 30mm deck is a very efficient process. There are minor exceptions to that rule tied up with bad operating practice but they are minor and very obvious exceptions to it. On the basis of the fact that the dry screening is such a demonstrably efficient process and is published on Hamersley ores as being such a remarkably efficient separation, there would be little point in adding water just for the sake of improving the screening.The water is argued as improving screening and that is a true argument but, as in any metallurgical argument, it is a matter of degree and at a 30mm cut size on a Hamersley ore with the typical plus 30 and minus 30 distribution of products,you would not want to nor need to add water just for screening. They do not - that is the simple demonstration of that fact for most of their tonnage.

Are you aware of the screening that takes place at Hamersley with the dry screening process?---As I indicated, perhaps my awareness is very extensive. It is on the basis of these, not innumerable but it is hundreds though, of tests.

Can you tell his Honour at what size the screening takes place with the high grade ore done dry for getting rid of the fines?---At of order 30mm and of order 6mm.

Is that screening at 6mm found to work?---Again, the 6mm screening dry is found to be quite effective. However, you are then starting to approach, in technical terms - metallurgically you are getting to the region where - - -

WITNESS (Continuing): - - - region where you would be able to measure the difference of water on the screening per se, as opposed to the washing and break-down. However, it would still be at 6mm exceedingly small; 6mm screening of Hamersley ores is still a very efficient process, metallurgically.

MR HULME: Down at what size does the difference become not only discernible but significant?---I can obviously quote what is in the literature but on the basis of my own tests on Hamersley ore, to which I will adhere, the dry screening can still be run as an efficient process at an order of 1mm, and we have done so on Hamersley ores. However, it starts to become somewhat uneconomic. It is technically quite feasible, so that at an order of 1mm, if only for economic reasons, straightout screening you start to seriously consider as being a wet process.

If you took a group of components in either the 6 to 30 or the 30 to 80 streams coming out of the wet screening process at Hamersley, would you expect the chemical analysis of those pieces to be different from the analysis you would have if you picked up those pieces with them only having gone through a dry process?---Yes. I would expect them to be different and it is that difference which I had poorly expressed in the original affidavit and which I hope is clearer now. If we considered a dry screening and then considered the same ore wet screened, on both 30 and on 6mm (I am not referring to the very fine material) we would expect the wet process to show a very different result. It shows it because processes other than simple screening have gone on, and again I am making the statement on the basis of actual test results, where we have gone out and subject the same ore to dry screening and to wet screening and then analysed the resulting products and they accord with exactly what I am trying to say, that the water makes a significant difference other than the simple separation of size.

That difference you would expect following from what? It may be obvious to you but let us be clear about it. Why do you get this difference with those components after the wet, as opposed to after the dry?---There are two reasons why you get this difference, which is the equivalent difference, I might add, to going up to the concentrator and turning off the water - - -

WITNESS (Continuing): - - - off the water to the scrubbing and screening operation. These two differences stem from the breakdown of the competent rock, that is the first one, which tends to have a lower chemical analysis, the rock which is water-active is of lower iron grade and then secondly, from the removal of adhering fines. Hamersley ores have a characteristic that when mined their moisture content - and I refer here to their total moisture content which includes an equilibrium moisture content - - The difference between those two, and I am happy to define those if you wish, is such that Hamersley ores tend to pelletise or granulate, to use words from other context, or stick together in plain language, because of the capillary forces. They are not bone dry in any sense of the imagination;even a bone dry ore has its equilibrium moisture content. As mined and as processed,even before water was added for dust suppression which was a relatively recent thing, the ores are still in the regime where there is sufficient free moisture over and above the equilibrium value to allow granulation to occur.

If you subject such a particle to a screening process, a so-called dry screening process, the agglomerate has a good chance of surviving its passage over the screen and will report to the oversize if we are talking a larger particle, so that the oversize is contaminated chemically by fines. As far as the screen is concerned it cannot distinguish - and this is the basis of published papers - between a large particle and a particle which is only slightly larger which is a large particle with an adhering fine particle and whilst one might superficially expect that such forces were trivial and would not survive passage over a vibrating screen, which is a fairly violent device, this is not so. The measurements quite clearly indicate that of order 10 per cent by mass of fines in dry screening at the moisture contents encountered in the Pilbara, that is the net moisture over and above the equilibrium moisture content, will survive passage over a screen. However, if we add a lot of water, apart from the breakdown of rock which I have already mentioned, then we are getting into the regime whereby we can destroy capillary forces by adding a lot of water. A capillary force exists between particles because of the radius of curvature of the neck of fluid between them. In other words, it exists because there is gas, particle, particle, and water. If you take the air away, for example by replacing it with water, our interface clearly has disappeared. We no longer have a radius of curvature and,as Lord Raleigh showed, hence a force of attract and, as has been quantified by many, many people since then, we no longer have the force holding the particles together even though they still have water between them. There is now no longer an interface.

A lot of water then allows those capillary forces to break down with a consequent liberation, if you like, it is simply a parting of the ways of the large and the small particles and hence, progression of the small particles through the screen in the normal process of screening and hence the difference in result.

MR HULME: Your Honour, I am going to ask Dr Batterham some questions about the clay. Your Honour has heard it described, or some of it, as water-active - - -

MR HULME (Continuing): - - - water-active, responsive - things of that sort. I will be asking Dr Batterham why that is and what happens. It would, we think, be helpful to your Honour's understanding of what has been said and an understanding of what Dr Batterham will be saying, to illustrate that evidence by putting some water on clay here, some of the feed clay we have - putting it in effect in water - and your Honour will be able to see the kind of reaction and appreciate what it is these witnesses have meant. I am not intending it as direct evidence itself. I am intending it simply to assist the understanding. The clay sample is exhibit 8, DFT9. (I think in fairness to Dr Batterham he should not use his own glass of water.)

It is exhibit 8,DFT9, shown on the list as "Water-active shale (clayey material)" and Dr Tompsitt referred to it at p.192. That is the formal identification.

WITNESS: Your Honour, I cannot say anything of what this sample is,obviously. This was not taken under my supervision. I knew that many samples were taken and I have also myself taken many samples but I cannot say this is the material that you see on the belt. Of course, it looks similar but it is not my first-hand knowledge.

OLNEY J: It has been identified.

WITNESS: That sounds almost like a disclaimer of a TV commercial that it might not work. That was not the intent. It was the very obvious one of pointing out that there is a range of water-active materials and the interesting thing about them is the rate of absorption of water and subsequent loss of competence of the structure, and this covers the full spectrum and if this sample is trying to exhibit that point then it should cover the full spectrum of materials whose water activity varies from almost nothing up to quite severe. We could, of course, drop the whole lot in, one by one, which would prove that point, but that would then destroy your exhibit.

What one would tend to observe is that the water will penetrate the material quite rapidly - - -

WITNESS (Continuing): - - - quite rapidly and the material will start disintegrating like a fire burning through. The physical violence of that disintegration, it is not going to be spectacular but it can be such that you rapidly then get eddies which then just cloud the sample and you cannot see what happens or if it is slower you will just see it slowly - and I have no idea of what will happen - disappear into a pile of powder at the bottom and that is indicative of the sort of range of activities.

Already you can see some powder fall from it. The rock has broken into two massive fragments, a whole load of fragments, this is about 15 seconds. It is a little longer now. There is still a piece of about half the size of original rock but most of it has already broken into quite small fragments. That I would put on a state of excitment scale or activity scale for water-active materials about halfway. It was not spectacular enough to - - It is a very fair example, so that it immediately clouded over and you just could not see what was going on but you could pour it out 5 seconds later and just show the slurry in the bottom, nor was it of the type which, even after half an hour, is still slowly going through the same process.

Do you wish to try another one?

OLNEY J: It is up to Mr Hulme, if he wants to see another one.

WITNESS: I have selected one here, quite intentionally, which physically looks quite different and, in fact, is almost the colour, not quite, of hematite. Given my lack of colour perception, to me it is certainly redder than the last sample which was a lighter colour, a whiter one, so that at least in terms of dust on the surface of it, this is a different mineral composition. It is just slightly more active. For the main fractures to occur was of order 10 - it has now broken into lamilla completely. That was in the order of 15 seconds for the main fracture, this one of order about 10 but it is still going on.

OLNEY J: You have demonstrated what you mean by water-active clay?---Yes. That is in the production of Chateau Tom Price. That is the breakdown of a rock which has been competent enough up to that point in time to survive many falls and many applications of very major force; for example, in crushers.

MR HULME: Are you able to tell us - I will not say chemically but in layman's chemistry - what is happening that causes that disintegration of water-active clay?---All materials absorb water on their surfaces and hematite and other iron ores are no exception. It might be possible to find some but I would find it rather hard to imagine

what they would be. They absorb water on their surfaces because at the molecular level water finds it energetically more favourable to attach itself to a surface - - -

WITNESS (Continuing): - - - a surface than to be a vapour molecule in the air or, for that matter, to be a molecule in solution. That only works for fairly small molecular-type layers of water on the surface. The surface of most rocks, I might add - the surface area given their porosity - is such that those molecular layers can add up to significant per cents by mass of moisture.

Clay has, on a surface area basis, a much higher propensity for water and it is tied up with the fact that the clay at a molecular level is really sheets of crystal structure with a few bonds in between them - and I would need to go back to a paper to remember what they all were but structurally that is what it looks like - lamilla with odd bonds in between. It so happens that the nature of the odd bonds is such that from the next clay level up they look similar - not identical but similar - to water. This means that clay has a rather remarkable property with water (or a lot of clays) to absorb water onto its surface, which happens on all surfaces anyway but with clay it is chemically favourable and then, having absorbed it on the surface, one can ask the question "Well, how does that look to another layer of clay?" which might have been chemically bonded to it, which is what is involved in competent rock, but as soon as those bonds are actually water bonds the surface is masquerading as water down at the melecular level. How does a water surface know itself from another water surface? The answer is it does not. Therefore, to all intents and purposes, by absorbing water onto the surface sites - the surfaces down at the lamilla molecular layer of the clay - you convince the clay that it is disselved. That is what the process of dissolution is about. It is surrounding a surface with water.

Because the clay is lamilla it also allows the penetration of water in, which further aids the process. Most clays will change their structure entirely in water, which they are I presume examples of. I am not a mineralogist to even attempt to identify those, but that is the physical chemistry reason, if you like, of why such materials respond so dramatically to water. They are not just absorbing water onto the surface like hematite does. It is convincing the lamilla that are responsible for the structure that they are water and hence there is no force of attraction between them.

MR HULME: The process that is begun when the water is first put on the ore - how long does that continue?---I take it you are referring to the water that is put on in the scrubbing box, not the water that is added in stockpiles and the like for dust suppression?

MR HULME: I am referring to the water put on in the scrubbing box and/or the water put on over the screens?--- The process of violent wetting and the subsequent changes has two components to its time scale. The first is the very rapid one, that the penetration of water - - -

WITNESS (Continuing): - - - of water onto the surface and the subsequent breaking off or liberation of the adhering fines is as rapid as you can present particles to the water curtain, and it is a violent curtain of water that the particles fall through. It is not spraying water onto particles. It is dropping them through a curtain. So the adhering fines, I suspect, become liberated as long as they are inert material themselves; they will become liberated rapidly. However, the clays, as we saw, whether they are part of adhering fines - and of course some of it is - or whether it is as competent rock, will take a variable time to absorb their water and to lose whatever bonds were between small particles and large or in the structure of the material itself.

It would be my observation that the first process of initial application of water is very rapid in its effectiveness, providing the particles are presented fairly individually. If they are presented as a mass - for example, bringing the water onto a stockpile and spraying it - then the rate of penetration can be quite incredibly slow. This is the, I am sure familiar to Perth people, gardening phenomenon of spraying water onto a sandy soil, which nominally should absorb water at a great rate but if it has not been previously wetted (and even to some extent if it has) you can wet the top part very quickly but then the penetration further down is very slow. We are not talking that, however, in the Hamersley case. We are only, if you like, dropping the surface layer through the water. That is rapid.

That process of breakdown of clay bonds can go on for a long period of time. It is demonstrably still going on when the material is presented to the heavy media drums and the demonstration of that is that you can - - on that basis, by the way, if you want to describe the breaking up of material as being scrubbing, then you are scrubbing from the time the water hits it until it hits the drums, which is an extended period.

The demonstration of it is in the way - and we have measured this also - the material presented to the drums can be screened and still produce dry screened. It happens to be wet screened I know in the real plant but if you take a sample and dry screen it just before it goes to the drums, you can still effect a separation of minus 30 material (it happens to be minus 6 material) which can only have got there from very inefficient screening (and I have already commented on how efficient screening is of the larger sizes) or breakdown of material. You can, therefore, quantify that there is still significant breakdown going after bins and transport up to the drums.

MR HULME: I would like you to look at exhibit 8,DFT1? I am going to show some photographs which were - - -

MR HULME (Continuing): - - - which were discussed by Mr Tompsitt at pp.184-186.
TO WITNESS: Would you look at photograph 11 and 12? Photograph 11 is in relation to stream B, the 6 to 30 stream at the head of belt 24C and photograph 12 being at the head of belt 51C?---Your Honour, may I consult the diagram?

OLNEY J: Yes; please look at the diagram to locate those?---Thank you. That is the 6 by 30 material leaving the first screening, washing plant and the same material when it gets to the drum plant.

MR HULME: Yes. Can you discern any difference in the appearance of the material in those two photographs?---You can discern a difference. I would comment that such differences on photographs are illustrative perhaps of what is going on but are not quantifying what is going on. I would regard that as a qualitative - - The difference is that 12 appears to be of a dirtier colour than 11 because you cannot see blue coloured hematite rocks in it. Eleven clearly has some rocks falling down in which the colour of the individual rocks is discernible which indicates that the covering of Pilbara red which permeates everything is not there except fresh ground ore or freshly washed ore is not present whereas 12 would indicate that there is less real colour available. I would stress that that is, to me, a qualitative indication that additional breakdown is going on. It does not indicate quantitatively the amount that is going on. That would be better determined by actual samples and measurements in a brief manner which I have personally done. I suspect that Hamersley also - - I will not comment on what they may or may not have done.

On the basis, as you say, that it is merely a qualitative difference what would you regard as having brought about that difference in appearance?---In my opinion, in that plant, on that ore, the difference that you see there - - -

WITNESS (Continuing): - - - see there is entirely, in a metallurgical sense that means very largely, due to the breakdown of apparently competent rock acting under the influence of water.

MR HULME: How does that bring about the universalness of the muddy appearance that one sees?---It brings it about by the same process that spreads dust uniformly through Hamersley ores when there is dust, and there always is; that is, at every transfer point you get a tumbling over of the ore in free-fall and then a taking off in another direction. We have made extensive measurements of the amount of dust generated in such tumbles, very extensive, more like the thousands than the hundreds of measurements and the composition of that dust and of the extent that it adheres to the fines and the extent that it disappears off into the atmosphere in an unacceptable way. This case here though is going to involve breakdown of material other than hematite rock abrading which is unfortunately called degradation as is that called degradation. However, both degradation of dry material and the much more significant degradation here of the wet material, will result in the spreading of fines if you take the ore over a transfer point and there are clearly, here and here, the vibrating feeders here which are quite a vigorous mixing together and the transfer point there, several transfers involved in this particular process and hence, opportunity to help that breakdown by physically knocking it around and then unfortunately,what is not desired, to spread the resulting products uniformly over everything.

Thank you, doctor. Would you go to photographs 5 and 6, 5 being the extreme A, 80 by 30, belt 22C and 6 being stream A, the head of belt 60C?---Again, may I - -

OLNEY J: Yes; please do.

WITNESS: In photographs 5 and 6 we are looking at the same relative positions in the plant, that is just after washing and just before entrance to the drum, but for the plus 30 as opposed to the previous case, the 30 by 60 fraction. Do you wish me to comment on the difference between them or not?

MR HULME: Do you have any separate comment on those ones? I am not suggesting you should?---Those show, I think, more of the same process but in different degrees. They again illustrate the difficulty of perhaps trying to quantify a process that is going on from measurements or evidence such as this. Clearly 5, which is taken soon after the screen where the first washing and scrubbing occurs, shows a relatively clean product. In the rock, for example, on the left-hand lower portion of 5, you can see a quite clean surface - - -

WITNESS (Continuing): - - - with a few smears near the corners of it. You cannot see the same sort of cleanness on the faces of the rock tipping over in 6. However, again you would have to look at them and say quantitatively you could not estimate the amount of breakdown. You would just use this as an indicator of saying there is breakdown and spreading going on.

MR HULME: Can I ask you to go lastly to 19 and 20, which are mentioned by Mr Tompsitt at p.186 of the transcript, and 19 and 20 are of the 6 by .5 of a millimetre stream, stream C, 19 being "Belt 28C" and 20 being the head of belt 41C?---These two are more of the same but for the finest fraction, coming from the screening and washing. Superficially, the main thing they show is a very different colour of the product. There is some indication that individual faces of rocks can be seen in photo 19. It is more difficult to see individual faces in 20 - whether that is because the photos are from a slightly different distance or whether because the material is very much muddier you could not say from this photo.

It is my experience of observing the plant in those two places, amongst many others - it is my personal observation - that the ore at the position corresponding to photo.20 is decidedly dirtier, muddier or covered in fine material, however you wish to describe that, than the ore which you see straight after the screens.

I think you mentioned the preparatory screens before the drums and cyclones. In any event, the evidence is that these various streams go through preparatory streams before they go into the drums or the cyclones. What would be taken off at that point - if stream A, for instance, has a preparatory screen at 6mm before it goes into the drums?---The second screening that occurs for each of those three streams at which we have just looked before the drum, can be looked at in a purposeful sense in two ways. One can look at those screens - - -

WITNESS (Continuing): - - - those screens and observe their performance, and I would comment perhaps only primarily on the screen for the coarser drum, which is screening plus 30 material but is screening it over minus 6mm holes. The observation that is made of the performance there is that the sort of material responsible for that smearing that one sees, which has broken down between the initial application of water and the amount that was removed in the first washing and screening - the material which has subsequently broken down - - there is an attempt to remove it on the screens just ahead of the drums. With the plus 30mm material that is done on a 6mm screen. It is not for me to question why you would screen plus 30 on a 6 but it is obviously not to remove material which is near to 30mm. The broken material, that sort of material, is removed on those screens quite demonstrably, and again we have measured the extent of that removal.

MR HULME: That is the finish of the photographs. Have you organised a testing programme to seek to illustrate a step towards quantification of the kinds of differences involved between the wet screening and dry screening, as you have been telling us?---I have indicated thus far that we have attempted to quantify the amount of scrubbing and washing which is occurring in the whole Hamersley-Tom Price concentrator. We have results from that programme. In a scientific sense I would regard them as the first step in a full quantification of the processes occurring. We have taken the scientific first step and actually made some measurements through the plant.

Would you look at this? (I will not tender it but your Honour will need it to follow.) Would you first just outline the various steps and show what is done?---Can I ascertain that we are both looking at the same thing because there are several of these and they all look alike?

OLNEY J: How do you identify it - 14C No.1?---14C No.1, yes. This is a sample from 14C No.1. Can I refer to the diagram?

Please do?---This is the feed material to the washing and scrubbing plant - - -

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WITNESS (Continuing): - - - scrubbing plant and what we have done here is to simulate the performance of that plant, to simulate it physically in a laboratory. As such it carries the obvious provisos that it is not a plant performance data. It accords with my understanding of the materials and sorts of measurements made on the plant and before describing it I would like to just explain that we indulge in an exercise like this in conjunction with plant measurements but, in this case, in preference to them because of the difficulty of doing an A or B experiment on the plant where A is with water and B is without water because the ore changes continuously to the plant and because the effects of the water, to some extent, must depend on the characteristics of the ore. It is no good going up to a plant, running it with water on and taking samples, turning the water off, taking more samples and saying, "The difference was due to the presence of water." It may or may not have been. The difference can equally well be due to the feed type changing and this is a problem that we face in all of the test work in a Hamersley-type situation.

What we did was to take a sample, a single sample, and split it into two sub-samples, one of which we subjected to what I would call a natural screening process, that is without added water, and the other which we subjected to a wet screening process of the type which, in our considered metallurgical opinion, would simulate the performance of the screen decks. In either case they were both subjected to the same time of screening. The choice of that time which is a non-standard time for laboratory screen tests was chosen as our best considered estimate of what would simulate plant conditions.

Our two streams were then separately sized in a manner simulating plant with a cut at plus 30, 30 by 6 and minus 6. I would suggest that the statistical significance of the 30 by 6 screening is satisfactory, that of the plus 30 is not because a plus 30 sample would require to be many tens of kilos instead of many kilos. However, as the majority of the material is minus 30, then the trend that we observe in the results should be a significant trend for a single result.

The results then of dry screening on 30 - -

MR HEEREY: Excuse me; may I just make this point, your Honour, that this comes as part of a great deal of additional material which your Honour would appreciate was not contained in the affidavit. Within the terms of the arrangements made between counsel we would like to have the opportunity to give this some consideration and take instructions upon it. Because of your Honour's earlier indication that, as I understand it, your Honour

will not be sitting this afternoon anyway, that should not cause any practical problems.
However, I just want to make the point at the moment that this exercise that the witness is now about to embark on may raise questions of admissibility and it would be an unproductive exercise to debate - - -

MR HEEREY (Continuing): - - - exercise to debate questions of admissibility at this stage, without obtained proper technical instructions, so could I just ask that that be noted?

OLNEY J: Yes, very well.

MR HEEREY And we not be taken as necessarily conceding admissibility.

MR HULME (TO WITNESS): Can you just come down the chart and explain? You start at the top with your sample and you split it and you go each side. You come down the dry screening one where you have done a simulated dry screening into the three categories, plus 30, 6 to 30 and minus 6?---Correct.

You warn us that there are so few pieces involved on the left-hand side that we ignore that?---I do not suggest it be entirely ignored. It means that when you compare some facets of the results you compare, perhaps, the plus 30 and the minus 30 plus 6 lumped together. I am not trying to present this as a significant test of plus 30 material. It is a significant test of the 30 by 6 material.

The 30 by 6 material you show being dry screen again a few lines up from the bottom. Could you explain that particular dry screening?---This is for an unusual purpose. We have found over very many screening tests of looking at and quantifying the extent of adhering fine material, that one way of so doing is to take the material and thoroughly dry it in a laboratory oven and reduce its moisture content to the point where the only forces acting between particles are the Van der Waals and the electrostatic forces, which are both very weak forces.

If we then subject that dried material to a further dry screening, the action of the screening is sufficient to break down those minimal forces of adhesion and the fine material can then present itself through the screen. This second dry screening then, which is only done on the 30 by 6 material, gives us the breakdown of the adhering fines that were present at the original screening, whether it was wet, or dry.

The very bottom line, therefore, indicates to us the amount and the composition of the adhering fines and in the example that has been presented here - and there are several such examples - we can see that the adhering fines, if we go through a dry screening process (that is if our original screening is dry) - - there are three units of 3.4 units of weight of a grade of 54.3 iron and the coarse rock

to which they adhered was 38.2 units of weight, of a grade of 61.2. That illustrates two points - firstly, that roughly 10 per cent by mass, 3.4 in 38, of material was happy to adhere in a so-called dry screening process; and reported - even though it was minus 6 - as a 30 by 6 fraction. Secondly, it illustrates what is very typical, that the adhering fines are of considerably lower grade than the larger rocks to which they are attached, because that very bottom stream indicates a grade of 54.3 iron units versus 61.2 of the large rock to which they are attached.

The same material when wet screened to produce three fractions comparable, we trust or believe, to the three fractions that would have been produced - - -

WITNESS (Continuing): - - - been produced if this material had been put through the first scrubbing and screening and washing operation at the Tom Price concentrator, then we would have expected the separation observed there. At that stage we dry the material so that all analyses are made on a comparable dry basis and we again take the 30 by 6 material which was this time wet screened, thoroughly dry it and give it a dry screening to determine its extent of adhering material. This time there is very much less adhering material of order one unit in 32, of order a ten-fold reduction in the adhering material. The difference in grade, 58.1 for the adhering material on the right-hand side versus 54.3, although it is in the expected direction I would not comment on it as being significant because we are down at .9 units of weight to the level where the actual grade starts to become less reliable. However, the amount is very much reduced.

The other gross observation that you can make is that if you look at the plus 30 and minus 30 plus 6 streams together - and I have done the elementary calculation of lumping them conceptually together so that we have a statistically significant estimate of grade to get around this problem of the plus 30 not being statistically significant at the mass level - go through that operation, and note this is from the same sample split with, I believe, metallurgical consistency, it was double-split actually but that is a procedure in such cases, then the grade of the material produced as being plus 6 in dry screening is worse than the grade produced by wet screening and that difference in grade which is of order one iron unit, which is monetary-wise a very significant difference, can be attributed very largely, because it is screening at 6mm, to the presence of water.

MR HULME: There is one thing I would like you to explain. You will notice after the first dry screening the letter C after the iron content figure indicating"calculated". Does the chemical analysis require, in effect, crushing and destruction of the sample as you have it? ---That is correct. The chemical analysis is done by taking the material, after these tests have been done, and crushing it, further subdividing the fine powder down - - -

MR HULME: Did you also do similar tests, again at 14C and one set of tests at belt 50C?---The answer immediately on 14C is "yes".

You have told us 14C will be the same - - -

MR HULME (Continuing): - -- the same type of feed at a different time. Is that right?---14C is from the same conveyor belt sampled at a different time so that the size distribution of the ore and its mineralogy would be expected to be different so it is more of the same but from a different time.

You also did belt 50C which is what? What are you dealing with there?---50C is the head belt for the 30 by 6 before the actual screen, before the drum, that is for the 30 by 6 drum.

To look at the second of those two sheets being the second test on 14C, your samples calculate back to 57.9 on the left-hand split and 58.1 on the right-hand split. Is that difference within the area of expectations?---To me that is an acceptable difference.

It results, one sees at the bottom, in 2.9 by weight out of 33 which is again somewhere near 10 per cent where the first process has been dry?---That is correct.

And 1 in 30 on the right-hand side?---That is correct. Your Honour,they are indicative of the fact that in processes such as this you can never expect to see the same result twice and if one wanted to quantify the difference between the two, there would be the need to keep repeating the test until the statistical significance was proven for which there are very standard ways. My purpose in doing these two was simply to prove up the method and to demonstrate, to give some estimate albeit imperfect, of the magnitude of the effect which I hope it clearly does.

Again, throughout that, the fines seem to be always lower than the larger lumps which you said you would expect?---Your observation is correct. The fines, in both cases, appear of lower grade. The adhering fines, to summarise the differences, are also similar trends in both cases; that is, much more adhering fines for so-called dry screening than for wet screening. The ratios do not come out to be the same. However, they are in the same direction. They would not be expected to come out to be the same.

There is one point that I may have missed you explaining or we may not have explained it - - -

WITNESS (Continuing): - - - powder down and submitting to an XRF routine measurement. These analyses, to the best of my knowledge, were done by the laboratory with the same procedures that are routinely done and accepted as the basis for contractual payments within the Hamersley system.

MR HULME: If we come done the minus 6 perhaps, for illustrative purposes, you get the minus 6 sample and you can go straight into your analysis?---Because we are not doing anything further to it, coming down that minus 6 fraction, when we have determined its weight we can then send it off for chemical analaysis. We cannot do that for the minus 30 plus 6 because we have to do a further dry screening. So we take the two dry-screened fractions, when we are finished with them right down at the very bottom, send them away for analysis and back-calculate what the stream minus 30 plus 6 would have been.

There is another way of doing it, which is to have very much more sample and when you get to that point split off the sample.

What you have in fact done is to analyse the ultimate samples at the bottom and if one sees the two weights of them, 38.2 and 3.4, they together add up to the 41.6 from which they and they only derived. Is that right?---I hope so. I do not have a calculator to prove it.

By a process of arithmetic, which I have no doubt takes some more sophisticated form than just arithmetic but by a process basically of arithmetic, you can calculate what the content of that total 41.6 must have been?---It is elementary arithmetic - I mean in the mathematical sense of elementary, not implying condescension - to multiply 38.2 times 61.2 and add to it 3.4 times 54.3 and divide by 41.6. I trust the resulting answer would come out to be 60.6; similarly, to multiply and sum all of the figures from those three dry screenings and come up with the so-called head grade up the top, where it says "Sample for natural screening 100 units of weight, 58.2". It should be noted that the two head grades should come out to be identical because they were split from the same sample, but we are dealing, of course with a statistical process and unless this material were sampled at the level statistically significant for plus 30, which would be many, many times the weight used here, then you might expect some small variation, as is observed in the head grades. However, the close agreement there is indicative that what we are trying to illustrate for the 30 by 6 is at least a first step towards quantifying the phenonema

MR HULME (Continuing): - - - explained it. To go to sheet 1 for a moment, the single set of figures appearing in the second line after the word "dry" which is 41.6 and 60.6 on the left and 38.2 and 61.6 on the right, is a calculated figure for the minus 6 to 30 and the plus 30?---They are calculated for the minus 30 plus 6 on that line because, as I explained, we did not have a separate sample for analysis.

It so happens it is a nil result but that is what that figure is, is it not, the addition of - -?---Yes, and similarly the figure below them is calculated but this time as the sum of the plus 30 and the minus 30 plus 6 stream, the main intent being to show two things there. Firstly, the amount of plus 6 material from the dry screening operation is greater than the amount of material from the wet screening operation, 41.6 versus 38.2 or, on sample No.2, 42.1 versus 35.8 - that is because of the adhering fines I suggest. Secondly, the grade of the dry process, 60.6 is lower than the grade of the wet process, 61.6, and in the second sample, 61.0 versus 62.0 and that increase in grade for the same type of screening process by the use of water, that demonstrable beneficiation, is of the order that we would expect from the screen tests that we have done on the other Hamersley dry screens.

OLNEY J: Would that be a convenient place to stop, Mr Hulme? I have to rise now and as indicated I will not be able to sit this afternoon. Is it convenient to counsel to commence perhaps half an hour earlier of a morning or is that not convenient? Perhaps we will make it half past ten on Monday and you can think about the other days.

MR HULME: I am a little bit in my learned friend's hands on this. I know that I have been working in the morning seeing witnesses and he is getting near to the point where he is going to be the one but perhaps we can have a word about it.

OLNEY J: We will make it half past ten on Monday. Thank you, gentlemen.

HEARING ADJOURNED UNTIL 10.30 A.M.

MONDAY, 14TH NOVEMBER, 1983.

ROBIN JOHN BATTERHAM:

EXAMINED BY MR HULME QC (Continuing):

MR HULME: We were looking on Friday at three sheets of figures, being the results of one set of tests carried out? ---Correct.

Which you described as being a step towards quantification of the kinds of differences involved between the wet screening and dry screening. Could you speak up a little, doctor, when you say "Yes", so that it gets onto the transcript? The first of those sheets which was test 1 on belt 14C - have you discovered an error in calculation?---There is an error in calculation on that first sheet.

If one looks at that first sheet, the calculation back from the ultimate results to the long line where we have the word "dry" appearing three times and arrows pointing down and the central arrow points to a figure 41.6 - - do you have the sheets there?--- No, I do not have the sheets. In my briefcase at the back is the sheet at which I was looking on Friday. I do not have it in front of me.

OLNEY J: Perhaps you should have a copy of it. Everyone else has one.

MR HULME: Yes. (TO WITNESS): Can I direct your attention to the second sheet, the middle figure? Do you have the sheets there?---Yes.

If you look at the middle sheet, test 2 on belt 14C, it contains the ultimate figures at the end. There is a calculation-back - - -

MR HULME (Continuing): - - - a calculation-back figure for the middle stream, the 30 to 6s; there is an actual result on the left of that for the plus 30s, and then there is a calculated figure combining those two?---That is correct.

The calculated figure of 42.1 - should that read 42.8?---Correct.

Should the calculated figure of 61, associated with the 42.1, read 60?---Correct.

Does that correction or alteration in any way affect what you have said about what is shown by this sheet 2?---That does not alter the facts I was trying to present in this sheet, the difference between dry and wet screening. It in fact exhibits now an even greater grade difference between the dry process and the wet process; it is only the extent which is altered, and I have already said I do not regard the extent as the major result, it is the direction of the change.

As far as this test is concerned it is the difference between the 60 in that figure and the 62 over on the right-hand side as the calculated combined figure about which you are talking?---Correct.

I would hand to your Honour a copy of sheet 3 so that your Honour will know what we are referring to. I think I only handed your Honour one sheet before.
TO WITNESS: You will be handed that in its original form. In sheet 3 are the analysis figures set out at the end inaccurate?---The analysis figures on the wet screening side of that diagram are misreported and hence they and the subsequent calculated figures with regard to analysis are therefore misreported.

If we just work on that sheet for the moment, at the bottom of the wet screening side the ultimate figure of 62.3 should be 64.4, should it?---Correct.

The other bottom figure, 57.2, should be 60.3, should it?---Correct.

If one goes back up, coming from left to right we have 63.5 for the plus 30 - -?---That is the corrected figure.

Should that be 63.6?---No, it is 63.6 in my - -

Sorry - should the 63.6 be 63.5?---Correct.

The minus 30 plus 6, presently 62.2 should be 64.3, should it? ---Correct.

And should the 61.2 be 57.4?---Correct.

And the calculated combined figure of 62.3 with those changes will come out at 64.2?---That is correct.

OLNEY J: Is that 64.2?

MR HULME: Yes, 64.2. The 62.3 becomes 64.2
TO WITNESS: The sample figure - - -

C140. 10.39

MR HULME (Continuing): - - - sample figure on that side, sample for wet screening, which is shown at 62.0 - should that be 62.7?---Correct.

OLNEY J: Could I have that again, please?

MR HULME: The sample for wet screening figure immediately under "split" should be 62.7. If your Honour please, I tender copies of those three sheets in that form as being the results of those tests but being a step towards quantification of the kinds of differences involved where it is not suggested, as Dr Batterham says, that this applies across all the ore in these precise figures.

OLNEY J: You wish to tender three sheets?

MR HULME: Yes, sir.

EXHIBIT EXHIBIT 16 .... Three sheets 1,2 and 3 respectively.

MR HULME: Doctor, can I take you to a different matter? There have been some questions as to what is comminution and I see your history as set out shows that you chaired an international conference on comminution. Can you tell his Honour what comminution is in however many different senses it can be used?---Comminution I take as having two meanings. The first is the scientifically correct usage which is then referring to the breakage process which is generally carried out in crushers or in grinding mills of some description. Comminution is also widely used in the industry to refer to the collection of processes associated with comminution in which case, such as in a comminution conference, it would cover crushing and its associated screening and grinding and its associated classification.

You said the scientific sense would be the crushing and grinding? ---Correct.

Just so that we can have this on the record, how does one distinguish crushing from grinding?---The distinction is fairly arbitrary and is more in the usage of the words. The larger sizes and the equipment used to break them is referred to, more often than not, as crushers. The smaller sizes and the equipment used to break them is referred to as grinding. However, that is an artificial distinction - - -

WITNESS (Continuing): - - - artificial distinction. In both cases comminution would be occurring.

MR HULME: Are you familiar with the piece of equipment commonly known as a sieve bend?---Yes.

What would you regard as the principal function of a sieve bend? ---There are a few processes occurring on a sieve bend. In most instances I think the chief process is one of dewatering. The other processes are screening - that is the presentation of particles to apertures - and some other minor processes. Principally, they are a dewatering device.

Can you describe briefly how that dewatering operation of the screen works and the significance of it in processes where the sieve bend is used?---Yes. It would be perhaps easier to make that description with the aid of a diagram, to show the partition function of the device, if that is permissible? I can do it in words but I suspect my pictures are easier to follow?

We have in evidence this photograph. Would you look at that to see if you can talk sufficiently to give a brief indication of the difference from that?---Yes. That would illustrate the point.

It is photograph 17 in exhibit 8,DFT1.

WITNESS: The screening process is designed to separate on the basis of size. This is what I am referring to when I talk about the screening process. It is quantified by considering the relative chances of any individual size fraction in the feed presenting to either the oversize or the undersize, the undersize being the material that has passed through the screen deck and the oversize, ergo, being the material which does not pass through. We can best describe any screen by considering (or screening device) numerically how, size by size, material distinguishes into - separates into - the oversize and undersize.

If we consider an ordinary, dry screen, then what we find at small sizes is that the material tends to present itself to the undersize, except for adhering fines which complicate the issue, and as we go up in size the chance of reporting to the oversize - - -

WITNESS (Continuing): - - - the oversize becomes higher and higher, reaching 1.0 or a 100 per cent probability with larger sizes, so the shape of this partition function, as it is termed, gives us a very clear indication of how well and to what extent screening is going on in any device.

If we now turn to a sieve bend and consider the partition function for a sieve bend, it exhibits an anomaly which makes it numerically quite distinct from what you observe for ordinary screens, that is dry screens, in that at the smaller sizes one tends to find a fixed fraction of the small size presenting to the oversize, rather than presenting to the undersize. That phenomenon is published and quantified, not by me but widely available. It is the same form of curve, identical in fact to what one observes for a hydrocyclone in which a certain fraction of the fine sizes will report to the overflow stream rather than the underflow stream, and the reason is the same with both a hydrocyclone and with a sieve bend in that the fine material which reports through the apparatus is of course into the undersize stream and of no concern, but the coarse material can only be transported out of the device by a current of fluid; it cannot be thrown off the end of the device by the vibrating nature of the device; it must be pushed off the end by a stream of fluid. This happens in a cyclone where it is carried out in the fine stream, or on a sieve bend. As such, some of the fluid which is responsible for clearing away the oversize must inevitably carry fine material with it, so inherent in the design of a de-watering device like this is that some fines must inevitably report to the oversize stream. You get a pictorial representation of that in photo 17, in which you can see the - - well, I can see it perhaps because I know what it looks like continuously rather than in a still, but that suggests to me that there is a considerable stream of fluid carrying the coarse material over the end of the sieve bend and as such that will carry fines with it. That is the curtain of water which you see in the lower right, along the line of the bend.

MR HULME: You made the remark then in the case of the sieve bend that the oversize cannot be thrown off by the vibratory nature of the device?---Correct, because it is a stationary device.

(Could the witness have exhibit 3, the paper by Mr Uys and Mr Bradford?)

OLNEY J: I think I was given a spare copy of that, was I not? Yes.

296. 10.54

MR HULME: Doctor, would you go to the fourth page? In the bottom paragraph on that page do you see the phrase, "Many ores require some form of beneficiation other than that naturally achieved by crushing and screening in order to meet the grade and impurity levels and even when high grade ore bodies are mined, large volumes of low grade ore are usually found which need to be beneficiated in order to optimise the total iron ore recovery from the ore body"?---Yes, I see it.

In the second line you see the words, "naturally achieved by crushing and screening"?---Yes.

As between wet and dry - that is the distinction I am talking about. What kind of crushing and screening would you understand the authors of this paper to be talking of in that passage?---I would read that as referring to dry screening.

Would you turn to the following page, the second paragraph, the paragraph beginning:

> "Because each iron ore type has its own peculiar mineralogical characteristics and requires specific metallurgical treatment ....(reads)....to complex combinations of various forms of beneficiation."

The phrase there, "simple crushing and screening" - to what type of screening would you take that to be referring?

MR SHER: Your Honour, in our submission, this questioning is irrelevant. What the authors meant only the authors can say and the witness's attempt to conclude what the author meant, in our submission will not assist your Honour; it is clear that other passages to which reference can be made make it clear, as a matter of logic, that screening includes wet screening. I do not know to what end this line of questioning is directed but if it is an intention on the part of the questioner to seek to elicit some evidence from which your Honour will be asked to conclude what the authors meant, in our submission it is not permissible. The authors can give that evidence if it is relevant and it is a matter for your Honour to conclude from the document itself but the witness's guess, whether it is an educated one or not, in our submission does not assist your Honour.

MR HULME: Your Honour, it is the first time, with respect, that I have heard it asserted that it is for a judge to interpret for himself, without technical assistance, a technical article. This is a technical article.

These terms which are being used are not simply words of ordinary language; they are words being used inside the iron ore industry to convey to people who are experts in relation to iron ore - - -

MR HULME (Continuing): - - - iron ore certain meanings, using technical terms, and there are very real questions in this case of terminology and, indeed, your Honour will see legislation cast in terms of simple crushing and simple sizing, the words known in the industry.

When one is interpreting a document in those kinds of fields, then the court is entitled to have the assistance of experts saying what they understand is being said.

OLNEY J: I must say I have not read this article. It may be that when I come to read it I will understand it and I may be able, on reading the article, to twig that wet screening or dry screening or whatever it might be is meant, in which case I may not need the assistance of the expert witnesses with the ordinary understanding of the language used. At this stage I have not been invited to read it but it does appear that I will have to read the whole article. Whether or not this evidence is going to be helpful to me I do not know at this stage. I am prepared to allow it on the basis that it might be, but it may be that in the wash-up I will simply ignore it.

MR SHER: I did not make clear what my objection was. Can I, in a sentence, just say what I was objecting to? I appreciate from the response that I had not made clear what my objection was. We do not oppose evidence as to what words mean, technical words mean, in the industry. Indeed, we are both seeking to lead evidence on that matter through affidavits. What I object to is a witness saying what another expert meant by the use of language, and that is all that this question is directed to.

OLNEY J: Yes, when your question was asked it immediately raised a query in my own mind. This witness can say what he understands the author to mean. That is not quite the question he was asked. He was asked "Well, what did Uys and Bradford mean?" He cannot say that. He can say what he understands it to mean.

MR SHER: I have made my point, sir.

MR HULME (TO WITNESS): I am not sure, doctor, whether you had answered the question before the objection was made or not. Can you tell us what you would understand that phrase, used in the iron ore context, to mean; what kind of screening operations you would understand it to be referring to?---My interpretation of what the authors are conveying there is that they are referring to the sort of beneficiation that I mentioned on Friday that can and does occur - - -

WITNESS (Continuing): - - - does occur for Hamersley iron ores with crushing and dry screening.

MR HULME: The authors then go to a heading "Beneficiation by Differential Crushing and Screening". I think there is a misprint there. It reads:

> "This is be far" (and I think it is clear that should read "by far") the most common iron ore treatment method.....(reads).....operates under dry conditions."

I would go two paragraphs down from that:

> "In most ores treated by only crushing and screening methods the shale.....(reads).....is concentrated into the coarser ore fractions."

To what kind of screening do you understand that sentence to be referring?---I am not expert on most ores; my interpretation of what the authors are saying there is again the same - they are referring to crushing and dry screening.

The next paragraph says:

> "Impurities also tend to concentrate in the fines. Some operators have thus been able.....(reads).....but are left with considerable stockpiles of low grade fines."

To what kind of screening would you understand the word "screening" to refer in that passage?---I have observed that I agree with the authors' comments, and I take it to be the dry screening which I have observed they are describing there.

Would you go on to the next page where, in the fourth paragraph - -

MR SHER: Your Honour, I would rise again to object to this. If we are just going to go through this document picking out those bits where screening refers to dry screening I dare say we can do it, but it will take quite some time, and then my learned junior in cross-examination will go through it and pick out all the words where it refers to wet screening, and in the end it is all argumentative, your Honour. It is submitted that it is a matter for your Honour, not for this witness, to say what the authors meant, and the best evidence are the authors themselves. There is no suggestion they are unavailable.

OLNEY J: Yes. It may be a long process, Mr Hulme.

MR HULME: I am not intending to go right through the document, your Honour. There are one or two more phrases, and it is not simply a question of what the authors mean, though that is half of it; the authors are talking in an industry context to people in the industry, and the way in which what they say is understood is, in our submission, very important. There is a fundamental issue involved. We would say that there is an accepted industry distinction between what the industry calls crushing and screening and what industry calls beneficiation. Scientifically crushing and screening may be beneficiation, but there is a distinction as in America between direct shipping ores and other ores - the ores which go out simply by crushing and screening - and we say that distinction is fundamental when you come to the question of what the draftsman of our contract was trying to distinguish.

MR SHER: I am sorry, your Honour, but that just highlights that this matter is irrelevant, in my submission. The agreement which your Honour is being asked to construe in clause (b) does not talk of crushing and screening - - -

MR SHER (Continuing): - - - and screening; it talks of crushing "or" screening. All this evidence, in my submission, may be relevant to the composite meanings of crushing and screening but that is not what the contract is concerned with. We will be addressing argument to your Honour hereafter about the misconceptions inherent in some of the witnesses' evidence, but the point my learned friend makes is that he is seeking to get some evidence about what crushing and screening, as a composite term, means. I draw your Honour's attention to clause 9(b), the clause under consideration, where the word "and" just does not appear. It is "crushing or screening". We would contend it is clear that they were meant to be separate and distinct processes and this evidence, we submit, is irrelevant.

OLNEY J: Though can you construe para.(b) in a vacuum, where you have in para.(a) a phrase "crushing and/or screening"?

MR SHER: Of course not, your Honour, but the distinction is clearly made.

OLNEY J: Yes. Mr Hulme, I am going to allow you to continue with this line of questioning. I have some reservations as to how useful it is going to be to me in the long run in resolving this issue, but whilst I do have those reservations I do not wish to inhibit anybody in presenting their case in whatever way they see fit. I invite you to continue, therefore, but without committing myself as to whether it is relevant or not.

MR HULME: No. I understand that, your Honour, and whether it helps your Honour in the long run will be a matter for what is said in the final addresses etc.
TO WITNESS: On the page I was asking you to go to, the page which begins "Well designed", I ask you to go to the fourth paragraph.

> "In Australia, Mt Tom Price and Paraburdoo of Hamersley....(reads) ....various types of further beneficiation."

Do you see that?---Yes.

I ask you to put to one side your own knowledge of these matters. As a matter of what the authors are saying there, to what kind of screening - crushing and screening - would you take them to have been referring?---Excluding my knowledge of those operations, I would still take that to refer to crush and dry screening.

OLNEY J: You have probably told me at some stage, Mr Hulme, or the witness may have told me, but this article of Uys and Bradford - is it dated?

MR SHER: I think when I put it to the witness and had it identified - -

MR HULME: My learned friend tendered it.

OLNEY J: That is right.

MR SHER: I put it that it was a paper delivered at a symposium in Germany in 1981. I do not think I was more precise than that in the date but it is in the transcript and I will look it up for your Honour.

OLNEY J: I notice one of the footnotes refers to something in October 1979.

MR SHER: Yes, I put it to the witness, Mr Langridge, and he identified it as something he had read and recognised and it was then tendered absolutely.

OLNEY J: About June 1981, you said, did you?

MR SHER: I did not say June. I know I said 1981.

MR HULME: At p.93 it was tendered. My learned friend said at p.91 that it was presented at an international iron or symposium at Frankfurt in Germany in 1981 and he identified it as a copy of the paper delivered and it was tendered absolutely at the bottom of 92 and became an exhibit a few lines down 93.

OLNEY J: That helps me a bit when they are talking in comparative terms of time; things recently done. Thank you.

CROSS-EXAMINED BY MR HEEREY:

MR HEEREY: Doctor, you told us this morning about the term comminution and I think you gave his Honour two meanings of that term; one,the scientifically correct usage and two, the usage perhaps more widely used within the industry. Do you recall that?---Yes.

Would it be fair to say that the use of the word comminution in those two senses is a good example of how technical terms are used within the industry, in the sense that sometimes they are used in a narrow and sometimes in a more broad sense?---It is an example that context is important.

The context is all-important, is it not, with any language, whether it is technical terms or everyday speech?---Correct.

You, yourself, as a scientist, I suppose, continually have in the forefront of your mind the precise scientific analysis of some process or device when you are asked to define it?---Unfortunately that is not always the case.

When did you have your first visit to the concentrator at Tom Price, doctor?---During the construction of it.

When was that?---I will not try and guess the dates of the several visits. If it is required I will have to go back to my notes in Melbourne. It was during the construction phases.

Can you put that simply in terms of the year?---I would only be guessing, your Honour. I do not carry time and events as with names of people, I am afraid, in my mind.

OLNEY J: Can you relate it to the stage that construction had reached when you last visited there?---Yes. My first visit to the concentrator was at foundation-type level and with several visits since then and since operational completion of the concentrator.

MR HEEREY: Had you had any involvement with the design of the concentrator prior to that visit?---Yes.

When did you commence this testing that you have told us about? ---Which testing am I being asked about?

You told the court that you had conducted some very extensive testing of the process in operation at the concentrator in particular in relation, for example, to the collection of dust samples?---I am sorry; I do not recall telling

the court that my testing for dust samples was in the concentrator.

MR HEEREY: Was it in some other part of the plant?---The dust sampling testwork has been in every plant, every plant of Hamersley, other than the concentrator which, being a wet process, does not have dust problems.

Have you been concerned with visits to the - - -

MR HEEREY (Continuing): - - - visits to the wet screening plant since the plant started operation, for the purpose of consulting with Hamersley? By that I mean other than for the purposes of giving evidence in this case? ---I would like to make it very clear that I do not consult for Hamersley. I mentioned to you before that I collaborate with them in development work, and there is a very major difference between the two.

OLNEY J: I think what counsel was meaning was that for the purpose of doing the job that you do - I think he was trying to find out - whether you have occasion to go to the plant and, to the extent that is necessary, talk to the people there to find out what is going on. I do not think he was talking about "consulting" in the terms of professional consultation?---But the difference, your Honour, with collaboration is that when you have a collaborative project involving people from both Hamersley and CSIRO, and you have agreed work programmes and regular discussion between all of the people in that team, then the actual team member who personally visits the plant at any one point in time is not of major concern.

It is to the extent that you are the one being asked the questions about your own personal knowledge here, and I think the question is simply, in your words, if you as a team member of this collaboration team visited the plant since it has been in operation?---Yes.

MR HEEREY: And approximately how frequently?---No more than four or five times, I am not sure. Again I would have to refer to notes, but certainly of that sort of order.

Are you able to say in what years those visits took place?---No, I would not attempt to.

These are visits which have taken place since the concentrator plant commenced operation in 1979, and I am talking about visits which included a visit to the part of the plant where the wet screening takes place - is that correct?---Correct.

You say such visits have occurred on four occasions?---Of that order.

Are you not able to say in what year those visits took place? ---Clearly they are between 1979 and 1983; I am not being evasive on that; I have simply been three to six months travelling around working sites per year and I do not attempt to carry a mental record of these visits. I rely extensively on my written notes.

Can you not say whether you visited the wet screening house in the first year of its operation?---That would be correct.

MR HEEREY: So you did visit it in 1979?---That would be certainly the timing of the first visit, to my best recollection.

Did you visit it the following year, in 1980?---Your Honour, I would be hard pressed to factually say in which years the visits were.

Are you telling his Honour you cannot say whether or not you visited the wet screening plant in 1980?---Correct.

Were you aware of any problems which were encountered in the operation of the wet screening plant after it commenced operation?---Yes. 10

Did those problems relate to the nature of the ore which was being fed to the plant?---Yes, but that is on what people have told me; that is not on the basis of my own - - -

315. 11.24

WITNESS (Continuing): - - - the basis of my own investigation.

MR HEEREY: Did those problems first emerge in late-1980 or the early part of 1981?---I could not comment on that.

When did you first become aware that these problems had emerged? ---Having visited the plant early, after start-up, I was told that the wet screening process was not performing as well as was hoped for. I cannot comment on the reasons for that.

Were you told why it was thought not to be performing as well as hoped?---As a research scientist I ignore such comments from people routinely and regularly.

I am not asking you whether you ignore them or not, doctor. Can you tell us whether you were told what was thought to be the reason for this lack of performance?---As I ignore such comments, I would rarely remember whether they were made or not.

Do you, in fact, remember in this case?---No. I do not remember.

Can I jog your memory by suggesting that the problem may have had something to do with the nature of the shale or clay in the ore?---Your Honour, if I hear the question right, I am being asked to comment on whether I remember people saying the shale or clay in the ore was causing problems in 1979 and I think I have already answered that I find it impossible to remember whether such comments were made.

OLNEY J: You do not remember. Is that right?---Correct.

MR HEEREY: This was a professional visit, was it, to assist in the rectification of the problems that Hamersley were encountering?---No.

What was its purpose then?---As part of the collaboration on screening, to show me how the wet screening plant was operating.

There were some problems with its operating, were there not?---I was told that,yes.

Did that concern you?---What do you mean by concern me?

Did you try to find out what the reason for the problem was? ---No.

Why not?---Because of the limit of the number of hours in the day.

OLNEY J: Was it part of the collaboration between you and CSIRO and Hamersley that CSIRO in general and in particular be involved in rectifying the problem?---No.

MR HEEREY: Your visit had nothing to do with the problem. Is that correct?---My visit was not specifically requested to solve the problem.

Your visit had nothing to do with the problem. Is that correct? ---I do not think that is the nature of a collaborative agreement.

Your visit had nothing to do with the problem. Is that correct? ---My visit had to do with observing first-hand the wet screening process.

Your visit had nothing to do with the problem. Is that correct? ---I cannot see how I can answer yes or no to that. I was observing a problem area, ergo it must have had something to do with the problem - - -

WITNESS (Continuing): - - - the problem. However, we were not asked - I was not asked as the representative of CSIRO - to come up with a solution. Perhaps Hamersley hoped that I might but in fact we did not, in this case, so how can I say yes or no to whether the visit was to do with the problem?

OLNEY J: Can I take it that your presence on that particular visit was not because there had been a problem?---Correct.

And whilst you were there you were not involved actively in doing anything towards rectifying or advising on the rectification of the problem?---Correct.

And that it happened that you were there and there was a problem and the two coincided but that is about all you can say?---Correct.

So probably the answer would be satisfactorily given if it were simply "No".

MR HEEREY: But your visit did have some connection with the wet screening at the plant, did it not?---We are referring to the first visit to the plant since it was operational?

Yes, we will start with that visit?---During the visit I observed the wet screening.

Was that part of the purpose for your visit?---Well, if I did it, it was part of the purpose.

It was not just a casual tourist's look at the wet screening, was it?---There were no samples taken. What is a "casual" look?

You were concerned to bring your professional expertise to bear on the process of wet screening that was taking place. Is that correct?---No, that is not correct. I have already stated that I did not instigate any follow-up work as a result of that visit.

OLNEY J: I would have thought that as an officer of a publicly-funded body you do not just travel around to iron ore mines and plants for no reason, so one would have assumed that you went to Tom Price on that particular occasion for a reason?---Correct.

I think counsel is just trying to find out what the reason was?---It was to observe the control scheme in operation of the concentrator.

MR HEEREY: What about the next visit - was that concerned with the wet screening?---The only visits that have been concerned with wet screening - perhaps I could state those? Would that be in order?

OLNEY J: I think it would be in order. It may not satisfy counsel but if we hear it it goes somewhere towards it.

MR HEEREY: It will be a start anyway. Perhaps you can tell us, doctor?---In 1983.

Was that for the purpose of giving evidence in this case? ---In part, yes.

What was the other part?---The other part was a consideration by Hamersley and CSIRO that the collaborative work should now address the problems of wet screening - - - 10

WITNESS (Continuing): - - - of wet screening.

MR HEEREY: Do I take it from that correctly that the visit of which you have just spoken, this year, was the only visit to Tom Price which was concerned with examination of the operation of the wet screening process?---That was the only occasion in which the major part of the visit was associated with the operation of the wet screening plant.

I think you can guess what my next question is, Dr Batterham: On the other visits there were minor parts of your purpose concerned with the wet screening; is that correct?---Correct.

Involving giving advice on problems which were encountered in the wet screening process?---Involved, as I recall, (and this is only my recollection) in discussing how wet screening could be investigated to help define its problems.

I would just take you back to the visit you have spoken about this year: Do you remember the date of that?---No.

OLNEY J: According to your affidavit you said your most recent visit was March of 1983?---That would be correct.

You were then speaking on 25th May 1983?---Yes.

MR HEEREY: That visit, described as your most recent visit, was the one that you have told his Honour was the only occasion when the major concern of your visit was the wet screening. Is that correct?---Correct.

But there were earlier visits in which the wet screening formed, as it were, a minor part of the purpose of your visit? ---Correct.

On those earlier visits how did it come about that you were concerned, albeit in a minor way, with the function of the wet screening?---My interest and, hopefully, expertise is I think well known to Hamersley people and in those visits (they knowing my background and my interests) we would mutually decide, at any one visit, what items there were to look at during the course of the visit.

I see - so you would be up there and in the course of your visit they might take the opportunity of asking your advice about some aspect of the operation of the wet screens?---Yes.

You would look at the wet screens because somebody from Hamersley asked you to; is that not so?---Or because I asked to look at them.

Yes. On any of these visits (I think the four visits of which you have spoken since 1979) did you look at the dry

screening processes also?---Yes.

MR HEEREY: When you speak in para.1(e) of your affidavit of "a detailed study of the screening and ore handling operation at all of the plaintiff's operational sites", the word "screening" there comprehends both dry and wet screening, does it?---Yes.

If, on your return from Tom Price, one of your colleagues asked you where you had been and you had said: "I've been up at Tom Price - - -"

A279. 11.38

MR HEEREY (Continuing):"- - - at Tom Price helping Hamersley with their screening" the word screening used in that context would convey to the listener both wet and dry screening, would it not?---Your Honour, that is hypothetical. My colleagues are well aware of where my movements are and if they were going to discuss the details of them they would tend to talk about the processes that interested that particular colleague in detail. My colleagues cover a range of interests and activities.

Doctor, let me assure you that we are not going to call evidence from your colleagues as to verbal admissions made to them. I am putting to you purely a hypothesis; that is, if you spoke to somebody knowledgeable in the industry about a visit that you had had to Tom Price which included examination on the Hamersley screening, that the use of the term in that context would comprehend both wet and dry screening?---No.

You say that screening in the context of iron ore processing always bears the connotation of dry screening only?---No.

You say it simply depends on the context in which the word is used?---Correct.

Do you have your affidavit in front of your?---No.

Perhaps you could see it?---Thank you.

On p.2, para.1(c) - in the previous sentence you had been talking about visiting the actual process operations and in the last sentence of that paragraph you talk about visiting research centres concerned with crushing, screening and processing. Were those research centres concerned with research into both wet and dry screening?---There was a mixture; some wet, some dry and mixed.

So the word screening in that context comprehends both wet and dry screening?---Screening there I am using as a process and as such covers wet or dry.

You gave some evidence this morning about sieve bends. I apologise if much of this cross-examination may sound a bit like a quiz show but can you say if a sieve bend is a screen? ---A sieve bend is a dewatering device.

It is not correct to call it a screen then?---You have to define what you mean by screen.

Is it ever called a screen?---I would not call it a screen

WITNESS (Continuing): - - - a screen in that one of the processes that goes on on a sieve bend is the presentation of particles to an aperture. Then a sieve bend has as one of its process descriptions screening.

OLNEY J: It is a bit like a flywire door, is it not? A flywire door is a door?---Correct.

But it screens?---Yes, so what you describe it as then tends to be a matter of context and if, as I am being asked, "Would you call it a screen?" - - it is like a memory test that says "What is the first connotation that would come into your mind for a sieve bend?" and the answer would be "Dewatering - a dewatering device" and having made that answer then why would one ever first recall it as being anything else? The answer could only be there might be some context where, in a discussion of the screening function of that device, you would, as with your flywire door, refer to it as a door or a screen, depending on the context you were referring to.

MR HEEREY: In the context of discussing screens generally, vibrating screens - wet screens, dry screens, types of screens - is it correct to say that a sieve bend is a screen?---I have great difficulty with answering that, in that I have already answered it I feel. One of its functions is screening, as I have defined screening.

Would you call it a screen?---Only in very loose language, exceedingly loose.

You would be critical, would you, of anybody holding himself out as an expert in this area calling it a screen?---They would only do so in some particular context.

You feel that such a person would be guilty of loose or imprecise language in calling a sieve bend a screen?---Other people's language is not my area of expertise but my technical consideration is that it would be loose to call it a screen unless you had gone a long way into some particular context - for example, how particles present themselves to apertures.

Are you familiar with Mr Pryor's book "Mineral Processing"?---
---I claim no great familiarity with it.

You know of it, though, I take it?---That is about the limit of my knowledge.

I wonder if my learned friends could be prevailed upon to show you a copy? (I have a photocopy of chapter 9 of this work, your Honour. Perhaps the photocopy could be handed to your Honour?) Just put the book down, please doctor.

Chapter 9 of this work, commencing at p.179, is headed "Industrial sizing and sorting". If you go to p.192, which is still within that chapter, you will see the heading "Wet screening"?---Correct.

MR HEEREY: At p.193 one photo and one picture of some screening devices and if you turn to p.194 do you see a picture there in figure 82?---Yes.

What is that?---That is a sieve bend - - -

364. 11.48

WITNESS (Continuing): - - - sieve bend.

MR HEEREY: And above fig.82 in the paragraph, what does that read?---Do you wish me to read it out?

Yes, please. What does the description read?---It reads:

> "A stationary screen, the Dutch State Mines sieve bend, has gone into considerable industrial use in the past few years."

Would you agree that appears to be a description of a sieve bend as a screen?---Well, I cannot dispute that Pryor is describing the device as a screen. He is not necessarily saying that it is performing screening, although that is one of its functions.

Doctor Pryor or Professor Pryor is calling a sieve bend a screen, is he not? Are you prepared to concede that?---Yes.

Do you suggest that Pryor is guilty of loose language in that terminology?---Yes.

Very well.

TO HIS HONOUR: It might be a convenient step, although I do not want to deprive my learned friends of their volume, as there may be reference hereafter to other passages in that chapter and perhaps it could be either marked for identification or tendered as an exhibit.

OLNEY J: There is no reason why it should not be exhibited is there, Mr Hulme? You would not object to this copy of chapter 9 of Pryor being exhibited, would you?

MR HULME: No, sir.

EXHIBIT — EXHIBIT 17 .... Chapter 9 from Mineral Processing by Pryor

MR HEEREY: Doctor Batterham, are you familiar with a work by B.A. Wills, Mineral Processing Technology?---No.

Perhaps you might look at this volume? I may be wrong, but I think this is the work to which Dr Lynch referred. Having seen the volume there, do you recognise that volume?---No, I do not.

It is referred to in para.3 of Dr Lynch's affidavit.

TO HIS HONOUR: I will hand your Honour and my friends a photocopy of chapter 8 of that work.

Would you turn to chapter 8, please, doctor? That is headed - - -

MR HEEREY (Continuing): - - - is headed, Industrial Screening. Is that correct?---Correct.

Can you turn to p.195? Do you see there the heading, Screen Types? ---Correct.

It reads:

> "There are very many different types of industrial screens which may be classified as either stationary or moving screens."

Do you see that?---Correct.

You will see, under the sub-heading of Stationary Screens, the author deals with the grizzly?---Correct.

There is a grizzly at Tom Price, of course, is there not?---Correct.

You can see at the bottom of p.195 in italics the term sieve bends:

> "Static screens such as the Dutch State Mines, sieve bends....(reads)....wet screening purposes."

WITNESS: Yes, I see that.

MR HEEREY: Do you accept that in that context the author of this work is referring to sieve bends as a screen?---He is referring to them quite clearly.

He is not only doing that. He is cataloguing, as it were, different types of screenings?---One should perhaps look at his catalogue of de-watering devices as well.

Do you suggest that this author also is guilty of loose language? ---Yes, most certainly.

I tender that, if your Honour pleases.

OLNEY J: The author is Wills, is it?

MR HEEREY: Yes, I think so.

OLNEY J: What is the name of the publication?

MR HEEREY: It is Mineral Processing Technology, 2nd edition, by B.A. Wills.

EXHIBIT EXHIBIT 18 .... Copy of Chapter 8, extracted from Mineral Processing Technology, 2nd edition by B.A. Wills.

WITNESS: It describes well what I said earlier of the problems of sieve bends as screens, your Honour, on the next page.

MR HEEREY: While we are still in the land of screens, doctor, what about a mechanical classifier? Is that a screen? ---I had already answered that on Friday - only inasmuch as one of the processes occurring in a classifier can be defined as the separation of a mixture into respective sizes.

You say it is a screen?---Are you asking me, is the process of classification the same as the process of screening or can a device called a classifier be called a device called a screen?

I am not up to complicated questions like that, doctor. All I am asking you is, is a mechanical classifier a screen?---I cannot answer yes or no.

Is it essentially a screening device?---It is a classifying device.

Is it essentially a screening device?---Your Honour, I have made clear that I cannot answer that yes or no.

OLNEY J: Does the process you have described as screening take place within a classifier?---No.

MR HEEREY: So you would disagree then with the proposition that it is essentially a screening device?---The main process is different from screening? Is that the question again?

OLNEY J: You talked about screening as the presentation of particles to apertures?---Correct.

For the purpose of separation on the basis of size?---Correct.

That is how I am thinking about screening while you are giving evidence and, no doubt, counsel is thinking in the same terms. Perhaps you would answer his questions, if you can, with that in mind?---Is a classifier a screen? That is the question?

Yes.

MR HEEREY: That was my first question.

OLNEY J: And he said, no, I thought.

MR HEEREY: He said no.
TO WITNESS: I asked you - - -

LA29. 11.58

MR HEEREY (Continuing): - - - asked you "Is a classifier essentially a screening device"?---A classifier is a device for separating sizes; so is a screen.

OLNEY J: Yes, but does a classifier separate by the presentation of particles to apertures?---No.

MR HEEREY:
Do I take it from that then that you would not agree with the proposition that a classifier is essentially a screening device?---That a classifier is not essentially a screening device? Was I asked that as a positive or negative question?

You disagree with the proposition that a classifier is essentially a screening device? Say either "I agree" or "I disagree"?---I do not think a classifier, as a piece of equipment, is a screening piece of equipment.

OLNEY J: I think I understand that to be "disagree"?

MR HEEREY: You disagree with that?---As you are aware, I find the distinction a little hard. The process and what is happening I can answer readily.

It should not be too hard, should it, because to say of something "that it is a screening device" attracts one's attention to what it does - what function it performs? Do you agree or disagree that a classifier is essentially a screening device?---Do I agree that a classifier is essentially a screening device? If we define the screening device as a device in which particles are presented to apertures, then a classifier, which does involve presentation to apertures, would be a screening device. A classifier which did not involve primarily presentation of particles to apertures would not be a screening device.

What about a mechanical classifier?---A mechanical classifier of the rake or the screw variety would not, in my definitions, be a screening device.

Not essentially a screening device?---I have said it is not essentially a screening device. It is not presenting particles to apertures.

Would you concede that a different view on this point might reasonably be held by somebody expert in the field of mineral processing?---Yes.

I wonder if the witness could be shown exhibit CFB1, please?
TO WITNESS: That is an extract from a United Nations publication. I would take you straight to p.112 of that. That is a passage quoted from - - -

MR HEEREY (Continuing): - - - quoted from a work by Mr S.E. Erickson, an American. Have you heard of him?---No, I have not.

Have you heard of Mr Herkenhuff, L.C. Herkenhuff?---No.

You have not heard of Mr Herkenhuff?---I repeat myself.

You are not aware that the plaintiff in this case has filed an affidavit sworn by Mr Herkenhuff?---I do not recall seeing a Herkenhuff affidavit.

I did not ask you whether you had seen the affidavit, but whether you were aware that an affidavit sworn by a Mr Herkenhuff had been filed by the plaintiff, Hamersley Iron Pty Ltd, in these proceedings?---Your question again, please?

Are you aware whether an affidavit sworn by Mr Herkenhuff has been filed by Hamersley in these proceedings?---I am not aware of that fact.

You do not know that he has sworn an affidavit and you do not know who he is?---That is right.

You would say he is not exactly a household name in the world of iron ore processing?---I did not say that.

Well, you have never heard of him?---I do not see the logical connection.

You, I take it doctor, hold yourself out as being an expert in the field of mineral processing and especially iron ore processing?---In iron ore screening.

That is part of mineral processing and ore processing, is it not?---Many other iron ore processors not of relevance to this particular case - -

OLNEY J: The particular aspect of processing in which you are expert is the process of screening?--Correct.

MR HEEREY: In your field do not people discuss the legendary figures in their art - the great screeners of the past and that sort of thing?---Oh that we had time to; no, not really.

Anyway, any such discussions certainly never touched on Mr Herkenhuff?

OLNEY J: The ABC might do a documentary on him for you!

MR HEEREY: Yes; they are very good at script writing, your Honour. TO WITNESS: I will bring this to a conclusion. I put it to you that at the top of p.112 there is a passage in which a mechanical classifier is referred to as "essentially a screening device". Would you agree that

that appears there?---Just a moment - you are asking me does a passage appear in print there or do I agree with its content?

MR HEEREY: Firstly, does it appear in print?--This is the passage which reads:

> "The oversize ore rock goes to waste and the undersize is washed on a vibrating screen.....(reads)..... and the undersize goes to a mechanical classifier."

Is that the paragraph? 10

Yes. Read on?---Very well:

> "This classifier is essentially a screening device.....(reads)..... economical and efficient fine mesh screens have not yet been developed."

WITNESS (Continuing): Yes, I have the paragraph.

MR HEEREY: You still adhere to your statement, do you, that it is not correct to say that a classifier is essentially a screening device?---That is a good example of context. He is using screening to mean the description of the sorting of particles, I would suggest, rather than the presentation of particles to apertures.

OLNEY J: You think he is using the word screening differently defined from the way you have been using it?---Yes.

MR HEEREY:
Do you recall on Friday when you were giving evidence you were asked about a mechanical classifier?---Yes.

I am referring to p.473 to p.474, your Honour.
TO WITNESS: You were speaking of a mechanical classifier as opposed to other screening devices. I will read the transcript to refresh your memory. You said:

> "Our separation is therefore by size....(reads)....equally important by specific gravity."

Do you recall saying that?---Yes.

That was referring to what happens in a mechanical classifier?---Correct.

Then you go on to say:

> "If we come to screening, to finish that side off....(reads) ....more of liquid continuum with solids in it."

When you refer there to specific gravity as being an equally important part of the mechanical classifier, are you speaking of specific gravity in the sense of the law of physics, which means that something with a higher - is it higher or lower - specific gravity will float in a liquid?---The rate of sinking in a liquid of a solid is proportional to the difference in specific gravity between the solid and the liquid.

The liquid that is being used in a mechanical classifier is water, is it not?---Correct.

Most substances produced from mines - ore, clay and shale - will sink in water, will they not?---At different rates, yes.

By contrast with the process which occurs in the heavy media drum, where you have a liquid with a higher specific gravity than water, some of the substances will not sink at all,

will they? They will float?---All substances in a heavy media drum sink. It is the rate - differential rate of sinking - that is used, both in a classifier and a heavy media drum - - -

600. 12.13

WITNESS (Continuing): - - - heavy media drum.

MR HEEREY: How long will they take to sink in the heavy media drum?---I could conjecture figures if I were given sizes and specific gravities; you could also develop a formula for it. I would not attempt to do it.

You would dispute the proposition, I suppose, that in the mechanical classifier from a practical point of view the specific gravity of a substance plays any part in the separation process which is carried out?---Would you repeat that, please?

Would you dispute as a practical proposition the statement that in a mechanical classifier it is a process which is not, practically speaking, concerned with the operation of specific gravity?---Specific gravity does play a significant role in the operation of a mechanical classifier.

You say it is equally as important as the separation which takes place by size?---You cannot generalise. You must talk a specific range of ore particles and their range of specific gravities.

You were asked on Friday, when you produced the charts of your simulated tests (referring to pp.503 to 504) to identify one of the charts and you said:

> "This is the feed material to the washing and scrubbing plant..... (reads).....simulate it physically in a laboratory."

Why did you use the expression "washing and scrubbing plant"?---Because that is what we were attempting to simulate.

I beg your pardon?---We were attempting to simulate what goes on in the Hamersley washing and scrubbing plant.

Why did you not call it "the washing and screening plant"?---I could have equally well referred to it as a "washing, scrubbing and screening plant" and would have been precise in so doing. Any two of those conveys the intent of what that plant is concerned with.

You see, Hamersley themselves do not refer to this plant as the washing and scrubbing plant, do they?---Hamersley - - I could not comment authoritatively on that.

You have told his Honour you have visited the plant on a number of occasions. People do not say: "Well, Dr Batterham, would you like to go up to the washing and scrubbing plant before or after lunch", do they?---I do not recall that ever being said to me.

MR HEEREY: Whether or not you are aware of Mr Herkenhuff's affidavit, you are well aware of Mr Langridge's affidavit, I suggest, are you?---Yes.

You have read it?---Yes. I would not like to be tested on its verbatim content.

Would you accept this from me: In that affidavit from Mr Langridge the word "scrubbing" is not used?---I will accept that from you.

And to the best of my recollection he did not use that word in his evidence in this court?---You have said so.

You would credit Mr Langridge with some involvement in the design of this plant, would you not?---In the design of the plant, yes, Mr Langridge was involved.

And with its day-to-day operation?---Correct.

Does it not strike you as strange that he does not refer to it as the washing and scrubbing plant - - -

C85. 12.18

MR HEEREY (Continuing): - - - scrubbing plant?---I have already said that you can describe it by any two, of washing, scrubbing and screening.

The term washing and scrubbing plant does not appear on any of the signs up at Tom Price?---I do not recall any signs at Tom Price on plants, your Honour.

Or on the lookout for visitors?---I have never been to the visitors' lookout.

Have you been to the control room?---Yes.

The term washing and scrubbing plant does not appear in the control room?---I would not recall seeing washing and scrubbing in the control room.

Doctor, when you spoke of the feed material to the washing and scrubbing plant, were you using those terms to describe it because you thought that appellation might be helpful to Hamersley's case?---No.

That had nothing to do with it?---I used those terms to describe it because that does describe some of its demonstrable primary functions.

In the chute-- I do not want to trap you into a concession; I appreciate it is sometimes called the pulping box and sometimes called a chute but you know the device of which I am speaking?---Yes.

The evidence has been that the ore is free-falling down that chute, the material going into it, the ore and everything else?---People have loosely described it as free-falling.

As we have only had Hamersley witnesses to date, presumably that looseness comes from that side. There has been evidence that the time the ore would take to fall from the time it is first wet by the sprays at the side of the chute is approximately a quarter of a second. Are you aware of that evidence?---I did not hear the original evidence given, your Honour. The evidence that Iheard discussed was that the time of passage of the ore dropping through the box and onto the screen was of order a quarter of a second. I am aware of that evidence.

I think there may be a bit of confusion here and I may well be wrong about this but my understanding was that from the top of the box to the bottom it took approximately half a second and from the time the material was first wet it would be something like a quarter of a second. Does that accord with your understanding, or perhaps I am mistaken?---It depends what we are defining as being the end of the little wetting process that is being discussed;

whether it is the impact of the ore on the bottom plate which is not a free-fall or some other definition.

MR HEEREY: I am talking about the time that the ore goes into the top until it hits the bottom of the - -?---The bottom of - -?

The chute box?---Are you implying that all of the ore hits the bottom of the chute box?

No, I am not?---So how can we define the time of passage of the ore which does not hit the bottom of the chute box? 10

It would go even quicker, would it not?---I doubt it.

The devices that spray the water on are what are called fantail or fishtail sprays, are they not - - -

MR HEEREY (Continuing): - - - they not?---I was not aware of that nomenclature. I will accept it.

That does not surprise you - if that term was used?---No.

The effect of those sprays is to disperse the water in a horizontal plane, is it not?---It is to provide a curtain of water, yes.

Which is horizontal?---It is not horizontal to the best of my recollection. It is not far off horizontal.

I take your point. Would the depth of that curtain be of the order of one or two inches?---No.

What do you say it is?---It depends on the distance we are from the spray.

I appreciate your point, that with any spray it will increase as the distance increases from the orifice from which it comes, but at the point where it strikes the ore what would be the depth of it?---It is of the order of a few inches.

After the ore has dropped through that space of - - did you say "a few" or "two"?---A few.

- - a few inches it then ceases to become subject to the spray? ---No, not at all.

I appreciate there is obviously a great deal of water around but the direct force of the spray is limited to that space of what you have described as a few inches, is it not?---The momentum transfer between water and ore is limited to the immediate zone of contact of the spray and the ore, but the water contact with the ore goes on.

Yes, because the water is falling down and it is all mixing up and wetting the ore?---Correct.

At the stage the ore goes through the wet screens which separate it into the four streams of ore, there is nothing removed from those streams. Is that correct - nothing removed to waste?---Within the wet-screening device, where the washing and screening occur, there are several streams that flow from it. Apart from trivial splash losses, there has not been any stream to waste at that part of the process.

You accept, I take it, that whatever happens at the stage that the ore is being wet-screened, a sizing process takes place - - -

L174. 12.27

MR HEEREY (Continuing): - - - takes place?---There is a size separation of the ore.

Do I understand your evidence correctly in saying that that is a less important process than the other processes which take place?---You were referring to the wet screen, I take it, and asking is the separation into size the most important part - is that the question?

Or of lesser importance than some other process?---I think the washing and screening processes are both important in that area of the plant.

I have no further questions.

RE-EXAMINED BY MR HULME QC:

MR HULME: Dr Batterham, if you direct a stream of ore in the top of that pulping box and let it fall and be hit by water jets going horizontally, is it correct to describe each piece of ore as "free-falling"?---No.

Are there any effects which develop as some pieces of ore hit the bottom of the chute?---The ore falls in a hindered manner as a collection of particles which interact and which tumble over each other whenever they have an external force imposed on them; for example the curtain of water through which they fall, the high impact curtain, and then, secondly, the plate at the bottom of the chute will cause a significant packing together and tumbling over of the ore.

You were asked whether you were saying that screening was less important than other things, and I think you replied that you regarded both the washing and the screening as important - -

MR HEEREY: Sir, I think I used the expression "sizing".

MR HULME: Your Honour, we both have the reply as being "the washing and screening are both important".

MR HEEREY: I think the witness may well have said that but I think the question was asked in terms of sizing.

MR HULME: I think the transcript will show that that question was asked in terms of "other processes taking place". The question was: "Are you saying - -".

MR HULME (Continuing): Can you tell us which would be the more correct of these two propositions, one proposition being that you are screening what you have just washed, the other proposition being that you have washed in order to improve the screening?---To comment, in one case,in the context of the Hamersley situation, you are washing to improve the screening - - I am sorry - the second proposition?

The other proposition being that you have washed the feed and now you are going to screen it?---Certainly the second; I commented on Friday that you would not add water for screening at those sizes in the normal course of events.

WITNESS WITHDREW

DESMOND EVERED WRIGHT, sworn:

EXAMINED BY MR HULME QC:

MR HULME:Is your full name Desmond Evered Wright?---It is.

You live at 26 Collier Street, Applecross in the State of Western Australia?---That is my postal address.

You are a mining engineer?---That is correct.

You have sworn an affidavit in these proceedings?---I have.

Could Mr Wright be given his affidavit, please?
TO WITNESS: Would you look at the affidavit and satisfy yourself as to your signature? Is that the affidavit you have sworn?---That is the affidavit I swore and that is my signature.

I tender that affidavit?

EXHIBIT EXHIBIT 19 ..... Witness's affidavit dated.30.5.83

MR HULME: Just looking at your experience, you are English-born, I take it, and certainly English-trained?---I was.

From 1947 to 1950 you were section foreman at a copper, lead and zinc mine in Peru?---That is correct.

From 1951 to 1954 - -

MR SHER: Your Honour, do we really have to go through what is in the affidavit again? It would be helpful if we could get on with it and it is in the affidavit. It has been attested to.

OLNEY J: I do not wish to inhibit the examination - - -

C62. 12.38

OLNEY J. (Continuing): - - - the examination. I take it, Mr Hulme, your intention is simply to give us a quick thumbnail sketch of the witness's experience?---Very thumbnail, and in particular in (c) I just want him to identify Bethlehem, Chile, and ask him whether he became familiar with an American terminology at that point. The question would have been asked by now if it had not been for the objection.
TO WITNESS: In 1951 to 1954 you were a mining engineer with Bethlehem iron ore mine in Chile?---I was.

Is that Bethlehem Chile associated with the American Bethlehem Steel Company?---A subsidiary of Bethlehem Steel.

At that time did you work in conjunction with American mining engineers?---I did.

From 1962 to 1963 you were Manager, Development, with Mt Goldsworthy? ---Yes.

From 1964 to 1980 you were with the Mt Newman Joint Venture? ---That is correct.

Being from 1966 to 1968 chief mining engineer, and then from 1968 onwards the manager of development. You retired from there in 1980?---Yes.

In your 30 years in the iron ore industry you have visited mines in Canada, the United States and South Africa as well as South America and Australia?---I have.

You will be given a copy of Mr Lynch's affidavit, exhibit 9. In your affidavit you have sworn that you agree with the views expressed by Mr Lynch in his paras.9 and 10 where he refers to the reasons which he gives earlier, and ;these go back into the earlier paragraphs?---That is correct.

You will see in para.6, towards the bottom of p.4, Dr Lynch has described the breaking down of the water clayey material and the separation of the small particles adhering to other particles. Do you see that section?---I see it, yes.

"They being effects of the addition of water" - in your terminology how do you describe those effects?---I would normally talk about washing, although I admit there is a small scrubbing effect; to me it is washing.

You have been concerned with each of the three mines in the Pilbara. Have you known water to be added to dry Pilbara ore simply for the purpose of facilitating the screening of that ore?---I have not.

What do you say as to that Pilbara ore for the purposes of dry screening - - -

MR HULME (Continuing): - - - dry screening?---Could you repeat that, please?

MR HULME: What do you say as to the Pilbara ore from the point of view of dry screening? Is it easy to screen, hard to screen?---Pilbara ore in general, as set up originally, is of such a high grade that there is no point in doing other than dry screening. Once you add water, I think I mentioned in my affidavit, it is a difficult, complicated and expensive operation. Once you add water, you have to take the water out. Hamersley, for example, when they first put in the beneficiation plant, took the whims concentrate at 20 per cent and tried to handle it, but it gummed up all the chutes in the stockpile. That is when they had to put in pan filters. Once you put water in, you either have to get rid of it or distribute it among other ores or you have to pay the freight, the handling, the shipping and use energy in the furnace to get rid of it. You never put water in, therefore, unless you have to.

Have you ever heard anyone even suggest that water should be added to Pilbara ore simply for the purpose of screening?---No.

Do you know of anywhere in the Pilbara where water is added to ore in any circumstances other than that the ore is going to go into a beneficiation process involving water?---No.

In para.8 Dr Lynch says:

> "At Tom Price the scrubbing effected by the water is a step essential to the preparation of the ore for the drums, cyclones and whims."

Do you see that passage?---Yes.

He says:

> "It is crucial from a metallurgical point of view....(reads)....It must be clean enough not to interfere with the specific gravity."

Do you have any comment on those statements?---Merely that I agree completely because if you present lumps to the heavy media drums, with particles of ore and waste adhering, you immediately destroy the gravity of the medium and the process becomes nonsense. It does not work any longer. You have to keep the gravity of the medium exactly correct, so the particles must be completely clean before they go into the drum.

We have been told that as far as the material goes out one is concerned not only with the desirable presence of iron by the undesirable presence of contaminants? ---Yes.

MR HULME: From the point of view of selling, one is concerned with, we have been told, matters - in particular alumina and silica?---Very much so, particularly alumina.

As between the iron ore and the clay and the shale, where does one find the alumina chiefly?---Alumina occurs in both clay and shale. Normally, it is present in the form of aluminum silicates, so there is both silica and alumina present.

Then in para.9 Dr Lynch says that for the reasons he has given the place, in his opinion, at which beneficiation, other than crushing and screening, begins is where the feed is first wet in the washing and screening house?---And I agree with that statement.

Do you have any further comment as to that proposition?---I believe that the beneficiation process starts when you add water but I believe that the beneficiation plant includes a lot more than just the feed pulp box on. In other words,the whole plant was built for the purpose of beneficiating the ore, so the whole plant includes right back to the grizzly at the primary crusher - - -

WITNESS (Continuing): - - - the primary crusher.

MR HULME: In relation to that, I would show you this document. Is that document a document called "Mt Newman Mining Beneficiation Plant" put out by Mt Newman as a brief picture of a layman's or public publication as to the beneficiation plant?---Yes. I believe it was first put out for the opening ceremony at the plant, and I believe it is still being issued; I am not sure, though.

Your Honour, I will tender this and one other.

MR SHER: I object to this document, your Honour. It is not a public document. The witness can give evidence as to what he thinks. If this is some way of trying to get in additional evidence, in my submission it is hearsay.

MR HULME: It is a lot more than that, your Honour.

OLNEY J: I was just wondering about the relevance of it initially. It has not been shown to be relevant yet. Maybe the witness's evidence will show it to be relevant.

MR HULME: In two ways, your Honour. We will be saying there is certain terminology in the iron ore industry which was there in 1962, it is still there now - but we have to prove the 1962. There are various years since then where we will show the use of the kind of terminology, the use of the same distinction which we say underlies the interpretation of this document, the distinction between the high grade ore, the direct shipping ore, the crushing and screening to do with that on the one hand, and the lower grade ores or less high grade ores which require beneficiation on the other hand. That is a constant theme throughout the legislation concerning the Pilbara and the documents showing the usage within the industry. This is not a distinction which we have invented for the purposes of these proceedings; it is a distinction which has been there since the inception of the Pilbara and the terminology used is, in our opinion, relevant to that end.

OLNEY J: I understand what the issues are and I understand the way in which the parties are presenting evidence to assist me in resolving the issues. I do not understand at this stage why this document is admissible. It may be that this witness can tell me something about it which provides some aid to your case, but at the moment I am presented with a document which is called "Mt Newman Mining Company Beneficiation Plant"; I do not know what is in it. I think this witness ought to say from his own knowledge - - -

OLNEY J. (Continuing): - - - own knowledge what it is the document demonstrates and whether what it says is true or false from his own knowledge. At that stage it may well be admissible, but at this stage I do not think there is any status for it.

MR HULME: Perhaps at the present time I could tender it for identification?

OLNEY J: It is marked for identification

MFI — MFI 20 .... Document put out by Mt Newman Mining Co.

MR HULME: Mr Wright, I would next ask you to identify this booklet called "Mt Newman Operations Guide". Could you tell his Honour what that publication is?---It is a publication of general facts and figures concerning the Mt Newman project which is used for passing out as a guide to visitors.

And that, in various editions, has been used for what purpose? ---It is also used sometimes by the Public Relations Department in handing out for educational purposes, to students.

In what kind of numbers?---Oh, tens of thousands.

MFI — MFI 21 .... Document "Mt Newman Operations Guide"

MR HULME: You have seen the Hamersley beneficiation plant, Mr Wright, have you?---Yes. I went there in March 1983 of this year.

If you look on the board there you will see a chart. Would you just take a moment or so and look at that? If you were asked at what point ore entered the beneficiation plant where would you say it enters the beneficiation plant? ---Up here.

OLNEY J: Perhaps you could describe that for the record?---The grizzly at No.2 primary where the minus 200mm material is separated off to be beneficiated.

MR HULME: Can you show us the point at which you would say material was leaving the beneficiation plant?---It leaves the beneficiation plant when it goes to stockpile.

The whole complex of machines, belts, etc., in-between those two points - how would you describe that?---I would regard that as the beneficiation plant,and that would include all the ancillary buildings which were put up as part of that project.

(Could the witness please have exhibit 12, Mr Pritchard's affidavit?)

OLNEY J: As you are starting on a new line perhaps we could adjourn at this point, Mr Hulme, until 2.15?

MR HULME: Yes, sir.

LUNCHEON ADJOURNMENT

C8A. 2.15

UPON RESUMPTION:

MR HULME: Could the witness please have exhibit 12, Mr Pritchard's affidavit? (TO WITNESS): Would you turn over to p.6 of that where Mr Pritchard is making comments which your affidavit endorses, as to Mr Grosvenor? At the top of that page you will see a comment that if water is added in the pulping box it achieves the same effect in principle as if the feed were passed through a scrubber. The difference is one of degree and the choice depends on the type of ore involved. Do you see that comment?---I am sorry, no.

At p.6(a), a note on para.10 and it is sentence 2. Do you see that passage?---Yes.

Would you wish to add anything to the way it is expressed there?---No.

Could I get you to go on to p.7, underlining sentences 6 to 7?---Yes.

Have you read that passage?---I have.

I wonder could you just expand that, connect it with what you were saying before lunch as to what you are calling "washing" but these people are calling "scrubbing"? ---The purpose of wetting the ore is to clean the particles, to present them absolutely spotlessly clean to the heavy media drums. If you dry screen lumps of ore or waste, small particles adhere to the lumps, unless you have a screen of impractical length, in which case you are generating more fines as you go down the length. Normally, the screen has to be a finite length and in the passage over that many fine particles do not free themselves from the lumps. In this reference they talk also (Mr Pritchard talks) about contaminants. The contaminating shales in this mixed ore and waste we are feeding to the plant under the term "low-grade" ore, are normally fairly free. They are not normally bonded together very tightly and so a slight washing effect cleans the shale off the ore and also cleans the small particles off the large particles.

Once you have the small particles freed from the lumps of ore and waste, the water washes it through the screen.

Could I ask you to go towards the bottom of p.8 where you say that water is an expensive and complicating component? You mentioned before lunch, I think, certain difficulties following the use of water. Is there anything to add to that?---Only that I did not mention the expense of obtaining water in the Pilbara - - -

WITNESS (Continuing): - - - in the Pilbara. That is minor in the overall picture, but it is a real expense. The major expense in the overall picture is building the plant, operating the plant, handling the wet material afterwards or de-watering before you handle.

MR HULME: Throughout your time in the Pilbara has any distinction been drawn between different classes of ore according to suitability for shipment?---Yes, indeed.

Can you tell his Honour what that distinction has been?---There are ores in the Pilbara known as (generally up there they are spoken of as) high grade ores, but I prefer to call them direct shipping ores which are crushed and dry screened for shipment direct to the furnaces for the lumpy product to be fed direct into the furnace and the fines product to be sintered. These so-called direct shipping ores include all the high grade hematite ores such as Tom Price, Newman, Goldsworthy and some of the minor ones such as Paraburdoo and the very small ones such as Western Mining's Kooloonooka deposit. There are also vast quantities of ores in the Pilbara which could only be shipped after being processed and there are borderline cases like Cliffs hydrated ores which can be crushed and direct-shipped for use in producing sinter for the furnace, and there are very borderline cases like Newman's Marra Mamba ore which can be blended in in a small quantity with fines from Tom Price or Whaleback-type ores. The vast majority of ores up there are lower grade and would have to be processed in some way, either by grinding and pelletising or by some form of beneficiation before they can be shipped, so you have approximately, perhaps, 3 billion tonnes of direct shipping ores and you have perhaps (I am guessing) 15 billion tonnes of other ores.

The definition, as it were, of high grade ores being - -?---Ores which can be sold on the market at any particular time for direct shipping. Thirty years ago an acceptable ore was minus 100mm run-of-mine at 61-odd per cent. In certain parts of the world, like in the North American continent right up until the second world war and even after the second world war they were mining direct shipping ores of only 56/57 per cent. In Europe they were mining direct shipping ores as low as 37 per cent, in France and Britain, but of course the resulting lack of efficiency of the furnace is terrible. You are producing a huge volume of slag and very little pig iron, so you are just wasting the capacity of the furnace and you are putting an enormous amount of fuel in. In the late 30s, therefore, a move was made in the States - - -

WITNESS (Continuing): - - - the States to get higher-grade ores to replace these direct-shipping ores, which from domestic production were gradually deteriorating in quality. They started mines mainly in South America, initially, which mainly did not come on stream until after the Second World War. They started just before the Second World War. They came on stream in force after the Second World War.

At the same time other ores were being discovered, like the Australian ores, the Brazilian ores, the Canadian ores - the Canadian rather ahead of the Australian and Brazilian and rather poorer in quality. These produced a secondary revolution in direct-shipping ores because grades were forced up and up as these higher-grade ores were mined in different parts of the world.

This, in turn, forced the domestic producers in Norther Europe and the States to turn more and more to imported ores or home-produced, beneficiated ores, washed ores, and they turned, as we all know, to taconites, where they had to grind extremely low-grade, extremely hard, rock and concentrate the magnetic component and make pellets.

Direct-shipping ore: That is why I said it is high-grade ore which is saleable as a direct furnace feed on the market at the time of making the contract.

MR HULME: What will be done to that ore before it is shipped? ---It is crushed and dry-screened only.

In relation to Pilbara ores, if you had been told at any time "This ore can be sold after being crushed and screened" what kind of screening would you understand would be referred to?---I would naturally assume dry-screening because that is the only screening applied to DSO or direct-shipping orders in my experience.

OLNEY J: Can I just ask you about one thing? You were talking about the grade, I think, of ore;even as low as 35 per cent was being fed into furnaces in the 1930s or up to the 1930s?---Yes.

You started saying something about a change which took place, which did not really come to fulfilment until after the Second World War, and I assume you were talking about the need to supply ore of a higher grade for furnaces?---Yes. I made the statement actually that ore as low as 38 per cent FE was in use up until after the Second World War. It was the appalling inefficiencies of blast furnace practice, spurred on by various other factors such as the coming in of the Japanese steel industry with its ultimate enormous efficiency, spurred on by the development of big equipment, that made possible the mining of distant high-grade ores at a low price.

OLNEY J: What I am really interested in is this: Did the acceptable grade, that is the iron content or the Fe content - - -

OLNEY J. (Continuing): - - - or the Fe content tend to rise? ---It did indeed, sir. As soon as high grade iron ores were coming in everyone could see that the furnaces using them were at an enormous advantage.

So that direct shipping ore would be regarded as high grade if it had a certain Fe content?---Yes.

What was that in 1962?---In 1962 they were just starting to make the contracts for the Australian ores and the buyers were naturally forcing every bit they could get out of the sellers. The exploration work had been started on most of the ore bodies at that stage - sorry, had been started on some of the ore bodies at that stage, and the Japanese knew what kind of grades they were looking at, so they made contracts which talked about 64 per cent Fe in the lumps. As time has gone by they have put more pressure on the sellers to try and change some of these base contracts by side letters. They cannot change the base contract by saying: "Let's scrap it and start again", because it runs for 15 or 20 years, so instead of that they say: "Look, you want us to buy more so please write some side letters saying that you will attempt not to ship below, maybe, 65 per cent Fe", or "You will attempt to ship a certain grade of alumina not above 3 per cent whereas your contract says 3.2 per cent in fines".

You said a moment ago about a percentage of ore in the lumps? ---Percentage of Fe.

Yes. Given that there is, let us say, a railway wagon full of ore, that is dirt which has come out of the ground and been through a crusher and no doubt screened over a grizzly and possibly something else into a railway wagon, some of it is lumps of ore and some of it is rubbish, I suppose?---No. The rubbish stays at the minesite.

Very well - so that what comes out then is actual iron ore? ---What comes out is actual iron ore.

So that when you grade that you determine the Fe content of a sample of what is in that railway wagon in the example?---Yes, that is perfectly true. I would like to qualify a little: Of course you could have a beneficiation plant down at the port, in which case you would be shipping material which was not high grade ore in your train from the mine to the port. In the case of both Tom Price and Newman the ore is shipped as high grade ore from the mine to the port, because the beneficiation plants are at the mine and the waste is thrown away at the mine.

Yes. What I am trying to grapple with is the distinction between upgrading and beneficiation?---If, your Honour, you are

talking upgrading in terms of mining practice, picking out high grade areas, or you are talking upgrading in terms of minimal upgrading possible by blowing out ultra fines, dry, or you are talking wet beneficiation, you are really talking entirely different processes.

OLNEY J: I will tell you what I am talking about; I am talking about iron ore upgraded before shipment by crushing and/or screening. How does that group of words relate to what happens at Tom Price?---I can only give an opinion. In my opinion this is written years ago and it compares to what just happened a few years prior to that. In the late 1950s many mines were still shipping crushed run-of-mine ore at minus 4 inches, so automatically by crushing down to 1¼ inches and screening into a lumpy product of 1¼ by one quarter and a fine product of minus one quarter you are improving the quality of the ore - - -

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WITNESS (Continuing): - - - the ore, the attractiveness of the ore to the steel mill. The steel mill, if it is going to load its minus 4 inch run of mine into the furnace, is going to choke the furnace to a degree. The fines are going to do that. If it is going to load its 1¼ by ¼ into the furnace, it will almost undoubtedly usually screen it off first and then all the fines will go into the minus ¼ fines coming from the mine and will be sintered into lumps of clinker-like sinter, that go into the furnace and allow the gases to flow up through the furnace and allow greater productivity.

OLNEY J: I am sorry, Mr Sher, to interpolate that but there was something I thought this witness might be able to help me with, and he has.

CROSS-EXAMINED BY MR SHER QC:

MR SHER: You swore your affidavit on 30th May of this year and in it you say you have read the affidavits of a number of people, including the three persons with whom you expressly express some agreement in your affidavit, namely Mr Pritchard and Drs Lynch and Batterham?---I did.

I take it you were available to swear an affidavit before 30th May of this year, had one been required of you?---I was available before 30th May, yes. I did not visit Tom Price beneficiation plant until March, so practically speaking April would have been the first available time.

Your view is that you do not feel you should have been swearing an affidavit until you had actually visited the plant?---I naturally expressed an opinion before I visited the plant and I would certainly not swear an affidavit until I had visited it.

There are some things which do not really require any visit to the plant at all to say something about, that you refer to in your affidavit by adoption of others - as, for example, the use of terminology. That does not require any visit to the plant, does it?---I would think yes.

Even to say what words mean and what practices had been would require some visit to the plant, would it?---What practices had been within my experience, certainly not.

I beg your pardon?---No, not within my experience.

I am not asking you who approached you or what they said, but when was it that you were first approached on behalf of the plaintiffs to involve yourself in any way with

this litigation?---I cannot remember but I would think approximately January.

MR SHER: Of this year?---Of 1983.

Is it the fact that since January of this year you have been generally available to confer with and give the benefit of your experience to the plaintiff or its advisers?---Yes.

So the decision to await the visit to the plant in March, before swearing an affidavit, was a deliberate decision, was it?---I think it would have been a deliberate decision on my part, yes.

And for the reasons you have explained?---Yes. I do not know what CRA thought.

No, but having visited the plant you then could have sworn an affidavit, could you not?---Yes.

I suppose you were prepared to do so if you had been asked? ---Yes.

Can we take it then that you were asked not to swear an affidavit or, putting it in another way, you were not asked to swear an affidavit until the views of Dr Lynch, Mr Pritchard and Dr Batterham had been made known? Is that what happened?--- That is correct.

Then the course you followed in your affidavit, rather than expressing in your own words your own views, was to refer to and adopt what these other people had said in their affidavits?---That is correct.

As to those affidavits, I take it you read them carefully? ---I read them as carefully as I could.

To add your oath, which is your private contribution as it were, to theirs requires a commitment on your part, does it not, independently of anything they have said - - -

MR SHER (Continuing): - - - they have said? It is your oath which is being given?---It certainly does.

When you read these affidavits of the three people to whom I have referred, did you regard them as containing any inconsistencies?---Slight inconsistencies in terminology which we have already mentioned.

Anything other than that?---I don't think inconsistencies other than slight differences of opinion which you get throughout the technical world all the time.

So the worst you would put is that, having read them with a view to seeing the extent to which you could add your oath to theirs, you found some slight inconsistencies of terminology and that is all?---Within my experience I would say that, yes.

Well, what does the qualification "within my experience" mean? ---It means that Dr Lynch is an expert in a mineral research centre who has wide experience of all kinds of minerals; it means that Mr Pritchard has wide experience in all kinds of screening operations at many different mines; it means that Dr Batterham has great experience in various types of operations including particularly comminution and screening, and it means that my experience for 30 years has been continually iron ore and iron ore operations only.

But to what extent does your experience either help or hinder you in detecting inconsistencies in the testimony of other people, whatever their experience may be? ---Because we are all talking about a common subject, the subject of iron ore.

I take it you looked at these affidavits with a view to seeing whether you could support them?---Naturally.

Are you saying that with that in mind you found nothing more than some mild inconsistencies of terminology?---As far as my experience showed me, yes.

Do those comments relate only to the paragraphs with which you have specifically said you agree, or is that true of the whole of the affidavits? Do you understand that question? I may not have made it clear?---I would like you to expand, please.

You say in your affidavit that you agree with the opinions expressed by Dr Lynch in paras.9 and 10 and the reasons he gives for them, and you say you also agree with paras.5, 6, 7 and 8 of Mr Pritchard's, and 5, 8 and 9 of Dr Batterham's. Does that mean that you do not agree with the other paragraphs?---No, it does not mean that.

MR SHER: Did you find any errors or inconsistencies in the other paragraphs of their affidavits other than those mentioned?---No.

You did not. Can we take it, then, that you generally accept the accuracy and correctness of what is said in the whole of these affidavits by these three people?---No, you cannot accept that.

We cannot say that - I see. Did you find anything in their affidavits that you thought was wrong?---No, I would not say that, either.

What - nothing at all?---Wrong - no.

Incorrect, to your knowledge?---No.

Let me, for example, direct your attention to one specific matter. One of those deponents says that sieve bends were not called screens; remember that?---In my experience sieve bends have always been called sieve bends.

The point is not what they are positively called but what they are not called. The dependent to whom I am referring at this particular point of time, which is Mr Pritchard in para.6 of his affidavit, says they are not called screens: "They were not called screens" is what he said. Do you recall reading that in his affidavit?---I am sorry, I do not understand - because they were not called screens; they are called sieve bends.

I understand you to say that. You say you agree with paras.5, 6, 7 and 8 of Mr Pritchard's affidavit. In para.6 he says, speaking of sieve bends: "They were not called screens". Do you agree with that?---Yes.

And do you say that in the iron ore industry - - -

MR SHER (Continuing): - - - iron ore industry sieve bends are not called screens?---I can only say that in my experience sieve bends are called sieve bends. My experience with sieve bends is extremely limited - limited to Mt Newman Mining and Tom Price.

With that limitation, do you really regard yourself in any position to say what sieve bends are called in the iron ore industry?---If the inventor and the producer and the seller of a sieve then calls it a sieve bend, I would think his word is pretty strong.

I did not ask you that, did I? I asked you whether you felt, because of your limited experience, able to say what sieve bends were not called? Do you really feel you are in any position to say that or not?---Yes.

You do?---Yes.

Then I ask you again, is Mr Pritchard's statement, which you have endorsed, that sieve bends were not called screens, correct?---That is correct.

If I showed you textbooks in which they are called screens, will that shake you in your opinion as to what they are called?---No.

MR HULME: Mr Pritchard's statement there is expressed as at 1962. Any 1962 textbook you can have but you broke from "were" to "are".

MR SHER (TO WITNESS): Did you hear what Mr Hulme said then? ---I did.

Is that the distinction you were making?---It was not.

You say they are not called sieve bends now, do you not?---I do. I beg your pardon. I say they are not called screens.

Yes, and you say that as of this date?---I say that and may I qualify, your Honour, because hundreds of people I know at Newman and Tom Price call them sieve bends; hundreds of people.

To take Mr Hulme's point, Mr Hulme thought perhaps I was misleading you by transposing what Mr Pritchard has said in 1962 to the present time. I just wish to get clear whether I was misleading you. Your evidence about what sieve bends are not called relates to the present time as much as 1962, does it not?---I do not know if they even existed in 1962.

Then can we take it that when you say in agreement with Mr Pritchard that sieve bends are not called screens, you are speaking as at the present time?---Yes, again with a qualification that I have seen sieve bends in the late 1960s - not in the early 1960s but in the late 1960s - in South Africa.

Yes, but when you say (I just wish to get this clear) that sieve bends are not called screens, agreeing with Mr Pritchard, you mean they have never been called screens from the time they were invented to the present time?---No.

MR SHER: You do not mean that?---No.

What does "No" mean?---What I do mean is that sieve bends have been called sieve bends by everyone I have ever met.

I ask you again, if I showed you two textbooks from people referred to by witnesses called by Hamersley, who regarded them obviously as having some weight, in which they are clearly referred to as screens, would that shake you in your expression of opinion as to what they are called?---No.

It would make no difference?---No.

But what it would demonstrate to you is that you might be wrong? ---Yes, with a qualification that terminology can differ from area to area, from authority to authority, and there are disagreements between technical people on some terminologies.

The texts that I have in mind you may or may not have heard of. One is Mr Pryor, whose textbook is called "Mineral Processing". It is the third edition. It is that book there behind my learned friends, on the table. Do you see it there?---Yes.

You have heard of it?---I believe the professor was a professor at my old school.

So a man of what - some eminence?---A man distinctly of some eminence.

The other Englishman - - -

MR SHER (Continuing): - - - Englishman?---I never met him. I would think so.

The other text was by a gentleman named Wills who comes from the Camborne School of Mines, Cornwall, England. He published a book called "Mineral Processing Technology", and the relevant passages from both those textbooks have been put in evidence today. Would you accept from me (and be sure Mr Hulme will interrupt me if I am wrong) that both those authors refer to sieve bends as "screens" and describe what they do as screening? ---I would accept that from you, yes.

All that suggests, does it not, that you are either wrong or, alternatively, that people do call sieve bends "screens" but you just have not heard them. They are the possibilities, are they not?---It certainly tells me that some people call sieve bends screens.

Right. It is not as though it is some 19 year old unskilled labourer on his first job in the Pilbara about whom we are talking, who calls sieve bends screens; it is two well-educated experts in the field about whom I am talking. It would suggest that both you and Mr Pritchard are wrong when you say they are not called screens, would it not?---I disagree.

You disagree - well, it certainly does not show that you are correct, does it?---I also disagree.

Let me ask you about something else to which these three people attest. They say, each one of them, and I assume you agree, that in 1962 (and I will get the precise wording from one of the affidavits) - - I will read to you from Dr Lynch's affidavit, reading from the last sentence of para.7:

> "I am not aware of any iron ore processing plant in Australia or overseas.....(reads).....without some further process in view."

Dr Batterham said in para.4:

> "I have no direct knowledge of the industry before 1973..." (and then says, notwithstanding that) ..."Like them I am not aware of any iron ore processing plant .....(reads).....without some further process in view."

I think it would be fair to say Mr Pritchard said much the same thing. Do you agree with those statements? ---Yes.

MR SHER: Let me take up one aspect of that with you for the moment: If that is the fact - if you are right, all of you - that means that somebody talking about wet screening as part of a process back in 1962 must have assumed that that wet screening would be part of a process which had some further step to be taken in it. Would you agree with that?---Yes. I beg your pardon, I don't agree.

Just a moment: We have the proposition that in 1962 you did not wet screen without some further process in view - alright? That is the proposition. Do you understand that to be the proposition - - -

MR SHER (Continuing): - - - proposition?---I understand wet screening to mean washing and screening, so there is some further process involved already.

I do not want to sort of trick you into agreeing that wet screening does not involve washing. Let us assume that for the purpose of the argument as well, Mr Wright. I am not asking you to make any implied concession by the use of terminology here; if you have any fears about that please say so?---Right.

Wet screening would always be carried on you say, based on experience, in 1962 and now as part of a larger process - a longer process, some further process in view?---That is correct.

So that you would agree, would you not, if anybody was talking back in 1962 of screening including wet screening they must have had in mind screening, which was wet screening, with some further process in view?---That is correct.

Because that was the common experience?---Correct.

And the only experience?---Yes.

Any such screening with a further process in view, firstly, would almost inevitably have been wet screening, would it not?--Almost always.

Certainly you would agree that the word "screening" in that context must in many instances have included wet screening?---I said earlier, you only add water when you absolutely have to.

But if we are talking of screening which has further processes in view, it would have to be, in many instances if not most, wet screening, would it not?---If you were talking screening with further processes in view and it was wet, you would say "wet screening", you would not say "screening".

Well, I want to come to that too - but can we just deal with this for a moment: Let us assume you were talking in 1962 of beneficiation, of which screening and crushing or screening or crushing were only part. Do you say that in that context, where you have crushing and/or screening as part of beneficiation, you must have other processes in view?--Yes.

And the other processes in view back in 1962 would have included heavy media separation?---Yes.

Which is a wet process?---Yes.

So if the further process you had in view of the beneficiation at that point of time was heavy media processing, firstly

you would have to be talking of wet screening, would you not?---You would have to be talking of wet screening to clear the ore.

MR SHER: Because you would have to have wet screening for heavy media separation?---That is correct.

There were other processes known in 1962 apart from heavy media separation, were there not?---Many.

But heavy media separation had become quite popular at that point of time because of those matters you were mentioning to his Honour, the need to continually get better product to fulfil contractual obligations?---Heavy media separation had become popular with certain types of ore.

Yes, but for the reason that you needed to get a higher Fe content than you would get by just dry crushing and screening? ---That is correct.

Yes. Heavy media separation is not something which has just been dreampt up since 1962, is it?---No.

It goes back to pre-war days, does it not?---Yes.

Heavy media separation by 1962 was a well-known means of beneficiation?---It was one of the many, yes.

And obviously a possibility in the Pilbara?---If there were ores of a type suitable for it.

But there are ores of a type suitable for it?---There are very few ores of a type suitable for it.

For heavy media separation?---Yes. May I expand on that? I said earlier that heavy media separation is used at Tom Price and Newman for primarily mixed ore and waste which we call low grade ore. If you are mining 1000 tonnes a day and you have shale bands and you have a one yard shovel, you can pick out the shale - some people call it "teaspoon mining" - and you can keep your grade high and produce very little low grade mixed ore and waste, at the contacts, shale bands, anywhere. If you are mining a quarter of a million or 300,000 tonnes a day of ore and waste and you are using 10 to 24 cubic yard shovels you have to just take everything as fast as you can, and that involves blasting on the contacts, blasting on the shale bands and mixing up your ore and waste, and that material would otherwise be wasted unless you fed it into a plant.

And that sort of ore is what needs heavy media separation?---That sort of ore is mainly the ore which you can put in a plant. There are certain low grade ores you can otherwise put in a plant, but if they are disseminated ores with hematite or magnetite disseminated in the country rock, heavy media separation is no good.

MR SHER: Let us face it, Mr Wright, at both the Mt Newman operation and the Hamersley operation - - -

MR SHER (Continuing): - - - Hamersley operation, they both have heavy media separation, have they not?---Yes.

And that is all they have in the sense of a wet process?---Because that process is ideal for separating mixed ore and waste.

But whatever the reason is, that is all they have from the point of view of a wet process, both of them?---Yes.

So the only process beyond crushing and screening that involves any wet screening in the Pilbara is, and has always been, heavy media separation?---No.

What other processes have there been?---At Tom Price, for example, there is heavy media separation and then there is wet, high-intensity magnetic separation.

That is part of the same beneficiation system, is it not?---No. At Newman they have heavy media separation and then Reichert cones which are purely and simply a gravity separation.

Not part of the same beneficiation system?---No.

Entirely separate plant, are they?---They are not separate plants. They resemble each other in many respect, but they differ from each other in many respects.

Is it fair to say that the difference between the two systems is because of the size of the feed that is being put through them?---No.

It is not the difference?---No.

So what you are saying then is that in the Pilbara there are two wet systems of processing. One is heavy media separation and the other is the one you have just described?---No.

You are not saying that?---No.

What are you saying?---I am saying there are two beneficiation plants in the Pilbara, one of which uses heavy media separation for the coarser fraction and wet, high-intensity magnetic for the very fine fraction minus 1mm, and the other of which uses heavy media separation, both drums and heavy media cones - cyclones - and Reichert cones, which is a straight gravity separation of the fines.

Let us go back to what started this discussion off. Back in 1962, if you had been talking of a system of beneficiation of which crushing and screening were part, one of those systems would have been the system presently in place at Tom Price - heavy media separation and the magnetic system forthe finer ores?---I do not think so.

They both existed at that time, did they not?---Yes.

Whether or not they were present to the minds of the people concerned in the contract only they could say, and not you. Would

that not be right?---Yes, but again qualified, your Honour. When the ore is a direct-shipping ore and the contracts are written for direct-shipping ore, I do not think an agreement would be written around some other type of ore.

MR SHER: Might I ask you to confine your answers to what you know as an expert and as someone with some experience, rather than postulate what might have been involved in contracts? Would you do that?---I will indeed. I thought you asked me that question.

What I asked you - and I will go back to it - is this: In 1962 if you had been talking about a process of beneficiation of which crushing and screening was only part, one such process, well-known at the time, was heavy media separation?---Yes.

In fact, that is what has happened in the Pilbara in both the mining operations in the Pilbara - the one conducted by Hamersley and the one conducted by Mt Newman?---Essentially, yes.

Can we take it that before those decisions were made actually to put the plant in at Mt Newman, the possibility that one would be needed had been discussed for some period of time?---"Some period of time" is obviously flexible.

Yes?---My group had been working on it for approximately six years before the plant became actuality.

When was the plant an actuality?---I cannot recall. I think it was early 1980. It was some months later than the Hamersley plant.

So from the early 1970s at least you had actually been working on the construction of the heavy media separation plant - - -

MR SHER (Continuing): - - - separation plant?----We had been doing metallurgical testing.

Actually working on it for six years?---Metallurgical testing to see if it was feasible.

The other aspect of this proposition about 1962, a wet process always being followed by some other process, was said by those three deponents and yourself, "There was always another process following the addition of water, of the wet screening, in the first instance"?---Yes.

Do you mean by that that the other process might be only classification by a mechanical classifier?---It would apply to any process whatsoever.

We have before the court in affidavit form and by way of exhibit material that suggests that in a number of mines in the Masabi range in America the only additional processing was by mechanical classifiers?---Yes.

Were you aware of that?---Yes.

Aware that those other processes were the only additional processes to wet screening?---Yes.

And you would say that mechanical classification is another process, would you?---Yes.

You would not describe it as something akin to screening?---I would describe it as another process.

Would you describe it as like screening?---I would not describe it as anything because I think, as a mining engineer who knows the principle of metallurgy, I should not get into metallurgical arguments.

The point is, you are in a metallurgical argument, are you not? ---A mining engineer does metallurgy as a final year subject and he understands principles.

You are holding yourself out as an expert capable of saying that in 1962 and now wet screening was always followed by another process, all around the world?---Yes.

You had never heard of any situation to the contrary?---That is correct.

What I am asking you is whether or not, if the further process was no more than using a mechanical classifier, you would call that something other than screening?---As you wish me to give an opinion, I do call it something other than screening.

Could you understand anyone of any expertise at all referring to a mechanical classifier as essentially a screening device? ---I would not accept it.

MR SHER: You would not accept it?---No.

But if you heard somebody who was expert saying that, would you say, "He's wrong" or would you say, "That's just another opinion different from mine"?---I would say it is just another opinion.

If we allow that exception, that is to say, if we allow that the only additional process is the use of a mechanical classifier which, to the mind of the person talking, is essentially a screening device so he identifies it, in effect, as another screening operation, there were in 1962 and earlier wet screening processes without anything further in mind?---Your Honour, I will answer yes, if I may qualify again. I repeat what I said earlier; that you do not wet ore unless you have something in mind like washing, in the first place, which is a process in itself, and then you have classification. You do not wet the ore first of all unless you want to wash it.

With that qualification you would agree, would you not, that there were many plants in the Masabi range that wet-screened ore with no further process in mind other than another screening process?---That is correct if you do not count disposal of the waste.

Does that not mean, Mr Wright, that we have unearthed a difference of opinion between you and some other people who are knowledgeable in this industry?---Yes, it does.

And does that not indicate that within the iron ore processing industry there are honest differences of opinion?---There have to be honest differences of opinion everywhere in the world - - -

WITNESS (Continuing): - - - the world.

MR SHER: But there are in this industry, are there not?---I must say yes to that with the qualification that ores differ.

Whether they differ or not, you were not differing and neither was Mr Pritchard and neither was Dr Batterham and neither was Dr Lynch when they said, as you say, that in 1962 wet screening was always followed by another process. You did not qualify that by reference to different types of ore, did you?---No.

You just said, in effect, that you always wet screen with another process in mind?---Which I thought you said was true.

Is that not what you said?---I did say it, certainly.

That did not depend upon any difference in the ores that were being screened. You were saying that was universally true, were you not?---I still believe it is.

In the world - not just limited to Australia and the Pilbara? ---I still believe it is.

What I pointed out to you is that there are people of authority - and the document to which I was referring is the United Nations publication - who describe in the Mesabi Range in America wash ores as ores that were subjected to treatment which only involved, assuming you regard mechanical classification as a screening process, wet screening and no other process. I pointed that out to you. That demonstrates, does it not, that either you are wrong or there are other opinions than yours?---It certainly does.

Yes, and that I why I asked you to concede that within the iron ore processing industry there are honest differences of opinion?---I agree to that.

Yes, and it is an over-statement of the case, I suggest, to say that in 1962 and now, in the world, wet screening was always followed by some process other than another wet screening?

MR HULME: That is not his statement.

MR SHER: He has agreed to it on more than one occasion in the course of this cross-examination.

OLNEY J: He has agreed to the proposition that wet screening is always followed by some other process.

MR SHER: Yes, that is what I am putting to him.
TO WITNESS: You have, I suggest to you, over-stated the position. I have just demonstrated that you have

by referring you to this United Nations publication. Do you concede that you have over-stated the position? ---No.

MR SHER: Do you think that in the affidavits you have supported the position was over-stated in respect of these particular paragraphs to which you have added your weight? ---I think the situation was stated fairly.

Let me take up another matter with you. To use heavy medium separation it is essential to have the feed properly sized?---Yes.

It is absolutely vital, is it not?---Yes. I beg your pardon. I misheard you there. It is not essential to have the lumps completely, accurately sized. It is essential to have them immaculately clean.

But you also need to have them correctly sized, do you not?--- You need to have them broadly sized.

What do you mean by "broadly" sized - give or take 30 or 40mm? ---No. I would not know exactly but your 80 by 30 could be 75 by 35 or could be 85 by 25 and the process would probably work as well.

What about when we get down to the smaller sizes - is the margin for error as great? What about the 30 by 6?---Again you could have a margin of error and the process would still work.

Yes, but not as well?---It would work just about as well.

Would it? Do you agree with this statement?---Again, that has to be an opinion because I repeat I am not a metallurgist.

You did not feel any hesitation in expressing your agreement with the other opinions because of any lack of qualification when you swore your affidavit?---Because they are principles.

I am only asking you about the principles. Are you agreeing or disagreement with this proposition?

> "Because the product from a preparatory screen....(reads)....it is necessary to add a further step."

Do you agree with that statement?---Yes.

That would convey the message, would it not, that there were two things you would need to do for heavy media separation. One is to have it clean and one is to have it of a "specific size"?---Yes.

Do you know who said that in his affidavit - - -

MR SHER (Continuing): - - - his affidavit?---I can't remember.

If I told you it was Mr Pritchard would that make you feel more confident about the correctness of it?---No.

You agree, do you not, that the sizing of the feed is one of the necessary steps in heavy media separation?---General sizing has to be.

It is more than general sizing; it is sizing which has to get down to a degree of particularity, does it not?---I'm not qualified to say.

If you are not qualified to say why did you agree with the propositions, for example, of Dr Lynch? Why did you not say: "I'm not qualified to express an opinion about this matter"?---I am qualified to express an opinion on generalities, on principles. I know broadly that when sizing the little off ahead of the heavy media plant the plant still works normally.

But we are talking about "a little off" - and they are your words?---And I am saying that not being a metallurgist I cannot specify exactly how much.

When you wet screen material for heavy media separation, is part of the screening process sizing the material?---Of course.

It is essentially what the process is?---No.

Is it not?---The most important part of the process is cleaning the material, followed by sizing.

Is it like saying you cannot have an omelette without breaking the egg? Is it any different from that?---I don't see the connection.

What I am putting to you is that they are two - - it is like having the legs on a stool; no leg is more or less important than the other; without them all the stool will fall over?---I agree.

And that is what the processes which are achieved by wet screening could be compared to, could they not - the legs of a stool, all equally important?---Yes, although I said that I regarded cleanliness as more important in that if you get slight size variations the heavy media drums still work, whereas if you don't get cleanliness it does not work.

You heard of Mr Langridge, I suppose?---Yes.

Do you know who he is?---I believe he is plant superintendent at Tom Price.

Do you think he is likely to know what he is talking about in relation to the operation of the beneficiation plant?---I

am sure he does.

MR SHER: I would like you to listen to this statement which he made on 8th November last, at p.167. Question:

> "So sizing is not merely important to get rid of waste. It is also important to make.....(reads).....which is heavy medium separation, was sizing?---Yes."

What I had done was to show him an article which he had written which was published in a book in which he had referred to the sizing but not the cleaning or the washing or anything else. I then said to him - and this is the question to which I want you to listen to the answer very carefully:

> "Would it be fair to say because you regard it" (that is sizing) "as more important than washing or cleaning? ---That's a difficult question to answer. They are obviously important as well, but sizing has to occur; it is fundamental. It is number one."

Do you disagree with that?---No.

Let's face it, Mr Wright - anyone who says that the cleaning is more important than the sizing, rather than saying the sizing is more important or at least equally as important, is over-stating the case, is he not? ---Unfortunately I omitted to say - - -

WITNESS (Continuing): - - - to say, for the heavy media drums.

MR SHER: Let us take that qualification. For the heavy media drums anybody who says that cleaning the ore is more important than sizing, in the light of Mr Langridge's answer which you have agreed with, is overstating the case? ---I would not think so.

You would not think so? But you cannot reconcile that answer with the one you gave a little earlier where you agreed with Mr Langridge's statement where he said it was No.1, can you?---Again qualifying, that is when it occurred to me that I have been thinking of drums purely. Of course you have to separate the iron ore fines from the lumpy portion; you have to make a broad separation of the lumpies.

Mr Wright, about half the feed in this beneficiation plant goes through the drums, does it not?---I do not know.

Have you any idea as to how much of it goes through the drums as opposed to the other parts of the beneficiation plant? ---Just guessing, looking at it, I would say at least half.

At least half goes through what?---The drums.

Let us assume it is only a half. If sizing is No.1 for at least half the feed that goes through this beneficiation plant, to say on the wet screens that cleaning is more important than sizing is to overstate the case, do you not agree?---No.

You do not agree?---No.

I will ask you again. Do you say cleaning is more important than sizing for that percentage of the feed that goes through the drums?---I say cleaning is all-important.

Is it more important - that is the question?---It has to be more important.

It is more important?---For reasons I explained; with slight variations in size in the drums, the plant still works. With slight variations - -

Then you are reverting to what you said before I put Mr Langridge's evidence to you. You are now going back to saying that it is more important, not that sizing is more important. Is that the position?---I thought I explained that when I suddenly thought of the drums, and I omitted to say drums, I had not been thinking of sizing between fines and lumpy. Of course it is of major importance to get the fines out.

MR SHER: What is your position? Is sizing of major importance? Is it No.1 or is it not?---Sizing is No.1 when it comes to getting out the minus 6mm and No.2 when it comes to drum feed.

So for at least part of the material that goes through the wet screens, sizing is the most important function performed by the wet screens?---For whatever portion goes to the fines, yes.

Then to say of the whole of the feed that the sizing is the least important function performed is to overstate the case?---I think I have to modify again, not say a definite yes or no. We are talking about the proportion of ore that goes over the screens and through the screens. Your premise there is that 50/50 pass each way of which I said I thought at least 50 went through the drums. If it were 55 through the drums obviously cleanliness of the feed to the drums would be more important than sizing. I should apologise, your Honour, for this. I was thinking right up until a minute or two ago about sizing of the drum feed. I was not thinking about getting out the fines.

Mr Wright, is this not the position then; that from day to day as the feed changes, the position may be it is more important one day to size and less important to clean but the next day it may be more important to clean and less important to size?---That is correct if we are talking about getting out the minus 6mm.

The feed that goes through this plant varies, not only from day to day but within the day, does it not?---Yes.

You can have a lot of the lumps on one occasion and a lot less on another?---Yes.

And if you have a lot of lumps at one time then sizing is less important than cleaning and if you have a lot of fines on the next occasion, then sizing is more important than cleaning. Is that right?---That is correct if we are talking about sizing including minus 6.

But to say of the whole process - - -

MR SHER BContinuing): - - - whole process that sizing is the least important function performed of three performed by the wet screening process, the other two being the washing process and - -

MR HULME: That is not what he said. He looked for para.6.

MR SHER: The three effects described by Dr Lynch is to break down the water-active clayey materials - -

You have not mentioned that, have you? Is that through some fault of mine or have you overlooked it, or was it in the way the questions were framed? ---I regard it as a minor effect.

So the breaking down of water-active clayey materials you would rate as of minor importance on the wet-screening process?---Yes.

The second one mentioned by Dr Lynch would be the one he calls abrasion or washing or scrubbing, which is to separate small particles, whether ore or gangue, which adhere to other particles by counteracting the forces that hold them together. We will call that the cleaning or washing effect, if we may. That is the second one.

The third one he mentioned was to accelerate the passage through the screen of particles which are already separate, which is in effect the sizing operation.

They are the three which Dr Lynch mentions. How would you rate them if you were speaking generally about the operation of this plant?---I rate the washing as the most important.

And next?---Flushing through the screen.

That is the sizing?---The sizing.

And the last one the breaking down of the water-active clays?---That is correct.

On occasions, number two, the sizing, would become more important than number one which is the cleaning, if you had a lot more fines than lumps?---No.

What - not ever?---No, because the cleaning is basic to the whole process. Without the cleaning you cannot have the process.

Would you agree with this proposition as a comment on your evidence? In so far as you have adopted without qualification the opinions expressed by Dr Lynch, would it be fair to say that you were a little careless?---No.

MR SHER: Do you not think you should have expressed some qualification about what Dr Lynch said?---No.

Let us leave Dr Lynch for a minute and pick up some of the things which Mr Pritchard said, which you have also endorsed. Do you regard what happens on the wet screen itself as scrubbing?---Scrubbing, I mentioned earlier,is not a term I normally use.

Do you regard it as scrubbing?---I understand there is some scrubbing effect.

But you would not call it scrubbing, would it?---I would call it washing with minor scrubbing.

You would not call what happened in the palping box scrubbing either, would you?---I would call it washing with minor scrubbing.

You would not call the pulping box or the wet screen a scrubber? ---I would call it a device for wetting the ore ahead of the screens preparatory - - well, as part of the washing and minor scrubbing procedure.

In so far as Mr Pritchard could be accused correctly of referring to the process as scrubbing, or any of the devices involved in it as scrubbers, you would not agree with that, would you?---I mentioned earlier I use the term "washing".

You know, I suggest, well that this case really is about language as much as anything - what people call things. You realise that, do you not?---Yes.

Therefore, what people call things is very important - - -

MR SHER (Continuing): - - - very important?---Yes.

When Mr Pritchard talks about "scrubbing" as going on in the pulping box and on the wet screen he has really over-stated the position, has he not?---In my opinion perhaps slightly.

Yes, because you know that in the iron ore industry "scrubbing" means something as a matter of degree considerably different from what goes on on the wet screen or in the pulping box?---I don't think it is a matter of degree. I think minor scrubbing and major scrubbing are both scrubbing.

But, Mr Wright, there are scrubbers, are there not?---Oh yes.

Specially designed plant called "scrubbers"?---Yes.

And it is recognised within the industry that scrubbers are different from screens?---Yes.

If you want to talk about scrubbing you talk about what goes on in a scrubber?---Not everyone.

But most people?---Some people.

Most?---I don't know.

Do you not?---No.

Would you agree with the proposition that the water which is added to the feed ore which goes onto the wet screens is essential for the screening process?---It is essential for the cleaning process.

It is also essential for the screening, is it not?---You could pass the ore through a dry plant and dry screen at the last moment to the fraction needed for the heavy media drums and put those lumps into the heavy media plant. You do not do that because you have to have water to clean off the adhering particles.

But, Mr Wright, if you decide for any reason to wet screen you have to have the ore sufficiently wet to enable it to pass through the screen?---Naturally once you decide to wet screen you have to have it sufficiently wet.

Right - so if you decide to wet screen, whatever your reason is, the ore has to be very wet to enable it to be effectively screened?---Yes, indeed.

And you have to pre-wet it so it comes onto the screen as a slurry? ---Yes.

That is what happens in the pulping box in this plant, is it not? ---It is also pre-wet for cleaning.

MR SHER: Whether it is "also", as part of the wetting it is being wetted to turn it into a slurry so it goes onto the screen?---That is correct.

Yes. What you are saying, I suggest, is that when you wet this ore in this pulping box you are wetting it for a number of reasons?---No. I said that you could dry screen and then wash it.

But they do not dry screen it; they are wet screening it, are they not?---Yes, they are wet screening it.

So once the decision has been made to wet screen it the reason you wet it is to clean it and to get it through the screens?---That is correct.

So you are wetting it for at least two reasons?---That is correct.

You have already said there are at least two, and you agreed with the third - the breaking down of the clay?---To a minor degree.

Yes. You agree that to wet screen the ore has to be in slurry form when it comes onto the screen?---I agree.

Do you also agree that in any wet screening process some degree of cleaning occurs?---Of course.

You cannot do wet screening without inevitably doing some cleaning or washing?---You normally wet screen because you want to wash.

All that means is that you agree with me that you cannot wet screen without some degree of washing or cleaning?---They go together.

Yes. You may wet screen because you want to emphasise the washing side of things; is that right?---I am sorry - I have been saying continually that you wet screen because you want to wash in the first place or follow up with other processes.

Mr Wright, the experts on what you wet screen for are Allis-Chalmers, are they not?---Allis-Chalmers understand screening very well.

They ought to know what the purpose of screening is, would you not think?---Yes.

In their publication which is in evidence now, in describing screen uses, they define nine different uses to which you can put wet screening?---Surely.

I beg your pardon?---Certainly.

Size separation is the first one they mention, incidentally. Is that your experience - that wet screening is usually used for size separation?---Certainly not.

MR SHER: Your experience of wet screening is confined to - what - to Mt Newman - - -

MR SHER (Continuing): - - - to Mount Newman?---Of wet screening. There was a beneficiation plant in Marcona as mentioned in my affidavit.

You have had experience of two wet screening operations, have you?---I have had experience of two wet screening operations, correct.

They say "Screen Uses" and as was pointed out to me by Mr Heerey - that is this gentleman here in case you are wondering who he is - the points are these: "Size separation, dewatering, desliming, media recovery, trash removal, washing, dedusting, conveying and concentration" - they are all known to you, I take it?---Yes.

They are all consistent with wet screening operations?---No wet screening operations that I have seen use those processes. I am sorry, no wet screening plants I have seen is the wet screening done for those processes.

Perhaps I overstated that dedusting appears to be - - That would be a dry dust removal, would it? That is not a wet operation I suppose; just a screening job, dry screening?---In the Pilbara dry screening is used to dedust.

Does this not suggest to you, what I have read to you from this publication, that your limited experience of actual wet screening operations is one reason why you are unaware of some of the things I have just put to you?---It does not, because Allis-Chalmers sells screens to literally hundreds of different industries.

They ought to know better than you then?---They are not referring to iron ore there.

Are they not?---I am sorry, I should not have been so dogmatic. I do not think they would be referring to iron ore there.

It is not hard to get dogmatic in this case, is it, Mr Wright? It is what you were asked to do, is it not?---I was not asked anything except tell the truth.

Page 17 - they refer to wet screening requirements for different types of material such as stone, stone and clay, sand and gravel, iron ore and coal, and refer to two different activities for iron ore; namely sizing and media recovery. Do you know of wet screening being used, firstly for all those different types of material?---No.

Do you know of it being used for those sorts of applications? ---For media recovery, yes.

What about sizing?---I have never come across that.

You have never come across it? The applications of wet screening for minerals by Allis-Chalmers are listed as follows:

"Washing, rinsing, rewashing,
media recovery, sizing and
pre-wetting."

They are the different types of applications. Have you not heard of some of those?---In the direct shipping or iron industry, no.

MR SHER: I am sorry, I do not suggest they are all related to iron ore. The only two mentioned for iron ore is sizing and media recovery and you have only heard of media recovery, I take it?---That is correct.

Not sizing?---No.

It comes as a surprise to you to find Allis-Chalmers recommending wet screening for iron ore for sizing purposes?---Purely for sizing purposes, it comes as a great surprise.

Either that means that the document has some error in it or Allis-Chalmers have made a mistake or you could be wrong? ---I cannot speak for Allis-Chalmers.

The Pilbara has a particular problem in relation to iron ore, does it not, when we talk about wet screening - - -

MR SHER (Continuing): - - - wet screening?---Please expand?

Do you not know of a particular problem in relation to wet-screening Pilbara ores? Do you say there is no particular problem or do you say there is?---I say many things.

I suggest to you there is a notorious problem about wet-screened, Pilbara ores?---One is it is not necessary for the high-grade ores.

That is not a problem, is it?---It is a problem if you decide to wet-screen.

I will suggest to you what it is and see if you agree. They are very hard to wet - meaning very difficult?---I am not sure I can understand that one. In the Mt Newman beneficiation plant the ore goes direct onto the screen before wetting. There is no pre-wetting. It is jetted with water on the screens before the drums.

Let me put it to you again. I suggest to you it is a known fact, a notorious fact, that Pilbara ores are difficult to wet?---It is outside my experience.

Do you know Mr Peter Booth?---I know Mr Peter Booth very well.

He was really the key man in the design of the Mt Newman plant, was he not, from Mt Newman's viewpoint?---Mr Booth was in charge of the engineering design of the Mt Newman beneficiation plant, correct.

He ought to know whether that problem exists, ought he not?---I suggest that question be put to Mr Booth.

It will but are you telling his Honour you are unaware of such a problem?---I am unaware because you may know we use water sprays to control dust in lump and fines but particularly in fines, and if you put on too much water the fines go sloppy. They absorb that water, I thought, rather readily.

Are you saying that not only do you not know of this notorious problem which I have suggested but that in fact it is no problem at all?---I am saying I was not aware it was a problem.

Are you saying Pilbara ores are easy to wet?---I am saying that I was not aware of the problem so I cannot say whether they are easy or hard, but all the evidence indicates they are not hard to wet.

The design of the Mt Newman beneficiation plant has, I suggest to you, certain characteristics which are directly related to the need to wet the ores, firstly. Do you agree with that - for the process they are going

to be put through?---I could not comment.

MR SHER: Do you not know?---I said earlier, I am a mining engineer who understands the principles of beneficiation. I am not a metallurgist or a design engineer.

Is this the position - that you do not know whether or not special steps have been taken at Mt Newman, because the Pilbara ores that Mt Newman treats are difficult to wet?---I do not know.

It may have done so, it may not have done so - you cannot say one way or the other?---That is correct.

Mr Booth ought to know, should he not?---I am sure he does.

If he were to say the Pilbara ores are difficult to wet and therefore special steps need to be taken to ensure they do get sufficiently wet for the wet screening that follows, you would not quarrel with that expression of opinion by him, or statement of fact by him?---I would not consider myself in a position to quarrel.

You see, whether or not the wetting of the Hamersley ores in the pulping box is due to their characteristics which make them difficult to wet or whether it is for some other reason, you really cannot say, can you?---No.

But there ought to be some people within the Hamersley camp who can?---I would say so; most distinctly.

Yes, and whether or not the wetting which actually takes place in that pulping box takes the form it does because the ore is difficult to wet and essentially for no other reason, you cannot say?---Could you repeat that, please?

Yes. Whether or not the wetting of the ore in the pulping box takes the form it does because the ore is difficult to wet or for some other reason, you cannot say?---No.

Therefore, when you say you agree - - -

MR SHER (Continuing): - - - you agree with Dr Lynch and other witnesses that the pulping box took the form it did to maximise scrubbing, you are guessing, are you not? ---I don't think so.

Well, you do not know in fact why that scrubbing box, as they call it, or pulping box takes the form it does. You do not know, do you?---It is only commonsense that if you want to wash an ore you wet it as soon as possible.

Certainly, but you also wet it to make it into a slurry to go onto a wet screen. You have already agreed with that, Mr Wright?---You wet it to make it a slurry as early as possible.

To go on the wet screen?---So the washing is as good as possible and the screening is good.

Why the pulping box is designed the way it is is something about which you cannot speak on the basis of any knowledge. That is the first thing. Is that not so?---I certainly would not attempt to design a pulping box.

It is out of your field of expertise?---The design is out of my field.

Yes - and the reasons for designing it in a particular way, whether to wet it efficiently or to scrub it or to do anything to it, is really out of your field of expertise, is it not?---The design is out of my field, I repeat.

So when you say you agree with the opinions expressed by witnesses such as Dr Lynch that the pulping box would not have been designed the way it is if it were not for the purpose of maximising the scrubbing effect of the water, firstly you would agree that that is outside your expert knowledge?---I am saying it is outside my knowledge to design a scrubbing box. I saw the scrubbing box, though, and there are two rock boxes, as we call them, so the ore falls and bounces and falls and bounces and falls. There are heavy jets of water which are obviously intended to give maximum wetting and maximum washing effects before it hits the screen.

Is that expression of opinion based upon your observation that there are two rock boxes?---And very, very heavy jets.

Where are the two rock boxes?---The ore falls onto one, comes off like that and falls onto one, bounces and falls onto the other and the jets, if I remember correctly, are in the middle.

So that it hits a box, bounces off it, goes through the water, hits another box, bounces off it and goes onto the screen?---Correct.

MR SHER: And that is the basis of your opinion whereby you agree with Dr Lynch?---When something is obviously working I don't think it is an opinion.

But it is outside your field of expertise, is it not - the design of a pulping box?---The design is outside my field.

Yes. Do you think you would adhere to the same opinion that you have expressed if the pulping box, instead of being designed the way it is, just had the feed coming in, falling through a curtain of water about a few inches wide coming in from each side, then hitting a ledge at the bottom and sliding as a slurry onto the screen? If that were the fact would that affect your opinion? ---I am not in a position to make any opinion. I did not see that.

If it were like that it could make a difference to your opinion, but you cannot say without seeing it what difference it would make?---That is correct.

Did you notice in those affidavits that Dr Lynch, for example - - -

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MR SHER (Continuing): - - - for example, said that words, "beneficiation treatment, crushing, screening", were not used universally or with constant meaning?---Yes.

Has that been your experience?---Yes.

Did you notice, when you read the affidavits of those three witnesses, that they used the word "screening" on occasions to refer to both dry and wet screening? Do you want me to give actual examples of those?---Yes, I would, please.

It is, if I may say, perfectly fair of you to want it. Firstly Dr Lynch said that the words crushing and screening were not used universally with a constant meaning so we can leave that for a moment. I will take you to Mr Pritchard's affidavit and just use one example. Looking at p.9, para.(f) - and perhaps you should have it before you (May the witness also have Dr Batterham's affidavit?) will you look at the first page of Mr Pritchard's affidavit? In the very last sentence, when giving his qualifications, he says:

> "I have worked on engineering matters in relation to the mining industry for 45 years....(reads) ....particularly involved with screening processes."

It is clear from Mr Pritchard's evidence that screening includes both dry and wet and you would agree, would you not, that he appears to be using the word "screening" there to encompass both dry and wet screening?---I certainly would.

Going to p.9, for example, and his comments on an affidavit sworn by Mr Booth, he said in para.(f), dealing with para.14, sentences three and four:

> "Screening alone is not enough. There must be cleaning as well but there cannot be efficient cleaning of the final preparation screens unless there has been scrubbing earlier."

He is obviously referring, by use of the word "screening" there, to wet screening, is he not? He is talking about efficient cleaning and all that. It would appear that he is using - -?---Yes, it would appear.

Going to the affidavit of Dr Batterham, p.2, para.(c), the last sentence:

> "In addition I have visited research centres concerned with crushing, screening and processing in most of those countries."

He told us they were both dry and wet screening research centres and it appears he has there used the word "screening" to mean both dry and wet?---It could be.

MR SHER: In the next paragraph, para.(e), it says that he was consultant to Mitchell Cotts and then he goes on and says:

> "The project referred to in sub-para.(c) above involved me in a detailed study....(reads) ....into the effect of moisture on screening."

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MR SHER (Continuing): He uses the word "screening" three times, obviously meaning at least wet screening in some of them if not in all of them?---I would not think so. I would think all those refer to dry.

Anyway, you use the word "screening" in para.3 of your affidavit to mean wet screening and dry screening in the same sentence, I suggest. Have a look at the sentence commencing "In my experience...":

> "In my experience in the iron ore industry water has never been added to a.....(reads).....by screening alone."

You meant a wet screening process in the first instance, did you not, and a dry screening process in the second? ---No.

Did you not? You cannot add water to a screening process without making it wet screening. You must have meant wet screening in the first use of the word, and by "screening alone" you obviously meant dry screening?---"Water has never been added to a screening process"?

Yes?---So water has never been added to a dry screening process to make it - -

You mean dry screening there?---Yes, certainly - "to make it a wet screening process, unless it was designed to achieve a different result".

I see. Do you use the word "screening" on occasions to mean wet screening?---I use the word "screening" as Mr Pritchard uses the word "screening" for many, many purposes.

Dry or wet?---In the business you talk about screening as dry screening and you talk about wet screening as washing and screening.

But I have just pointed out to you where people in the business use the word "screening" to mean wet screening?---I don't think so, because Mr Pritchard is an Allis-Chalmers man who sells for many, many industries. He is not just selling for the iron ore industry.

But I just pointed to an example where he used the word "screening" to mean wet screening. Do you want me to point it out to you again?---I thought that was debatable, but it doesn't matter; Mr Pritchard is Allis-Chalmers and he talks about screening all the time for a million things. He obviously could forget he is talking about one specific industry.

Are you suggesting, contrary to the expression of opinion of Dr Lynch that the words are not always used universally, that

"screening" means always dry screening in the iron ore industry?---"Screening" unqualified by "crushing and screening" means "crushing and dry screening".

MR SHER: Just say you do not use the word "crushing", just talk about "screening" without the word "crushing"; what does it mean then?---It almost always refers to dry screening.

But it can refer to wet screening?---Yes. If you had a wet plant, all the ore was going over wet screens, you would talk about "the screens", because there is no distinction there between dry screens and wet screens. Where there is a distinction between dry and wet screening you talk about "screening" and "wet screening".

If I could show you where Hamersley themselves had referred to the plant where wet screening goes on as "the screening plant", meaning therefore wet screening, would that make any difference to what you have just said about the use of language in the iron ore industry?---No.

You would still say, if they were using the word "screening" to mean wet screening that it generally means "dry screening"?---Using the word "screening" alone generally means dry screening.

Can you understand why anyone in describing a screening process would describe it as "screening" if it were wet and draw a distinction between that and dry screening, and use the adjective "dry"? Say you had, for example, "dry screening, washing and screening plant", meaning by the last word "wet screening" - can you understand anyone using that sort of language?---I find it hard because I have never worked on a property where there is a 100 per cent wet processes. There if they had some screen which happened to be dry they might refer to "dry screening" for that particular screening.

I am just asking you about the use of language in the iron ore industry, now and in 1962?---I can only talk within my experience - - -

L119. 4.00

WITNESS (Continuing): - - - within my experience, the 30 years between 1951 and 1980, saying that "screening" was always dry screening.

MR SHER: You cannot understand anyone of any experience in the iron ore industry calling dry screening "dry screening" and wet screening just "screening" in the same sentence. That would be a unique use of language as far as you are concerned, based on your experience?---If they are in the direct shipping ore, the high grade shipping industry, that would be unique in my experience. If they were in - -

Hamersley are in the direct shipping business, are they not? ---Hamersley are in the direct shipping business.

Yes, so you could not understand Hamersley describing plant as "the dry screening, washing and screening plant", the second "screening" referring to wet screening. You would expect them to say "the screening, washing and wet screening plant", would you not - consistent with your knowledge of terminology?---If it were all in one building yes, I think I would.

If you just have a look you can now see what I am talking about, can you not?---"Screening, washing and dry screening"?

Are you sure?---"Screening, washing and dry screening plant".

Yes. They have therefore used the word "screening" there to mean wet screening?---I also point out that this was produced by Technical Illustrators Limited.

They would not know what they were doing, would they?---They would have made this and then it would have been vetted by Hamersley officers.

It might even have been vetted by the people who designed the plant, Mitchell Cotts?---Yes, it might have been.

Yes. They have all overlooked it, have they?---It might have been overlooked; it might be a difference in terminology.

But the fact is, is it not, that Dr Lynch was right when he said that the words do not always have the same universal meaning?---I have to repeat, in my experience "screening" has always meant dry screening, in high grade direct shipping ores.

Very well. Do you recall Mr Pritchard's suggestion illustrative of a point he was making, that it would make no difference if the pulping box, as he called it, was several hundred metres away from the wet screens? Do you recall that? ---Yes, I do.

That is one of the things you have said you agree with?---I can't see that it would make any difference.

MR SHER: Do you agree with it, then?---Yes.

What is the basis for your agreement?---Because while you pump the ore from over those several hundred metres you are agitating it all the time and you are actually, I would think in my opinion, improving the minor scrubbing effect and washing effect.

Right. Firstly you agree you would have to pump it over that distance because you could not convey it any other way?---It would either have to be gravity or pumping.

Yes; you could not put it on a conveyor belt, for example?---Wet materials are conveyed in the world but rarely.

Not in slurry form, though?---No.

Not as it would emerge from this pulping box?---No.

It is a silly suggestion as a practical suggestion, is it not? ---Yes.

But as a theoretical suggestion you say it would not make any difference; in fact it would make the cleaning even better because the water would be on it longer and it would be agitated as it was being transported along? ---I said that was my opinion.

Yes. The fact that that was not done and the fact that washers and scrubbers, strictly so-called, were not used must have made you wonder what it really was that this pulping box was designed to do. Did that thought cross your mind?---No.

It did not?---No.

If you wanted to wash ore there are much better ways of doing it than in this pulping box, are there not?---Of course there are.

And if you wanted to scrub it there are much better ways of doing it than in this pulping box?---Yes, definitely.

And if you really wanted to expose this ore to water for the purpose of breaking down shales or water active clays, you would expose it to water for a long period of time, would you not?---Not necessarily a long period of time but vigorously.

You would not expose it to water for 0.25 of a second, would you?---It depends if it does the job.

Mr Wright, 0.25 of a second is not the exposure to water of this ore in this pulping box in a spray; it would be an absolute split second exposure to the spray because it falls through this few inches and then whatever water it is exposed to is what is in the box because it is all milling around. That is not really soaking it, is it - - -

MR SHER (Continuing): - - - soaking it, is it?---It has to depend on the type of ore. If it does the job, it does the job.

Yes, but if you are wondering without knowing what type of ore it is - what it is being exposed to in this box, for what reason it is being exposed in this box - the timing itself would make you wonder what the reason was, would it not? I mean, it is not very long, is it?---I fail to grasp the point.

The point is that you do not know what these ores are like, do you - these particular ores?---One day I saw the ore going through the plant, I saw the wetting, I saw the screening, I saw the beautiful, clean products and beautiful, clean floats coming out.

But you do not suggest for one moment that that is typical of every day and every hour of every day, do you? ---No.

You do not know what these ores are really like because you have only seen them once. Is that fair enough?--- Fair enough.

You know they get exposed to the direct spray of water, for the amount of time it takes ore that is falling to go through a few inches of a spray. That is the only direct exposure to water, is it not, in this pulping box?---That is the only direct exposure to fresh water.

The moment it hits the bottom and slides as a slurry onto the screen, it is immediately hit by water on the screen, is it not?---Yes.

So the only exposure to a spray of water in this pulping box of this ore is for a split second?---That is correct.

You were not in court when it happened, but Dr Batterham got some glasses of water (I think it was Dr Batterham) and he took some pieces of shale out of an exhibit and he dropped them in the water and we watched them as they bubbled a bit and then sort of started to break up. The transcript will record what Dr Batterhame said but I think he suggested after about 10 seconds it started to crack up and the like. This ore is not exposed to direct - - first of all it is not surrounded by water like that demonstration was at all, is it?---No.

Let alone for 10 seconds. It is not remotely like 10 seconds, is it?---No.

It would be exposed directly to water and surrounded by it for what - a split second in this pulping box?---Yes.

MR SHER: And thereafter it goes onto the wet screet and the water to which it gets exposed there is part of the screening process?---Part of the washing and screening.

Washing and screening, all right. Anyway, it is water coming onto it while it is on the screen?---Yes.

It is equally consistent, I suggest to you, that all that is happening in that pulping box is it is being wetted for the purpose of screening - just on those facts? ---If I may comment - -

Will you just answer that, please?---No.

If you do not know, say so?---No.

What is the answer - no?---The answer is no.

It is not equally consistent and you say that without knowing the type of ore that is being put through that process?---Yes.

And you cannot answer that without knowing the type of ore, can you?---Yes.

You can, can you?---Yes.

At Mt Newman you do beneficiate ore by heavy media separation? ---Correct.

That involves wetting the ore before the drums?---That is correct.

And sizing it before the drums?---Correct.

That is all done, I suggest to you, in one operation immediately
148B before the drums?---That is correct.

When you are doing that to the ore, are you washing it?---Clearly.

But you wash it within seconds of it going into the drum?---Yes.

So you do not have this concept of wetting it minutes before it goes into the drum, so that the water can work on it for minutes as it goes through the processes and on the belts and all that sort of thing?---That is correct.

It just gets wet, cleaned and sized and goes straight into the drums?---Correct.

So the need to degrade the Pilbara ores mined at Mt Newman does not require any extensive wetting for any period of time before the heavy media drums, the heavy media separation?---That is correct.

It is 1980 since you were actively engaged in the Mt Newman project?---Yes.

But had you observed in the period of time that you were involved that problems with the ore sort of kept coming up -

that is to say that the ore was thought to be of one quality or one characteristic at one point of time and a year or two later it was found that it had quite different characteristics?---Not really.

MR SHER: Can you comment on this? If I suggested to you that at Hamersley the ore now being put through the beneficiation plant has substantially different characteristics from the ore upon which the beneficiation plant was built, would you know whether or not that is the fact?---I would not know.

Would it surprise you if that were the fact?---No.

It would not?---No.

Because that is the sort of thing that could happen?---Yes.

So if that has happened, then the purpose for which the plant was designed may be quite different from the way in which it is presently used?---Yes.

HEARING ADJOURNED UNTIL 10.30 AM

TUESDAY, 15TH NOVEMBER, 1983

S95. 10.32

DESMOND EVERED WRIGHT:

CROSS-EXAMINED BY MR SHER QC (Continuing):

MR SHER: Your Honour, I regret to say that overnight I have thought of a few more things; it inevitably happens, but I hope I will not be too long.
TO WITNESS: Mr Wright, firstly I would ask you this: You have said in your affidavit that you read a number of other dependents' affidavits and you agree with them, and one of the people to whom you referred was Dr Batterham. You said you had read paras.5, 8 and 9 of his affidavit and you agreed with them. Which version of para.5 of Dr Batterham's affidavit were you referring to in your affidavit when you said you agreed with it - the current version or the version which was extant at the date of swearing your affidavit?---The original version.

Have you seen the change?---I have.

Do you agree with that?---I do.

So you agree with both paragraphs 5 of Dr Batterham's affidavit? ---I think I do. I cannot recall the specific wording. I read them both and they both seemed to be in agreement.

Would you kindly explain to us, if you would, the difference between the two affidavits?---I cannot. I cannot remember them.

Well, is there any difference between what Dr Batterham said in the first version of para.5 and in the second version?

OLNEY J: I think if the witness cannot remember the words he ought to have the opportunity of looking at them, Mr Sher.

MR SHER: Certainly.

WITNESS: I would opine that they are saying the same thing, only the new version is rather more clear.

MR SHER: Would you explain the difference?---I said my opinion was that they said the same thing.

But they are not the same, are they?---They have to be different because there is a second version and a first version.

Quite clearly Dr Batterham must have thought (and I think he said as much) that he did not regard the first affidavit as expressing clearly what he intended to convey, so he re-phrased it, so there is clearly some difference between the two. Do you discern any difference yourself?---I repeat I think the second version is just a little more clear.

MR SHER: In what respect? What does it make more clear? ---The first version says "the chemical upgrading is of a different order"; the second one says "this will reflect in chemical analyses differing". "Upgrading" refers to normally - -

Just a moment; you are saying the first version refers to a chemical upgrading, does it?---The first version says those words "the chemical upgrading..."

Yes, "...is of a different order" - and you discern no difference between the two in effect in what they are saying? ---To me in the industry "chemical upgrading" would be chemical upgrading of all elements, in other words diminution of contaminants and upgrading of Fe, but I would gather for the layman "chemical upgrading" might just mean "Fe".

Is the effect of adding water, causing some chemical change, within your field of expertise?---Yes indeed.

It is? Well, what is the chemical difference which results from the adding of water?---The chemical difference is that you are picking up fine particles of shale in suspension in the water and they leave with the water.

But that is not a chemical difference; that is just a physical difference, is it not?---No.

You are removing something from point A and putting it at point B - - -

V60. 10.37

MR SHER (Continuing): - - - at point B?---That water with the particles of shale is going to waste. Those particles of shale are high in alumina and you are reducing the alumina in the balance.

But all that means, does it not, Mr Wright, is that instead of having a mass which contains certain fines which may also include certain wastes such as alumina, it separates it from the iron?---And improves the iron and reduces the alumina in the product left.

But it only improves it by removing it?---That is part of the process of beneficiation.

Whether it is part of the process or not, there is no chemical change; it is just a physical separation, is it not? ---There is a chemical change in the iron ore.

I suggest to you that the iron ore remains exactly as it is. The only difference that occurs is that instead of having iron ore with some contaminants you have less contaminants?

OLNEY J: I think he ought to know what iron ore is.

MR SHER: Fe is what I really meant.

OLNEY J: That is iron. As I understand it, when the shovel takes the dirt out of the ground and puts it in the Haulpak you have a truckload of iron ore which contains iron and alumina and goodness knows what.

WITNESS: Your Honour, you may have a truckload of low grade ore.

OLNEY J: Yes, but it is still iron ore?---It is really iron ore, your Honour, when you can sell it. You might call it low grade.

All right; then it goes through the grizzly and the primary crusher, or the other way round, and then when it comes out some of it goes into a truck to the port and you have railway trucks loaded with iron ore?---Yes.

Then you have a stockpile of the other stuff that does not go in the truck?---Yes.

We are calling that iron ore too, because as I understand it, that is the iron ore that goes into the beneficiation plant?---You would call that the low grade ore or beneficiation plant feed.

If it is not iron ore I do not know what we are talking about because the contracts talk about iron ore but, anyway, you have this feed which I thought was generally being called iron ore that goes into that beneficiation plant

and that is made up of iron, alumina, shale and general rubbish?---I am sorry, your Honour, but my point is that iron ore is not iron ore until it can be sold. Up until the time it can be sold it might not be iron ore. It might be direct shipping high grade in which case it is iron ore but it might be low grade which has to be beneficiated and it is not iron ore until it is actually saleable.

OLNEY J: Anyway, in terms of chemical analysis that part of the feed or whatever it is called that is iron, remains iron. There is no actual chemical change in the lumps of iron themselves, is there?---There is no chemical change in the lumps of iron but the product as a whole becomes higher in iron content.

That is right; the percentage of iron content is raised by the removal of other substances?---And that, indeed, is beneficiation.

MR SHER: That really is a process of separation, is it not? ---So is any beneficiation process.

Let us just concentrate on this one which is causing enough trouble, Mr Wright. What has happened is, you have separated non-iron from iron?---That is correct.

And that is the chemical change that has occurred?---That is correct.

And it is not really a chemical change; it is a question of ascertaining that fact by chemical analysis. Is that not so?---You have to ascertain that fact by chemical analysis.

The affidavits that you have said you agree with include statements in substance that say that the adding of water is the beginning of beneficiation which the drums, the cyclones and the whims - - -

MR SHER (Continuing): - - - the whims complete. Is that right?
---That is correct.

We have now before the court, and we will have another document in due course before the court, a document which states that the reason for designing the plant as it is, in a modular concept, is to enable the ore to be diverted before it goes through the drums, the cyclones and the whims - but perhaps we should leave the cyclones out of that but certainly through the drums and the whims - for either maintenance reasons or where the grade of ore is high?---Yes.

Were you aware of that?---I was indeed.

You were?---Certainly.

In that event, in the event of a diversion, the proposition with which you have agreed, that something begins because of what happens at the end, is no longer - -

MR HULME: That is not the proposition. What is said is that the process begins at one point and ends at the other.

MR SHER: With respect, your Honour, I would contend that is not what is said.

MR HULME: Let us look at it.

MR SHER: If your Honour pleases, I am cross-examining this witness and in my submission I am entitled to put a view. (Would you please allow me to continue what I am saying?)

I am putting a proposition to the witness which we would contend is a reasonable conclusion to be drawn from the affidavit material. That is a legitimate purpose of cross-examination. If your Honour disagrees with the premise upon which the questions are put, then the cross-examination will not help, but it is submitted it is still permissible, unless your Honour rules that on no view of the evidence is what I am putting open.

OLNEY J: I think it ought to be put to this witness on that basis.

MR HULME: Or he can put the actual words.

OLNEY J: Yes. You could put the actual evidence to the witness or, if he has himself assented to the hypothesis or the proposition then that is fair enough.

MR SHER: Your Honour, I would rather not waste time on the matter, so I will put the actual words.
TO WITNESS: Dr Lynch said, in para.8:

"In my opinion, the initial addition of water must be viewed as the first step in a process which those units complete."

"Those units" were identified earlier in the paragraph as the drums, the cyclones and the whims. All right? ---Yes.

MR SHER: So you are clear in your mind about what I am now talking, are you?---Yes.

The proposition, with which you have agreed, is the initial addition of water is the first step in a process which the units, drums, cyclones and whims, complete? ---It is the first step.

You also are aware that Dr Lynch defined beneficiation and screening - beneficiation certainly - beneficiation, and treatment as having purposive connotations?---I am sorry?

He defined those words or said those words (beneficiation and treatment) usually have a purposive connotation, meaning by that, I take it, that you can tell what they mean by reference to the purpose that the processes are designed to achieve?---Yes.

The processes that are designed to be achieved in this particular instance would be the processing of the feed through the drums, the cyclones and the whims. That is what you understood Dr Lynch to be saying?---That is the primary purpose.

If they are not going to go through the drums, the cyclones and the whims, that purpose ceases to be relevant, does it not?---Your Honour, may I qualify this answer?

OLNEY J: Give the answer as best you can?---Ore is by-passed after being beneficiated slightly by being washed and this is an engineering contingency when there is a breakdown occurring for a short time. You could not absorb very much of that very slightly beneficiated washed ore before you would have to stop the flow if you were sending that direct to the stockpile, because otherwise the grade in the stockpile would sink too much - - -

WITNESS (Continuing): - - - sink too much.

MR SHER: But, Mr Wright, you have overlooked what I told you, have you not - that the documents (and one of them emanates from the men who designed this plant) provide for diversion if the grade of the ore is high, not purely for maintenance but just when the grade of the ore is high. You have overlooked that in your answer, have you not?---Yes.

In that instance, where the grade of the ore is high and that is the reason for the diversion, and it is designed to cope with that, you cannot regard putting the ore through the drums, the cyclones and the whims as the purpose of the beneficiation, can you?---You cannot, because that ore would not need beneficiation.

I am sorry?---That ore would not need beneficiation.

Whether it needs it or not you cannot regard putting it through the drums, the cyclones and the whims as part of the beneficiation process because it is not put through them. That is simple logic, is it not?---That is simple logic for small amounts of high grade which slip in.

Even if it is for a tonne of ore, in respect of that tonne of ore the logic of it leads you to the conclusion that you cannot define the beginning of a process by reference to the end when the end does not exist. That is just straightforward logic, is it not?---I think the plant was built for beneficiation of low grade ores.

Would you please answer the question, Mr Wright?---No.

What does "No" mean?---To your question.

OLNEY J: I think he is agreeing. You said: "You cannot define the - -"

WITNESS: Thank you, yes.

MR SHER: In that case, where you have not got the ore going through the drums, the cyclones and the whims, the beneficiation which takes place cannot be determined by reference to that purpose because the purpose does not exist?---For that minute amount, no.

How do you know it is a minute amount? Have you ever been given any figures?---I can only tell - -

Would you please answer that directly; it is not hard?---I have not.

You have not - thank you. Did you know before I told you that this plant was designed to divert ore if it was high grade? ---I did indeed.

MR SHER: You did?---Sorry - I knew it was built to divert ore.

But did you know it was built to divert ore, amongst other reasons, not for maintenance but when the ore was of sufficiently high grade?---No.

You did not?---No.

In respect of that ore, that is ore for which the plant was designed, diverted before it goes through the drums, the cyclones and the whims, the beneficiation process obviously does not include putting it through the drums, the cyclones and the whims. Do you agree with that?---Yes.

In that event you cannot define the beneficiation beginning by reference to the drums, the cyclones and the whims, can you?---Yes.

You can?---Yes.

Even though they are not put through it and it is not intended to put them through it?---We are talking about 99 per cent of the throughput.

I am not asking you about the 99 per cent; I am asking you about the per cent which does not go throughput, of which you agree you have no figures and whether it is 99 per cent or not you do not know. That is what I am asking you about, Mr Wright; would you direct your answers to that percentage? In respect of that percentage you cannot define the beginning of beneficiation by reference to the drums, the cyclones and the whims, can you?---It is the beginning of beneficiation, indeed it is.

But you cannot define the beginning of it by reference to the drums, the cyclones and the whims, can you?---Not for that amount, no.

No. Where would you define the beginning of beneficiation for that particular ore?---At the wetting.

And why would you do that?---Because there is washing involved.

Yes, but it is not being washed for the drums, the cyclones and the whims, is it - that particular ore?---No.

It is just being washed?---That is correct.

And washing is part of screening, is it not - - -

MR SHER (Continuing): - - - is it not?---No.

It is defined, I suggest to you, by many of the authorities as being part of screening and accomplished by it. Did you realise that?---No.

You disagree with that, do you?---I do.

In any event, in so far as you have agreed with the opinions of Dr Lynch, that you define the beginning by reference to the work completed in the drums, the cyclones and the whims, in respect of ore diverted, you would agree, would you not, that that definition of beginning is no longer appropriate?---I would.

Yes, and until I pointed those matters out to you, you had not turned your mind to that question at all, had you?---No.

Might I take you to Mt Newman? You know Mr Peter Booth?---Yes.

You know that he was, as he says himself in his affidavit, the gentleman directly responsible for the design and construction of the Mt Newman project, including the mine and associated plant, township, railway system and port facility, which was a billion-dollar project. You know that to be the fact?---I think you had better ask Mr Booth that.

You know that because you worked with him, did you not?---The affidavit says that Mr Booth was made project manager in 1971, as I recall, and construction started in 1967.

From 1971 onwards, which is what the affidavit says and you have recalled it accurately, he was directly responsible for the design and construction of the Mt Newman project, was he not?---No.

Well, who was?---Many people, from the general manager down.

Were you?---No.

In any event, he played a substantial part in that, did he not?---A very large part.

You have read his affidavits, have you not?---I have.

Very carefully, I suggest?---I have read them as carefully as I could.

You knew you were going to be giving evidence?---I did.

And you were going to be cross-examined?---I did.

I assume as carefuly as you "could" means very carefully?---Of course.

However, the capacity of different people to read and absorb different things varies.

MR SHER: All I really wish you to tell his Honour is whether or not you took the trouble to carefully read Mr Booth's affidavits?---I did.

I wish to direct your attention to something he deposed to in his second affidavit, in para.4. What he said was this:

> "In the Hamersley affidavits" (he referred to Hamersley there as "HI") reference is made....(reads)....as being involved in the scrubbing rather than the wetting process."

That is the topic about which he is talking and it is the next series of comments to which I wish to direct your attention.

> "This point may be illustrated by considering the wet screen feed chutes ....(reads)....the Tom Price chute and also the Newman chute."

Do you recall when you read his affidavit seeing that exhibit?---Yes, I recall seeing that exhibit.

Could the witness be shown that exhibit, PFB2?
TO WITNESS: Would you look at it? Do you recognise it as the exhibit at which you looked when you read his affidavit?---I do - his second affidavit.

Would you look at it again - - -

MR SHER (Continuing): - - - at it again? Bearing in mind that they are simple and obviously not drawn to scale, very simplistic in outline, do they appear to you to be accurate in depicting both the Hamersley and the Mount Newman wet feeder chutes?---First the Hamersley; I sketched when I went there and remember two rock boxes and one is shown here.

So you think it is wrong, do you?---I do not know. It might have been changed.

Do you think that it might be that the chute you saw in March was different from the one that was seen by Mr Booth? ---I can only say what I saw in March.

Anyway, that drawing of the Hamersley Iron wet feeder chute is not what you saw in March?---No.

Tell me, when did you learn that the chute might have been changed?---I never learned it might have been changed.

It is apparent to you now that it must have been, is it not? ---I am saying merely that that is how I saw it.

I do not quite understand what you are saying, Mr Wright. Are you saying that you might have seen it and it was not there or that you saw it and it was there? What are you saying?---I said in March I saw it. I made a sketch at the time which I have in my briefcase up there showing two rock boxes.

This one shows one rock box?---It does.

Either one of you is wrong or it has been changed?---That will be correct.

You think it has been changed, do you not?---I do not know which.

You do not know which? Have you taken this matter up with the Hamersley people since you gave evidence yesterday? ---I have not.

At this particular time you just do not know whether what you saw was what was seen by others or not?---I believe in my own observations.

Let us not concentrate on the Hamersley one; we will move across the page to Mount Newman, if we may. Is that a fair depiction of the Mount Newman screen feed chute?---I cannot remember.

You cannot remember?---No.

MR SHER: Whether you can remember or not, when you saw Mr Booth's affidavit, did you turn your mind to the question that his affidavit raised including the comparison between the Mount Newman and the Hamersley wet feed chutes?--I did, and I could not remember.

You could not remember? Did you check up at all?---I did not.

Does the drawing of the Mount Newman chute appear to you to be correct?---I cannot remember.

You have no idea?---I have no idea.

So it could be exactly right or it could be totally wrong? ---That is correct.

Do you not think there was some obligation on you as an expert witness offering an opinion about, amongst other things, the function being performed by the chute as to Hamersley to check it out?---No.

You did not think there was any such obligation?---No.

Or any need?---I knew what I saw myself and that is all I - -

The point is that Mr Booth was saying in his affidavit that the description given to the Hamersley chute by these experts with whom you were agreeing was wrong. It was not what they were saying it was. He was saying it was really just a simple wet feed chute, was he not?---Please, would you repeat that?

Was not Mr Booth saying, in effect, that the opinion with which you were saying you agreed about the wet feed chute at Hamersley carrying out a scrubbing operation and designed to maximise scrubbing, was wrong, it was nothing more than a simple wet feed chute?---I believe there is a minor amount of scrubbing.

Mr Wright, I am asking you now about what you apprehended Mr Booth to be saying and I suggest you know full well that Mr Booth was saying that these opinions, expressed not by the designers but by independent experts brought in after the event, were wrong. That is what he was saying. He was saying it by reference to Mount Newman. Is that not right?---I cannot comment on what Mr Booth says.

Mr Wright, did it concern you that a fellow worker from Mount Newman, a man who had been, in your view, one of the designers of this billion dollar plant - - -

MR SHER (Continuing): - - - plant, was contradicting you? Did that concern you?---No.

Did it occur to you that in fairness to the court and the party for whom you were giving evidence, you ought to check out what Mr Booth was saying?---No.

Did it occur to you that it would be reasonable, in view of the opinion you were expressing, to see whether Mr Booth's comment was fair or not?---No, because I am not a metallurgist.

Whether you are a metallurgist or not, you could understand, I suggest, that what Mr Booth was saying in para.4 of his affidavit was, in effect, that this chute at Hamersley was a normal, wet-feed chute, not designed to maximise scrubbing and if it was it could have been done a lot better and did not compare with the Mt Newman chute which was solely designed for wetting. That is what he was saying, was he not?---I would think so.

That is critically important in this case, is it not?---No.

Mr Wright, is not the chute where the wetting takes place, said by Hamersley to be the beginning of beneficiation other than screening?---Yes.

Is not that at the heart of this case?---Yes.

Is not what Mr Booth was saying, was that you and the opinions with which you agree were wrong?---No.

Anyway,you did not check it out?---No.

You did not check out the very plant with which you were associated for years?---No.

And your honest answer is you cannot tell his Honour whether this drawing of the Mt Newman chute is right or wrong?---That is correct.

On that particular drawing, if you look at it, you will see it has sprays in seven different positions?---Yes.

As opposed to two?---As opposed to two jets.

At least six places as opposed to one, according to the drawing, where the feed is going to bounce off a rock ledge or some impediment?---That is correct.

Mr Booth was saying that that particular wet-feed chute with its seven sprays and six ledges was designed to wet the ore and that was what it was designed for and, in effect, nothing else. That is what he was saying, was he not? ---Yes.

MR SHER: You still adhere, do you, to your opinion, expressed by Dr Lynch in the first instance, with which you agree, that the design of the chute on the left-hand side of the page is to maximise the scrubbing effect, notwithstanding that at Newman, with seven sprays and six ledges, it is designed, in effect, solely for wetting? You still adhere to that opinion, do you? ---Your Honour, I did not say that in my affidavits.

OLNEY J: You did not say what?---I agreed that it was for maximising scrubbing.

MR SHER: Do you agree with that proposition?---I believe that there is some scrubbing.

You do not agree then with the proposition that the design of the Hamersley chute is to maximise the scrubbing effect?---No.

Indeed, you would go so far as to agree, I suggest, with this proposition, that if it was designed to maximise the scrubbing effect it would be a lot different than it is - whether it has two rock ledges or one?---Your Honour, that cannot be answered unless I know exactly the type of ore.

You do not know the type of ore, do you?---I do not.

Neither did Dr Lynch, it may interest you to know? Did you know that?---I did not.

Would you agree that nobody could express an opinion about maximising the scrubbing effect on the ore without having detailed information about the characteristics of the ore?---I would.

Then does it come to this - that whether or not the Hamersley feed chute was designed to maximise the scrubbing on the ore is something about which you can offer no opinion at all?---That is correct.

And in so far as your affidavit appears to be agreeing with the expression of opinion that it is designed to maximise the scrubbing effect - - -

MR SHER (Continuing): - - - scrubbing effect, you would say now that if you had said that by adopting what others said you would no longer adhere to that view?---I have not changed my view in the least.

What you are saying is you have never agreed with that view, I take it?---My affidavit stated I agree with the opinions expressed by Dr Lynch in clauses 8 and 9 (I think it was 8 and 9) and the opinions were the first sentence in the first clause and the whole of the second clause.

And you also agree with paras.5, 6, 7 and 8 of Mr Pritchard and 5, 8 and 9 of Dr Batterham?---That is correct.

Mr Wright, you do not know whether what appears in the Hamersley chute is a jet or a spray, do you?---I saw it with my own eyes; it is a heavy jet.

Did it look like a jet or a spray?---Two heavy jets.

How does it compare with what you see in the Mt Newman feeder chute?---Far heavier.

Far heavier, is it? Do you have any statistics or figures or information about what it actually does?---No.

What the pressure is?---No.

The size of the orifice?---No.

The amount of water?---No.

No; it is based solely on this one observation that you made when you saw two rock ledges?---That is correct.

Was your view of the jets obscured by the rock ledge which was above them?---No.

It was not?---At some risk we had to put our heads inside and get dirty.

I see. Did you ask anyone for information about the jets and the pressure of the water and the amount of water and the size of the orifice or anything like that?---I did not.

You did not. Thank you. The washing of fines off lump is part of the object of putting water on the feed, is it not? ---That is correct.

But that of itself is of no value unless you actually separate the products which result from that activity, that washing?---That is correct.

MR SHER: If you do not separate them they might go back together again?---They would go back together and the product would be useless.

So separation is a necessary part of the washing process?---It is.

One is useless without the other?---It is.

Finally, in the course of looking into this matter did anyone draw your attention to the affidavit sworn by Mr Baker, Mr Geoffrey Samuel Baker of Mitchell Street, Ardross?---No.

Do you know Mr Baker?---No.

Mr Baker deposes to having had some practical experience in mining in the state of Western Australia in places east of Marble Bar and in the Pilbara district and the like from 1953 for 17 years. You have some knowledge of the Pilbara district in that time, have you not?---Yes.

You are aware that there were relatively small mining operations on in the Pilbara district in those years?---Yes.

And in many of those small minin g operations there was a wet screening process, was there not?---I wasn't aware of what was happening at those mines.

You do know something about them, do you not? You knew more than the fact that there were some mines there; you knew a bit more than that, did you not?---No.

You did not?---No.

Did you know anything about a manganese mine not far from Port Hedland?---No.

If I suggested to you that there was a manganese mine not far from Port Hedland which had wet screening, that would be something you had never heard of?---No.

Are you saying frankly that you knew there were mining operations in the Pilbara but you had no idea of the processes being used in any of them?---No - sorry, yes; I did not.

Very well.

RE-EXAMINED BY MR HULME QC:

MR HULME: Mr Wright, you were asked yesterday as to mechanical classifiers. Do you remember being asked by Mr Sher about mechanical classifiers?---I do recall.

If one talks of a mechanical classifier, has one automatically said whether the process will be wet or dry?---I am not an expert in the field. I would think that the process would be wet; not being an expert in the field, there may be dry classifiers also.

Do you, yourself, know of any such thing as a dry mechanical classifier?---In my experience I have not come across dry mechanical classifiers.

If with Pilbara ore you desired to separate 30mm to 80mm ore from that part of the steam which was below 30mm - there is a mixed stream of nought to 80 and you wish to separate the nought to 30 from the 30 to 80 - and I ask you to assume that that is all you need to achieve, would that be done wet or dry?---Dry. I beg your pardon; dry assuming it was high enough grade to ship direct.

No; I am not asking you to make any assumptions as to what is to be done. It is just simply, here is a stream of ore and we wish to separate the nought to 30 from the 30 to 80?---Dry.

I now ask you to assume that you want to put the 30 to 80 into a heavy media drum. Do you follow?---Yes.

You have separated it dry and here is your 30 to 80 stream?---Yes.

Is that in a suitable condition to be tipped straight into a heavy media drum?---No.

Why is it not in a condition fit to be tipped straight in? ---Because there are adhering particles of both ore and waste on both lumps of ore and lumps of waste and they would come off into the medium in the drum and contaminate the medium and alter the specific gravity of the medium rendering the process inoperable.

What, then, must be done with the ore before you tip it into the drum in order to prevent that occurring?---It has to be washed to get the adhering particles off.

If you wash it, you have said this morning that you will need to keep the fines separate from the lumps - -?---You must indeed.

How will you achieve that permanent separation?---You have to screen in the wet stage.

MR HULME: (May the witness please have Dr Lynch's affidavit, exhibit 9?) Mr Wright, will you go over to para.6 on p.4?---Yes, I have it.

MR HULME (Continuing): Doctor Lynch says there that the screening part of crushing and screening refers to the separation of material by size rather than to the separation of different kinds of material, although the latter may occur incidentally?---That is correct.

We then go on from that:

> "The addition of water, as described by Mr Langridge has three distinct effects." ——

Do you see that?---I see it.

The first effect, that is the first effect of the addition of water, is to break down the water-active clayey material?---Yes.

Do you agree that that is the first effect - that that is an effect?

MR SHER: Your Honour, I object to this form of re-examination. It is leading and it is very close to cross-examination. The witness has been cross-examined about these matters. In my submission, my learned friend should be careful not to lead and in my submission the better way to ask the witness about this in non-leading form is to ask him what he regards the purpose of whatever it is my learned friend is directing his attention to; but to take him through these matters seriatim is, in my submission, clearly leading. The witness has had plenty of opportunity to consider what Dr Lynch says and indeed has sworn an affidavit saying he has read it and he agrees with it. I object to it, therefore.

MR HULME: I will put it in different form.
TO WITNESS: Would you read that paragraph carefully, with the view of telling his Honour where, in that paragraph, if anywhere, you find Dr Lynch expressing a view as to the importance of sizing, as distinct from a view as to the effects of adding water? Do you follow what I am asking you?---Yes.

Will you please see if you can find anything there where Dr Lynch says anything as to the importance of sizing?---There is no reference to the importance of sizing.

You said yesterday you regard the application of water for the purpose of washing off fines (jets of water) as washing?---I did.

Yesterday afternoon you said that you would regard what happens in the pulping box - - -

MR HULME (Continuing): - - - pulping box as washing with minor scrubbing?---I did.

What is the "minor scrubbing" to which you were referring there? ---I believe that the low grade ore fed to the plant is mainly a mixture of discrete particles of ore and waste produced at shale bands and contacts. I believe I stated that yesterday. The minor scrubbing, therefore, is any loosening of particles of waste adhering to particles of ore which may occur. I think there are few particles of waste adhering to the ore therefore there is only minor scrubbing takes place in the feed chute.

You were asked questions as to whether your views were not somewhat different from those of Allis-Chalmers in relation to wet screening for sizing purposes. Have you seen an instance where Allis-Chalmers have recommended wet screening for Pilbara ore simply for sizing purposes?---No.

If you have a stream of ore which is, let us say, 30 to 80, not washed, fines adhering to it - if you make a chemical analysis you will get a certain result?---Yes.

If you wash off the fines and make a chemical analysis of the lump ore which remains would you get the same chemical analysis or a different chemical analysis?---You get a different chemical analysis.

I think his Honour asked you some questions about the word "ore"? ---Yes.

If you saw a truck coming down from the mine towards the crushers in the ordinary course of routine and someone said "What's in the truck?", what word, if any, would normally be used to describe what was being brought down out of the mine?---Normally, if it was headed for the high grade crusher, you would say "ore".

Let us assume now we have a stream going into a heavy media drum - a stream of material coming along and going in; what would one normally say was being put into the drum? ---Feed.

You have defeated me! Let us assume that out of the drum you have - - -

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MR HULME (Continuing): - - - drum you have the good end and the bad end,shales and clays coming out at one place and something else coming out at the other. How would you normally describe what was coming out of the good end?---It is normally described in two ways. The people in the plant might call them sinks and floats or generally you could refer to them as ore and waste.

You were asked questions about defining the beginning of beneficiation by reference to where it ends. Do you remember?---Yes, I do.

In particular Dr Lynch's statement: "The initial addition of water must be viewed as the first step in a process which those units, that is the drums, cyclones and whims, complete"?---Yes.

If the plant normally operates in a certain mode of beneficiating everything and there are periodic interruptions for maintenance, would you regard what happens during such interruptions as altering the analysis to be made as to where beneficiation begins and stops in that house?

MR SHER: Your Honour, it may be a bit late in the day but I have an objection. My objection is that this really is a matter for your Honour and witnesses really should not have been permitted to say this but at this particular point I do object to this witness being asked that question. In my submission it is a matter for your Honour to determine,what the contract means. This is really just argumentative.

OLNEY J: But witnesses have been giving me the benefit of their wisdom for some time now, Mr Sher, and I think we will allow this witness to continue for what it is worth.

MR SHER: Very well.

MR HULME: I am trying to stay as far from the contract as I can.

OLNEY J: Sooner or later I am going to have to come back to the contract.

MR HULME (TO WITNESS): Mr Wright, that ore which does not go to the drum but has been washed, wet screening following the washing - do you follow?---Yes.

Will the chemical analysis of that ore be different - - -

MR HULME (Continuing): - - - be different from what came into the washing and scrubbing process?---Yes, in my opinion it would be slightly improved.

You have agreed with my learned friend that if it does not go to the drums that process cannot be completed at the drums?---That is correct.

Where would you say in that case the process of beneficiation ends? ---It begins and ends at the washing and screening, but it is of a minor nature only.

OLNEY J: What you are really saying is that the material that comes out has been beneficiated?---Very slightly.

You would say that it has been beneficiated by that process which it has been through?---Yes, your Honour.

MR HULME: You were asked some questions about Mr Booth and the Mt Newman plant?---Yes.

Your Honour will see that what Mr Booth says is that he was directly responsible for the design and construction of the Mt Newman project, including the mine and associated plant, township, railway system and port facilities, that Mt Newman is reputed to be the biggest operation in the world and the project involved an expenditure of about one billion. TO WITNESS: Are you able to tell us when the Mt Newman mine opened?---The mine started producing ore in early 1969. I think the first ore was railed in February 1969, from memory. I might be a month out there.

You were at Mt Newman itself, if would appear, from 1964 to 1968?---No.

When did you come down from Mt Newman to Perth?---That is not correct. I was in Perth from 1964 to 1967. I spent virtually the whole of 1968 on site and then returned to Perth.

So you were chief mining engineer from 1966 to 1968?---That is correct.

In that capacity you were in charge of the development of the mine and the plant - - -

MR HULME (Continuing): - - - and the plant?---That is correct.

Do you remember whether Mr Booth was even there at that point?
---No, he was not.

Indeed your Honour will see he says he does not come to Mt Newman until 1969.
TO WITNESS: When the mine opened and began to send ore, how did the ore get away from Mt Newman?---By railroad.

There was a railroad down to the coast in 1969?---There was.

They now have the ore at the coast; what happened to it there?
---It went through tertiary crushing and screening, stockpiling, reclaiming and shiploading.

Was there a port there?---There was indeed.

The people who were working there - was there a township?---There was.

OLNEY J: Where - at the port or at the mine?---At the port end and at the mine.

They go through Port Hedland, do they not?---Yes, but separate townships for the company.

MR HULME: In the years since then have these things been added to, developed?---Yes, they have been added to continually up until a few years ago.

Turning, then, to the chute boxes and the comparison between them you will remember being asked to compare the two pictures in PFB2?---Yes.

Do you happen to know what size feed the Mt Newman feed chute is built for?---I can't recall clearly; I think it was minus 80.

You think it was minus - -?---Sorry, minus 100 rather than minus 80, but I repeat I cannot recall clearly.

Yes. May the design of your feed chute be affected by what you are putting through it - the size of what you are putting through it?---I feel it would be; my opinion is that it would be.

Are you able to tell us whether you would regard as valid a comparison between a chute built for minus 6mm ore with a feed chute built for minus 80 ore?

MR SHER: It is an interesting but irrelevant question - unless my learned friend is suggesting that is what the chute is at Hamersley, which is not as I understand the case so far.

MR HULME: Whether it is irrelevant will be known when we know more about what ore goes - - this whole purpose of PFB2 is to say: "Look what we're doing at Mt Newman, and we don't even call that scrubbing", and that may well depend on what feed is being put in.

OLNEY: The proposition, as I understand it, is that the feed chute and pulping box at Hamersley is designed for minus 6mm ore; that seems to be implicit in your question, does it not - otherwise it does not arise out of cross-examination?

MR HULME: I am covering the contingency of the position being that the Mt Newman chute is used only for minus 6mm ore.

OLNEY J: Mt Newman?

MR HULME: Yes.

OLNEY J: Oh - I was told Mt Newman was designed for minus 100.

MR HULME: Yes. Mr Booth will be able to explain the flow chart which we have marked for identification. I am covering the contingency that this feed chute is used for minus 6 with ore that Mr Booth has said is very hard to wet - or he is going to say it is very hard to wet - and that it may well be a very suitable one for that but that does not throw light on the comparison. I am simply saying, if you are asked - -

MR SHER: I do not persist in the objection. I took it, I think, exactly the same as your Honour did. I thought my learned friend was suggesting that Hamersley was for minus 6 - -

MR HULME: I do not understand,at present, the objection.

OLNEY J: The objection has now been withdrawn because both Mr Sher and I now understand the line of your questioning which we did not before.

MR HULME (TO WITNESS): Does the validity of comparing two different chutes depend on the feed for which each of those two chutes is intended to be used?---Yes. I repeat, I am not a metallurgist. I could not design a chute. There are quite clearly different ores, different sizes, different types of ore which require different designs.

WITNESS WITHDREW

MR HULME: Your Honour, I will ask Mr Callaway to call the next witness.

ROBERT GEORGE HORSEMAN, sworn:

EXAMINED BY MR CALLAWAY:

MR CALLAWAY: Mr Horseman, is your full name Robert George Horseman?---Yes.

Doyou live at 16 Norman Street, Fig Tree Pocket, Queensland?---Yes.

Are you a mining consultant?---Yes.

Did you swear an affidavit in these proceedings on 29th August this year?---Yes.

(Could Mr Horseman be shown his affidavit, please?) Mr Horseman, would you look through that document to check that it is your affidavit and that that is your signature?---Yes.

Are the contents of that affidavit true and correct?---Yes.

Your Honour, I tender that affidavit.

EXHIBIT EXHIBIT 22 .... Affidavit of R.G. Horseman dated 29th August 1982.

MR CALLAWAY: Mr Horseman, in the affidavit you set out your background referring to your experience in iron ore beginning in 1944 and then from 1948 to 1967 in coal production for iron and steel-making operations and then again in iron ore, manganese and coal. From 1972 to 1976 you were the executive director - - -

MR CALLAWAY (Continuing): - - - executive director of Mt Newman Mining Company Pty Ltd?---That is correct.

Could you look for a moment at para.1(c) of your affidavit, on p.2, where it says:

> "In both places coal production was entirely....(reads).... and industry usage and terminology."

To what industry are you referring in that sentence? ---The iron ore industry.

Then in para.(e) on p.3, towards the end of para.1(e), you say that you frequently travelled overseas on marketing missions to Japan. Approximately how many of those were there?---I was overseas in that capacity approximately 50 times.

The sentence continues:

> "and technical appraisal visits to Europe, North America, Africa and South America, where I visited iron ore mines and processing facilities."

Would you tell his Honour what sorts of mines and/or facilities you visited in Europe, North America and Africa?---In Europe I visited coal mines. In North America I visited nickel, mines, uranium mines; I visited a mine at Minetrona. In Africa I looked at some coal and some copper and in South America I looked at the iron ore operations in what is known as "the iron quadrangle" north of Rio de Janeiro.

Then in para.2 you set out the affidavits which you had read at the time you swore your own affidavits and you refer to having inspected Hamersley's facilities at Tom Price in August of this year. Going on to para.3 in the first line you refer to your personal knowledge of industry usage in Australia. To what industry are you referring there?---I was referring to the iron ore industry.

You depose that from that knowledge of industry usage in Australia, the process described in para.9 of Mr Langridge's first affidavit would not have been described in 1962 and would not be described now just as "screening" - spraying the ore with large quantities of water and tumbling it in the pulping box and on the screens is a cleaning process usually described as washing?---Yes.

MR CALLAWAY: In that part of your affidavit you talk about the word "screening". In iron ore industry usage, is screening a word with a fixed meaning divorced from context?---No, it is not.

In industry usage, what, if anything, was the meaning of - - -

MR CALLAWAY (Continuing): - - - of "screening" in relation to Pilbara ore in the early 1960s?---Whenever screening was referred to it would be referring to dry screening.

Why was that?---Firstly, the ore was amenable to dry screening; dry screening achieved the purpose and the use of water on the screens then was not considered necessary and indeed it was an expensive medium to use and because it was not necessary it was not used.

OLNEY J: Just wait a moment: The first iron mine in the north was Goldsworthy; that is right, is it not?---Yes.

I know when they started production, in 1967, but we are talking about 1962; were there any iron mines in production in 1962 in the Pilbara?---There were none in the Pilbara but there were elsewhere.

So there would not be any peculiarly Pilbara usage in 1962?---There was no peculiar usage in 1962.

No - so if we are trying to find out what the usage of terms is we would be looking at the Australia-wide or world-wide industry rather than the Pilbara-wide industry, would we not?---Yes.

MR CALLAWAY: I am sorry if the way in which I asked the question appeared misleading.

OLNEY J: It did seem to suggest that there was some established Pilbara usage in 1962, or the early 1960s, you said.

MR CALLAWAY: Yes. I was only trying to give the witness a context, your Honour; the witness having said you needed a context I was trying to say in relation to Pilbara ores in the early 1960s. I did not mean to imply that there were iron ore mines in active operation in the Pilbara in the early 1960s.
TO WITNESS: Are there circumstances in which a person might describe the process which Mr Langridge describes by using just the word "screens" or just the word "screening"?---Yes. Prior to the advent of the beneficiation plants all screening in the Australian iron ore industry was dry screening, and it was simply referred to as "screening". Later, with these beneficiation plants where there was wet screening, it was referred to in that context as "screening"; it seemed superfluous for anybody to say "wet screening" in an area where it was wet; it would just be referred to as "screening" in that context.

Is there anything you want to clarify about that, Mr Horseman? You said that all screening was dry screening?---All screening in the iron ore industry in Australia prior to the arrival of these beneficiation plants was dry screening.

MR CALLAWAY: To what date are you referring when you say "prior to the arrival of these beneficiation plants"?---Well, prior to the late 1962 - - 1970, I think, was the first wet process.

Going back to your affidavit, after the sentence "spraying the ore with large quantities of water and tumbling it in the pulping box and on the screens is a cleaning process usually described as 'washing'", you continue:

> "It is designed to achieve results quite distinct from those obtainable or expected from mere sizing."

Would you tell his Honour in your own words what the distinct results are to which you are referring there? ---Yes. I am not a processing expert, your Honour, but clearly in simple terms as I see it the ore comes into the system - -

MR HEEREY: This witness seems to have prefaced his answer by a comment which makes his answer inadmissible, your Honour.

OLNEY J: He can go so far as to say what he knows from observation and his own knowledge. He has disqualified himself from giving opinions on matter in which he says he is not an expert. I think so far he probably has not gone too far because his background does, I think, qualify him to tell me what he has observed and what he knows from practice. He probably cannot go further than say what the purpose of the practice is.

MR HEEREY: Yes; that really lay behind my objection - he was directed towards a sentence of his affidavit which really expresses an opinion; it is expressing a view as to what the purpose of this was - - -

MR HEEREY (Continuing): - - - of this was.

OLNEY J: Mr Callaway, I think there is some merit in that objection in view of the witness's own prefatory comments.

MR CALLAWAY: Your Honour, the witness, of course, has never claimed expertise in mineral circuitry or mineral processing and the only expertise that he claims in his affidavit is industry usage. The question was asked on the basis that the answer was merely a footnote to what the witness says about industry usage and the use of the words "screening and washing". It is not designed to elicit an expert opinion on the purpose of the process. It is a matter of observation, in my submission.

OLNEY J: I think the sentence to which you drew his attention is saying that it, spraying, is designed to achieve results and really he started by saying he is not an expert so he is only giving his non-expert opinion on what spraying is intended to achieve.

MR CALLAWAY: I will not press the question, your Honour.
TO WITNESS: Then, Mr Horseman, you say:

> "According to industry usage
> the process were and are washing
> and screening....(reads)....is
> in the pulping box."

Mr Horseman, does the word "upgrading" have a meaning according to industry usage?---Yes.

Would you tell his Honour what that meaning is?---The meaning is attention that you give to an ore to improve its quality to make it more readily saleable.

Did upgrading have a meaning in industry usage in or about 1962?---Yes. The word "upgrading" was used in 1962.

What was its meaning in industry usage in 1962?---It would mean giving an ore some special attention to make it a better product for the salesman to sell.

Is beneficiation a word which has a meaning according to industry usage?---Yes. It has a meaning. It comes under the umbrella of upgrading but refers specifically to taking lower grade ores and improving them as a product for sale.

In 1962?---There was no talk in 1962 of the beneficiation as we know it now.

I am not asking you to describe what actually happened or did not happen in 1962. Was the word "beneficiation" a word which had a meaning in industry usage in or about 1962?---Yes, it would have.

MR CALLAWAY: What was its meaning then?---It would have meant taking lower grade ores and improving their quality to the extent that they were capable of being placed on the market.

Going back to that last sentence of para.3 of your affidavit where you say you agree with the view that where a process of beneficiation other than crushing or screening takes place is in the pulping box, I want to ask you something now different - - -

MR CALLAWAY (Continuing): - - - now different. Where, according to your knowledge of usage, would you say that beneficiation begins at Tom Price? I would invite you to use the isometric drawing and stand up and go across to it. That will assist you to answer the question.

MR HEEREY: Again, your Honour, we have a problem. The witness admitted he is not an expert in the field of processing.

OLNEY J: Yes. I think this witness's qualification to give evidence probably does not take him to giving the same expert testimony as the other, professionally qualified people like Dr Lynch and others, Mr Callaway.

MR CALLAWAY: Your Honour, I was careful to ask the witness where, according to industry usage, he would say beneficiation begins, as opposed to this concept of beneficiation other than crushing or screening. Mr Horseman has just given evidence as to the meaning of beneficiation in industry usage, now and in 1962. I am only asking him to apply that industry meaning to the isometric drawing - no more.

OLNEY J: Very well. Go ahead with the question on that basis?

MR CALLAWAY (TO WITNESS): Would you use the diagram and, confining yourself to industry usage, would you tell his Honour - -

OLNEY J: Could we just perhaps make it clear in my mind as to whether we are talking about current industry usage or 1962 industry usage, because as I understood it the term was one which had no Australian context, as it were, in 1962? Presumably, the witness is talking about the current usage of the term?

MR CALLAWAY: Yes, although I understood the witness to say - - he gave a meaning of beneficiation according to usage now and I then asked him about 1962 and it was my fault for asking an unduly short question. I then explained to the witness that I was really asking just the same question placed back in 1962 - whether it had a meaning. As I apprehended it, he gave substantially the same answer.

OLNEY J: He did indeed,say the word meant that same. That is understandable, but now we are really applying his practical - - when you are talking about usage and where something in a process begins, he can only it to individual processes, which is what you have asked him to do. You are saying "In this particular process".

MR CALLAWAY: Or plant, your Honour, yes.

OLNEY J: That is all right, as far as it goes.

MR HEEREY: Before you leave this area, your Honour, I would persist in our objection. There seems a clear distinction, in our submission, between a man who is, no doubt, knowledgeable in a particular industry but disclaims any expert knowledge of the processes that take place in that industry, in the sense of technical or engineering or other disciplines - - for example, a man might be very experienced in the motor car trade but have no engineering or mechanical background and it might be legitimate for him to give evidence about what words mean but it would not, in my submission, be admissible to ask him to analyse some piece of machinery or equipment and give an opinion as to its nature or where certain processes commence or end, and this witness, in my submission, is on the other side of that line. Apparently he says: "I've been in the industry and the words are used, and this is the sense in which they are understood as being used". That is unobjectionable, but then he is taken to a technical drawing and he is asked, in essence, to analyse that and to state what is happening and where certain processes begin, and that is a matter, in my submission, not within the expertise to which he deposes.

OLNEY J: Yes, I take the point. I think this witness can say: "I am an iron ore industry man; I have been for many years. I know about beneficiation plants because we use them in the industry and as far as I know in the trade we say beneficiation begins here". I think that is legitimate for him. The weight that one attaches to it is another matter. I will allow Mr Callaway to proceed.

MR CALLAWAY: If your Honour pleases.
TO WITNESS: Just to refresh your memory, you told his Honour the industry meaning of "beneficiation"?---Yes.

I was about to ask you, and I ask you now, with the aid of the diagram to tell his Honour where beneficiation in that sense - not beneficiation other than crushing and screening but beneficiation - begins?---In my opinion the beneficiation other than crushing and screening - -

OLNEY J: No, we do not want that. We want to know where you, as an iron ore man, would say in that plant beneficiation commences?---Yes, I understand the question. The answer to that question is that the beneficiation commences here.

That is when you take the ore from the primary crusher?---Yes.

MR CALLAWAY: What is that piece of machinery there, Mr Horseman?
---In this area there would be a grizzly.

Thank you.

SUPREME COURT WA WESTERN AUSTRALIA

DOCUMENT 2* - Plaintiff's Evidence
Evidence of Robert George Horseman
Examination in Chief

CROSS-EXAMINED BY MR HEEREY:

MR HEEREY: You are aware, I take it, in general terms of what has been described as the heavy media concentration process which takes place in drums and cyclones and whims at Tom Price?---Yes.

Would it be correct to describe that process as a gravity concentration process?

MR CALLAWAY: Your Honour, I object to that. My learned friend Mr Heerey correctly pointed out that the witness has not claimed expertise in processes, and objected even to the description of something as general as beneficiation.

In my respectful submission my learned friend would have to himself lay a foundation by suitable questions before he could ask a question which is even further along the line than the one which was objected to when I asked it.

OLNEY J: Yes. I think when counsel cross-examines a non-expert witness on a technical matter he leaves himself open to getting a fairly obvious answer.

MR CALLAWAY: Would your Honour give me leave just to add one thing to that, because I did not make my objection altogether clear?

OLNEY J: Yes.

MR CALLAWAY: In my submission no witness, even under cross-examination, can express an opinion as opposed to factual evidence unless somebody has laid the appropriate foundation.

OLNEY J: Yes, you are quite right.

MR HEEREY: I will rephrase the question, sir.
TO WITNESS: You recall the process to which I have referred; is that referred to in the industry as a gravity concentration process - - -

MR HEEREY (Continuing): - - - concentration process?---Yes.

Or a concentrating process?---Yes.

On my instructions, Mr Horseman, the process of that nature was first used on an experimental basis in relation to the processing of iron ore in the United States in 1938. Are you aware of that or not?---I could not respond to that.

I am also instructed that the first commercial operation of such a process occurred in a plant at a place called Merritt in the United States in 1939. Are you aware of that?---No.

Are you aware that the process was in operation by the time the Second World War had concluded?---I cannot answer that truthfully. I am not aware.

OLNEY J: You do not know whether you are aware of not or you are not aware?---I am not aware of that, truthfully.

MR HEEREY: There has been evidence in affidavits filed by witnesses for the defendant that the process was quite well known some years before 1962. Would you agree with that?---Yes. I would be aware that it was prior to 1962.

OLNEY J: Are we talking about the iron ore industry or the mining industry generally?---I am talking about the mining industry generally.

MR HEEREY: And its application to iron ore or do you not know? ---I am not clear what that question is.

I am sorry; it was a bad question. It is not surprising it is not clear. Are you able to say whether or not the use of a heavy media process in relation to the processing of iron ore was known before 1962?---No, I am not able to say that.

One way or the other?---No.

(May the witness be shown exhibit 17, your Honour?)

OLNEY J: That is the extract from Pryor?

MR HEEREY: Yes, your Honour. May the witness be shown the volume itself if it is available?
TO WITNESS: Are you familiar with this work, Mr Horseman? ---No, I am not.

Have you seen it before? Perhaps my friend could show you the volume?---No, I have not seen this.

MR HEEREY: Perhaps I might short-circuit this exercise a little by - - -

MR HEEREY (Continuing): - - - a little by asking, before I take you to the work in general, this: As I understand it from your evidence in-chief to Mr Callaway, the term screening can comprehend both wet or dry screening, depending on the context in which the word is used?---Yes.

Can you look at the first page of that exhibit, p.179? You see there is a chapter headed "Industrial sizing and sorting"?---Yes.

There is a definition of screening and about 11 lines down the first paragraph the author says:

> "Screening is only used for comparatively coarse material ....(reads)....with a long-ranged dry feed subject to the screening."

Do you see that passage?---Yes.

Does that convey to you the understanding that the author is talking about wet screening as one particular type of screening?---Yes.

He then goes on to give some purposes for which ore may be screened. You see the four lettered items there? ---Yes.

Item (d) is to present a correctly-sized feed to a concentrating process?---Yes.

Would you agree that that is a fair description of the purpose for which the wet screens at Mt Tom Price are used?

MR CALLAWAY: I object to that, your Honour. That is almost identical to the question which my learned friend successfully objected to when I asked about a sentence that included the word "designed". This is precisely what the witness does not claim to be qualified in, and it is also an opinion that is sought.

OLNEY J: Yes, I think he is right.

MR HEEREY: Yes. (TO WITNESS): I will just take you quickly through the chapter there. Can you go to p.185? ---Yes.

You will see there is a sub-heading "Screening machinery"?---Yes.

Turn over to p.186, at the top of the page, where, after having spoken about grizzlies, the author goes on to say that the general types of separating device are presented schematically "thus" - and you see a kind of family tree there, as it were?---Yes.

MR HEEREY: Would that seem to indicate that,in the kingdom of screening, wet and dry screens are of equal rank?---They are on the same line.

OLNEY J: Does that mean they are brothers or cousins?

MR HEEREY: He goes there to deal with trommels. At the bottom of the page he speaks of a trommel which can be used wet or dry. Do you see at p.187 at the beginning of the second paragraph"Shaking screens usually worked dry and chiefly in the sorting of coal"? That is a field in which you have great experience, of course, is it not? Are you aware of shaking screens?---Yes.

When the author says they are usually worked dry, does that convey the meaning to you that they are sometimes worked wet? All right. Will you go to p.192?---Yes.

You see the heading there "Wet screening" with the word---

MR HEEREY (Continuing): - - - the word "wet" in inverted commas? ---Yes.

Then the author commences his discussion of that by saying that if the ore can be simultaneously held in suspension and given screening action the adverse effects of specific surface friction are reduced, so would you agree he seems to be there speaking of screening with the application of water?---Yes.

Are you aware as a matter of ordinary English usage, or would you agree, that sometimes inverted commas are used when the author wants to convey the impression that "this is a name which is used but I don't want to be taken as agreeing with it necessarily myself"?

MR CALLAWAY: Your Honour, I object to that, too. The witness cannot be asked questions about ordinary English usage.

OLNEY J: No. Mr Heerey, I do not really think that that is a question - -

MR HEEREY: Yes, very well.

OLNEY J: You will be interested to know that there is a decision of the full court of this state on the use of inverted commas in a document - not that it would help you at all.

MR HEEREY: That is a very tantalising hint, your Honour!

MR CALLAWAY: I have had the advantage of reading it, your Honour; I will give the reference to my learned friend.

OLNEY J: It was in the Workers Compensation Act, that is why it would not help you, Mr Heerey. I do not think that helps anybody!

MR HEEREY (TO WITNESS): If you would just turn quickly over to p.194 you will see a much-discussed device in this case, Mr Horseman, the sieve bend. Are you familiar with sieve bends, or have you seen sieve bends?---I have seen sieve bends.

Are they screens in your view?---Yes, I see them as screens.

You will now be shown exhibit 6. Those are a number of annual reports of Hamersley Iron, as they no doubt appear on their face. I take you to the 1976 one; would you turn to p.11? If you would just hold that up. I think we have been told in the evidence that that is a photograph of a model of the concentrator plant at Mt Tom Price; does that seem correct to you?---Yes.

MR HEEREY: On the right-hand side of that picture there is something labelled "screens". Do you see that?---No, I cannot find that.

It is difficult for me to direct you, I am afraid, because I have a photocopy here - - -

MR HEEREY (Continuing): - - - photocopy here, but if you would just hold that up? Do you see the white panels in the top right-hand corner of the photograph?---Yes.

Underneath that; I think you just had your finger on it then? ---Yes, "screens".

Yes. Is that a model of what is now the building where the wet screens are installed?---It looks like it to me.

If you look at the text on p.11 there is a description of the process which is proposed to be introduced. Do you see the third paragraph from the bottom: "Ore will be withdrawn from the primary stockpile and separated into four basic sizes..."?---Yes.

And: "The large size fraction will be crushed in all product size by the secondary and tertiary crushers without prior concentration. The crushed product will be combined with some of the lump ore from the high grade plants on a new stockpile load-out facility and the intermediate size fraction 80 to 6 will be treated in the heavy medium drum separator plant, the coarse concentrate produced under those crushings all being transferred to the lump stockpile". Would those passages which I read to you convey to somebody with knowledge of the industry such as yourself that what was proposed was the installation of a wet concentration process or a heavy media separation process?---Yes.

Where the word "screens" in the picture is used to indicate that particular building in the model, would that convey to an informed reader such as yourself that the screens to be installed in that building at the very least would not necessarily be dry screens?---I can't say that from this picture; it simply says "screens" on the picture.

Yes. Would you take that as conveying that it could be either dry screens or wet screens?---I would take it to mean wet screens.

Yes, because it was obvious there was a wet concentration process? ---Yes.

Indeed, is this not really an example of the very thing you mentioned in your evidence in-chief, that it would be in a way superfluous to describe it as "wet screens" because the informed reader knows that there is a wet concentration process?---Yes.

Would you just turn to the 1978 report?---Yes, I have it.

Would you turn to p.12? Does that have a photograph on it? Would you just hold it up? Yes. Does that appear to be a photograph of the concentration plant as built

at Tom Price?---Yes, it is.

MR HEEREY: The caption down in the bottom left-hand corner indicates "Concentrator plant at Mt Tom Price. Foreground from left, water storage, screening plant, secondary and tertiary crushers". In the same way as you have said that the 1976 report with the photograph of the model would convey to an informed reader that wet screening is involved, would you say that about this picture of the actual plant?---Yes.

Do you know Mr Herkenhoff?---No, I have never met Mr Herkenhoff before yesterday or the day before.

You know he has sworn an affidavit and filed it in these proceedings?---Yes, I have been told that.

OLNEY J: Just before you re-examine, Mr Callaway:

Mr Horseman, you talked about beneficiation as taking lower grade ore with a view to increasing its quality for the purpose of marketing it?---Yes.

You may have heard me ask the previous witness a question this morning about what - - -

OLNEY J. (Continuing): - - - this morning about what is it that you call iron ore - when it comes out of the ground or when it has been screened, grizzlied, or what?---My opinion of iron ore is a material that is capable of direct sale, or with a certain amount of treatment afterwards is then capable of a sale.

So it is something which is capable of immediate sale?---Yes.

Or being converted, as it were, for sale as iron ore?---Yes, provided the cost of the mining plus the cost of the conversion does not exceed what you can get on the market.

You would never sell it then, would you?---Then it is not ore.

So what has been called the "feed" that goes into the Hamersley beneficiation plant or concentrator - you would class that as iron ore?---In the industry they refer to it as "low-grade ore".

The dirt that comes out of the ground that is ready for direct shipping is high-grade ore?---Is high-grade ore.

But it is all iron ore?---It is all iron ore, yes.

RE-EXAMINED BY MR CALLAWAY:

MR CALLAWAY: Mr Horseman - -

WITNESS: Excuse me, could I qualify that? We also got some ore, some iron in a waste which was dumped on the mullock heap. That was very low grade, incapable of being sold or incapable of being upgraded. That was not referred to as ore, even though it had a fair quantity of iron in it.

OLNEY J: Yes, I follow that.

WITNESS: That was the third category.

MR CALLAWAY: My learned friend Mr Heerey asked you about sieve bends and asked you whether you had seen sieve bends and you told him that you had?---Yes.

Could you tell his Honour where you have seen sieve bends?--- I have seen sieve bends mainly in my coal-mining experience and I saw the sieve bends at the Tom Price concentrator.

In your coal-mining experience, were they being used in relation to coal?---Yes.

What description, if any, other than sieve bend, would you apply to a sieve bend?---We referred to them as "de-watering screens".

WITNESS WITHDREW

IN THE PRIVY COUNCIL NO. 28 of 1985

ON APPEAL
FROM THE COURT OF THE SUPREME COURT OF WESTERN AUSTRALIA

B E T W E E N :

HAMERSLEY IRON PTY LIMITED	Appellant (Respondent) (Plaintiff)
- and -	
1. THE NATIONAL MUTUAL LIFE ASSOCIATION OF AUSTRALASIA LIMITED, 2. LANGLEY GEORGE HANCOCK, 3. ERNEST ARCHIBALD MAYNARD WRIGHT, 4. HANCOCK PROSPECTING PTY LTD, 5. WRIGHT PROSPECTING PTY LTD AND 6. L.S.P. PTY LTD	Respondents (Appellants) (Defendants)

RECORD OF PROCEEDINGS

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