



PATENTS ACT 1977

APPLICANT	Senergy Holdings Limited
ISSUE	Whether patent application GB0917689.2 complies with section 1(2)
HEARING OFFICER	H Jones

DECISION

Introduction

- 1 The application relates to a method of modelling oil and gas production from a subterranean region. It was filed on 9 October 2009 and published as GB2474275 on 13 April 2011. A divisional application, GB1413221.1, was filed on 24 July 2014.
- 2 The first examination report was issued on 27 August 2013 in which the examiner set out his objection that the invention as claimed falls within various of the exceptions to patentability set out in section 1(2). This report also included objections to plurality of invention and to a lack of novelty or inventive step. The application was amended on 28 July 2014 with the aims at least of establishing unity of invention and of overcoming the objection to lack of novelty. However, these amendments and subsequent letters from the applicant failed to resolve the section 1(2) objection, which was restated in two further examination reports, the last of which was issued on 31 July 2014.
- 3 The period for putting the application in order was extended to 27 December 2014 by the filing of Forms 52 and has subsequently been extended to 27 February 2015. Further searching with regard to novelty and inventive step has been deferred pending resolution of the section 1(2) objection.
- 4 The applicant requested a hearing to decide the issue of whether the invention is excluded from patentability under section 1(2) for being a computer program, a mathematical method and/or a mental act. The hearing was held on 16 December 2014 at which Mr Douglas Rankin and Mr Graham McGlashan of Marks & Clerk LLP attended as patent attorneys for the applicant.
- 5 Even though this decision does not directly relate to the divisional application, my conclusion as to whether there is anything patentable in the parent application will obviously have implications for handling the divisional application.

The invention

- 6 The application relates to a method of modelling production from a subterranean region with reference to a wellbore and surrounding formation, such as may be encountered in oil and gas exploration and production. The invention is provided in the context of assessing and predicting the likely performance of oil or gas flow from a formation. The specification describes that such a method helps with appraisal of development prospects, well planning and reliable prediction of true well and field value, to permit sensible and informed choices to be made during the design phase of a well to ensure maximum well output.
- 7 An amended set of claims was filed on 28 July 2014 having a single independent claim, claim 1, as set out below, which it was agreed would be the focus of this decision:

1. A method of modelling production from a subterranean region comprising a wellbore and surrounding formation, the method comprising:

providing a computational model of the subterranean region, the computational model comprising a wellbore and surrounding formation;

modelling one or more zones in the surrounding formation, the or each modelled zone surrounding the modelled wellbore;

associating a particular viscous resistance with each modelled zone; the viscous resistance derivable from altering a sample material associated with the formation and exposing the sample material to one or more conditions such that the sample material is subjected to formation damage; and

modelling the production through the one or more modelled zones into the modelled wellbore using the associated viscous resistance.

- 8 Figure 1 of the application, reproduced below, represents a cross-section of a computational domain portion which includes both a wellbore 12 and surrounding formation 14.

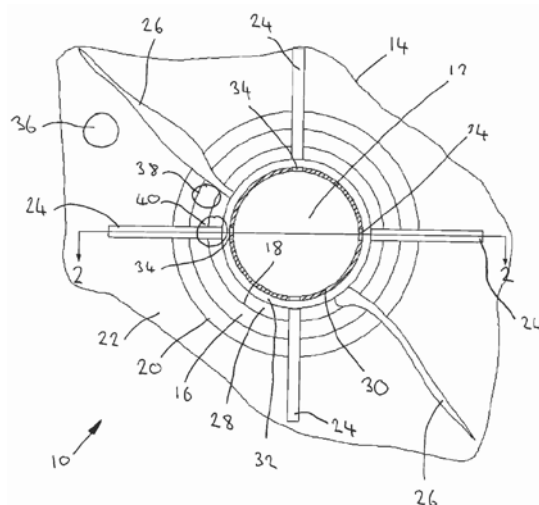


Figure 1

The law

- 9 The relevant provision of the Act in relation to excluded inventions is section 1(2), which reads:

1(2) It is hereby declared that the following (among other things) are not inventions for the purposes of this Act, that is to say, anything which consists of -

- (a) a discovery, scientific theory or mathematical method;*
- (b) a literary, dramatic, musical or artistic work or any other aesthetic creation whatsoever;*
- (c) a scheme, rule or method for performing a mental act, playing a game or doing business, or a program for a computer;*
- (d) the presentation of information;*

but the foregoing provision shall prevent anything from being treated as an invention for the purposes of this Act only to the extent that a patent or application for a patent relates to that thing as such.

- 10 In order to decide whether an invention relates to subject matter excluded from patentability under section 1(2), the Court of Appeal has said that the issue must be decided by answering the question of whether the invention reveals a technical contribution to the state of the art (cf *Symbian*¹, *Aerotel*²). This approach to the analysis of the requirements of section 1(2) is consistent with the approach taken by the attorneys in their arguments with respect to the present application.

Arguments and analysis

Determining the actual contribution

- 11 In line with the Court of Appeal's reasoning in *Symbian*, the first step in deciding whether the invention reveals a technical contribution to the state of the art is to determine the contribution made by the invention. It is clear from *Aerotel* that this determination needs to be made by considering the problem said to be solved, how the invention works and what its advantages are.
- 12 The application suggests that it is known to perform computer simulations of a well in an attempt to evaluate virtual flow conditions and to provide an estimate of well performance. It says that existing techniques are restricted to analytical approaches which rely on solving analytical equations by assuming certain simplifications, which make it possible to obtain simple and fast answers. The simplifications made during prediction analysis based on analytic approaches are often driven by a lack of understanding of the physical conditions within both the formation and the wellbore, and take no account of the effect the creation of the wellbore has on the formation. For example, some analytical approaches simply assume homogeneity within the formation, and often ignore features associated with the wellbore and its impact on formation conditions. It is said that these analytical approaches usually produce poor predictions, and are often used to identify possible general trends associated with the wellbore rather than virtual data which is considered to accurately reflect reality. Mr

¹ *Symbian Ltd. v Comptroller-General of Patents* [2008] EWCA Civ 1066

² *Aerotel Ltd v Telco Holdings Ltd and Macrossan's Application* [2006] EWCA Civ 1371

Rankin referred to the use in the prior art of a variable called the “Skin Factor” to simplify the analysis.

- 13 At the hearing, Mr Rankin suggested that the contribution made by the invention is a method of designing a wellbore that includes simulation of performance of the wellbore using a simplified approximation for wellbore conditions in the form of viscous resistance. Mr McGlashan added that the invention enables a well to be designed better, operated better and more accurately. I suspect the reason for describing the contribution in this way was to highlight any similarity between the present invention and the one considered by HHJ Birss QC in *Halliburton*³ which was found to be allowable. I shall return to the judgement in *Halliburton* later in this decision.
- 14 As it stands, the invention defined by claim 1 makes no reference to the use of the method of modelling wellbore production in either the design or in optimising the design of a wellbore, so I have some difficulty accepting this assessment of the contribution made by the invention. However, there appears to be sufficient basis in the specification to support the use of modelling wellbore production in the design of a wellbore should it become necessary to amend the claims, e.g. at line 15 of page 1, at line 7 of page 3 and at lines 24-25 of pages 15.
- 15 As Mr Rankin himself explained, the present invention is concerned with providing an improved model of fluid flow from a wellbore and in using this model in the design of an optimum wellbore. It would seem from the application that an initial design for the wellbore would have to be produced before modelling can be performed; this initial wellbore design can then be modified in an iterative fashion based on the results of the modelled oil or gas production. Therefore, rather than being a method of designing a wellbore per se, the invention provides at best a method of optimising the design of a wellbore using a more accurate model of production. Secondly, the computational method set out in the application is not intended to specify the optimum design of a wellbore but is merely employed as a tool to allow such optimisation to take place. In other words, the computational method of the invention provides a better estimate of production from a particular design of wellbore which then allows a user to modify the design and to investigate differences in production performance. It is the user who modifies and improves the wellbore design based on results derived from the model of wellbore production.
- 16 I have considered whether physical testing of various wellbore parameters relied upon by the model forms a part of the contribution made by the invention, however, it is clear from the application that a direct link to a specific testing method is not an essential feature of the invention.
- 17 On the basis of the description of the invention set out in the application and as defined by claim 1, I consider the contribution made by the invention to be an improved method of computationally modelling a combination of a) a theoretical or real wellbore and b) modelled subterranean materials having a parameter assigned thereto, wherein the model predicts wellbore fluid flow. This description of the contribution has been formulated to acknowledge that the method is operable with the wellbore representing proposed configurations, without any contribution in terms of means or a requirement for it to become real and non-theoretical in nature.

³ *Halliburton Energy Services v Comptroller General of Patents* [2011] EWHC 2508 (Pat)

- 18 My assessment of the contribution refers to a parameter assigned to subterranean materials. This parameter has been described as “viscous resistance” in the specification, and although it was stated by the attorneys that viscous resistance is a term in the art, no specific or rigorous definition of viscous resistance or of how it may be derivable has been provided in the specification. It would seem that it provides a convenient parameter which, in an unspecified way, is derivable as a simplification to simulate actual or expected properties of whatever items and materials may be around the wellbore. Considering the application in greater depth, a passage such as “the viscous resistances being derived from formation sample material having been subjected to different amounts of formation damage” comes close to introducing a further element to the contribution in terms of sampling and damage being imposed on samples. However, since substantial details of such sampling and such damage imposition have not been provided, such a passage provides no further element to what is actually contributed by the invention.
- 19 In summary, I assess the contribution made by the invention to be an improved method of computational modelling production from a wellbore fluid flow, albeit with possible refinements in terms of what the parameter is intended to represent and in terms of the number of subterranean zones to which a corresponding value of the parameter is assigned. The next step is to decide whether this contribution is technical or whether it lies wholly within matter excluded under section 1(2).

Whether the contribution is excluded and non-technical

- 20 I will first consider whether the invention is excluded as a mental act. The decision in *Halliburton* confirmed that the mental act exclusion is to be interpreted narrowly. It only covers acts that are carried out by “purely mental means” and does not extend to those which are merely capable of being performed mentally. It was considered that the aim of the exclusion was to prevent patents being granted which could be infringed “by thought alone”. It was also specifically outlined that, with this interpretation, a claim carried out on a computer could not be excluded as a mental act. Therefore, if a computer, or any other hardware, is involved in the invention, it will not be excluded as a mental act. The present invention inherently involves computing. Claim 1 confirms this by use of the term “computational model”. Therefore, following *Halliburton*, I cannot exclude the invention as being a mental act.
- 21 I will secondly consider whether the invention is excluded as being a mathematical method. Computational flow analysis necessarily involves mathematics; however, the specification makes clear that the analysis involved in this invention uses known mathematical methods which are applicable to fluid flow analysis through and between different zones. The improvement made by the invention arises not from the mathematical method employed or from the parameters being modelled but from the degree of granularity at which the model operates (or the number of subterranean zones to which the viscous resistance is assigned). The invention is aiming to solve a computational problem, a problem of balancing computer resources and the time available to undertake a large number of complicated calculations to arrive at a more accurate representation of wellbore flow performance. The underlying mathematics, however, remains the same, which leads me to conclude that the contribution made by the invention is not a mathematical method.

22 Thirdly, I need to consider whether the contribution lies in a program for a computer. Mr Rankin referred me to the guidance provided by HHJ Birss QC at paragraph 38 of *Halliburton* to help answer this question:

“What if the task performed by the computer represents something specific and external to the computer and does not fall within one of the excluded areas? Although it is clear that that is not the end of the enquiry, in my judgment that circumstance is likely to indicate that the invention is patentable. Put in other language, when the task carried out by the computer program is not itself something within the excluded categories then it is likely that the technical contribution has been revealed and the invention is patentable. I emphasise the word “likely” rather than “necessarily” because there are no doubt cases in which the task carried out is not within the excluded areas but nevertheless there is no technical contribution at all”.

23 Mr Rankin argues that the task of modelling oil or gas production from a wellbore represents something specific and external to the computer and does not fall within any of the other excluded areas. Since none of the other exclusions apply then it is unlikely that a program which performs a specific task external to the computer, i.e. the modelling of oil and gas production in a wellbore, can be excluded as a computer program as such. He suggests that the question I need to answer is whether the task of modelling oil or gas production from a wellbore represents something specific and external to the computer, and given the similarity between the present invention and the one in *Halliburton* then he suggests that the answer to this question must be “yes”.

24 I agree with Mr Rankin that I am bound to follow the reasoning in *Halliburton* as it applies to the facts of this case. I will do so by considering the nature of the task performed and the degree to which the task is performed outside the computer. In addition, I will need to satisfy myself that the contribution made by the invention is technical.

25 I have already established when assessing the contribution made by the invention that the task performed by the computer program is not the design of an optimum wellbore: the optimum design of wellbore is determined by the external user through a process of iteration in which he or she attempts to maximise the value of production. The task performed by the computer program is to provide an estimate of oil or gas production based on various physical parameters which describe the nature of a wellbore. The model relies upon data relating to physical properties of materials in the real world and provides a more accurate prediction of fluid flow from the particular model of wellbore chosen by the user. However, even though the model is intended to represent what might happen in the real world, the task of modelling exists wholly within the computer and has no impact on the real world without the involvement of the user. It is the user who designs the wellbore, not the computer program. So, in my view, the answer to the *Halliburton* question is “no”: the task performed by the computer is not specific and external to the computer.

26 The guidance concerning patentability of computer programs in *Halliburton* suggests that the nature of the task is only “likely” to indicate whether a technical contribution has been revealed. The question of whether the invention reveals a technical contribution to the state of the art remains to be decided. At the hearing, the attorneys argued that the model itself is technical in that it requires a technical understanding of how a wellbore works. In my view, even though a relevant engineer or technical expert may have been well placed to influence how the model is

programmed and may be well placed to operate the model, these are not reliable indicators for distinguishing whether the invention is technical in nature - the computer program is not made technical by virtue of such factors. Other factors, such as the signposts to technical contribution which Lewison J set out in *AT&T/CVON*⁴, i.e. whether there is a technical effect outside the computer, whether the technical effect operates at the level of the architecture of the computer, whether the computer operates in a new way, whether there is an increase in speed or reliability of the computer and whether the perceived problem is circumvented or overcome, need also to be taken into account. In my view, the contribution made by the invention is not in making the computer operate in a new or more reliable way nor does it result in improvement to processes outside the computer. The invention does not produce a technical effect at the level of the computer's architecture nor does it allow the computer to work faster. In my view, the contribution made by the invention is a better computer program for modelling production from a wellbore, the program being better in the sense that it provides a more accurate prediction of wellbore production based on a more refined estimate of wellbore characteristics used as the initial model. I do not consider that this computer program is better in any technical sense.

- 27 As a final check, Mr Rankin has suggested that the invention in this case is so similar to the one considered in *Halliburton* that I am bound to conclude that the present invention relates to patentable subject matter. The invention in *Halliburton* was a method of designing roller cone drill bits comprising the steps of i) an initial design of drill bit being specified by the user, ii) a computer program simulating the way in which this design of drill bit would drill into an earth formation, iii) an assessment made of the bit's simulated drilling performance and iv) the user then modifying the design in an iterative fashion to arrive at an optimum design. The invention defined by claim 1 of the present application is not a method of design because it does not have steps i) and iv) which are present in *Halliburton*. However, I have already found that there is sufficient basis in the specification to amend claim 1 to define the invention in terms of a method of optimising the design of a wellbore. If the claim were to be amended in such a way, then would that change my view as to whether the task performed by the present invention was specific and external to the computer such that it is likely that a technical contribution has been revealed? In my view, this would make a material difference, one of substance and not simply of form. To begin with, the method cannot be said to fall wholly within the computer program exclusion because the optimum design of wellbore is derived by the user interacting with a mathematical method running on a computer and not by the computer program itself. Secondly, designing wellbores is obviously a very technical process which involves in-depth understanding of physical properties of geological formations and the way in which wellbore equipment physically interact with these formations. The specification describes how various parameters such as underbalanced drilling and managed pressure drilling techniques, well length, size and orientation, acid drilling and near well drilling, etc, can be evaluated, which I consider to be technical considerations in the design of a better wellbore.
- 28 There is a further point I need to address. In his pre-hearing report of 12 November 2014, the examiner made reference to the hearing officer's decision in *Logined*⁵ which appeared to be of particular relevance to the present case in that it relates to

⁴ AT&T Knowledge Ventures' Application and CVON Innovations Ltd's Application [2009] FSR 19

⁵ [BL O/408/12](#)

the exclusion of a computer implemented method of generating oil /gas development plans. The hearing officer in this case found at paragraph 27 that “a computer-implemented method of deciding how to create a [field development] plan to extract oil or gas” is not patentable, and says at paragraph 29 that a development plan is “too abstract a concept to provide a technical contribution”. At the hearing, Mr Rankin sought to distinguish the optimised design of wellbore of the present application from the field development plan in *Logined*, and, upon reflection, I agree with him that the present invention when defined as a method of optimising the design of a wellbore cannot be described simply as an abstract plan.

Conclusion

- 29 I have found that the invention as currently defined by claim 1 relates to a program for a computer as such and that it is therefore excluded from patentability under section 1(2). I have found that there is sufficient basis in the specification to amend claim 1 to define a method of optimising the design of a wellbore such that it would not relate to a computer program as such. Given the impending deadline for putting the application in order, the applicant will need to amend the claims as soon as possible in order to allow the examiner sufficient time to consider the remaining requirements for grant.

Appeal

- 30 Any appeal must be lodged within 28 days.

H JONES

Deputy Director, acting for the Comptroller