



13 September 2011

**PATENTS ACT 1977**

APPLICANT

Logined B.V

ISSUE

Whether patent application  
GB 0820591.6 complies with Section  
1(2)

HEARING OFFICER

Phil Thorpe

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**DECISION**

**Introduction**

- 1 This decision concerns whether the invention defined in the patent application relates to excluded matter. The application is concerned with seeking to maximize the production of an oil field reservoir. More specifically it relates to a method and system of determining optimum injection and production rates for the oil field using simulation of the reservoir.
- 2 The examiner has maintained throughout the examination of the application that the claimed invention is excluded from patentability as a program for a computer under section 1(2)(c) of the Patents Act 1977. The applicant has not been able to overcome the objection, despite amendments to the application.
- 3 The matter subsequently came before me at a hearing on 13 July 2011 at which Mr Martin Hyden of Finnegan's appeared for the applicant, Logined B.V.

**The invention**

- 4 GB 0820591.6 was filed on 11 May 2007. It was published as GB 2451977A on 18 February 2009.
- 5 The invention relates to optimising the extraction of oil from a reservoir. Controlling the rate at which oil is extracted from a reservoir plays an important role in increasing the life of the reservoir. To extract oil from the

reservoir a fluid such as water is pumped into the reservoir to 'force' the oil out through a 'tap'. The rates at which the water is pumped in and the oil allowed out are therefore crucial when optimizing the oil extraction process. The rate at which water is pumped in is referred to in the application as the 'injection rate' and the rate at which oil is allowed out is the 'production rate'.

- 6 According to the application, the injection and production rates are typically calculated using complex computer generated models that break the reservoir down using a fine grid. As the reservoir is developed the injection and production rates will be constantly recalculated and adjusted to ensure optimum reservoir production. Existing methods for doing this according to the application (paragraph 003) suffer from increased 'costs' brought about by long computer simulation run times associated with the fine grid models.
- 7 The invention recognises that it may not be necessary to use a fine grid for all parts of the reservoir. In some areas, for example in areas of consistent behavior, a coarser grid (referred to as a coarse grid proxy) can be used without significantly reducing the accuracy of the simulation. By producing an optimal grid that is only fine-gridded in some areas, the computer run time is reduced. The application refers to run times that are between 4 and 27 times faster than the original fine-grid model while the error in the calculated production total was no greater than 1.73%. It is noted that the application states that all of the fine-grid model could be replaced by a coarse-grid model; however Mr Hyden confirmed that whilst this may be the case in theory, in practice, this would not be the case.
- 8 The application explains how a fine grid model is first utilized to create a "training set" for a variety of control variables such as production and injection rates. An optimizer is then used to find alternative coarse grid proxies to replace parts of the fine grid model. The coarse grid proxies that are chosen are those that produce outputs closest to those of the training set.
- 9 The applicant has requested that I should base this decision on the amended claim set filed on 06 May 2011. This claim set includes independent claims 1 and 8. Claim 1 reads as follows:

A method of determining injection and production rates for controlling production from a reservoir using optimal gridding in a reservoir model, comprising:

establishing an optimal coarse grid proxy that can replace all or parts of a fine grid with a coarse grid while preserving the accuracy of a predetermined simulation model output, the step of establishing an optimal coarse grid proxy including:

constructing a training set by using the fine grid to calculate a plurality of fine-grid solutions for the predefined simulation model output, wherein each of the fine-grid solutions is calculated using one of a plurality of control variables;

until subsequent values of an objective function converge to within a

predefined threshold, iteratively;

adjusting coarse grid line positions to obtain an adjusted coarse grid;

evaluating the objective function to compare simulation results obtained using the adjusted coarse grid results of the training set, wherein the adjusted coarse grid includes a plurality of coarse grid cells, the fine grid including a plurality of fine grid cells, each coarse grid comprising more than one coarse grid cell;  
and

averaging a set of material properties of the fine grid cells in each coarse grid cell; and

once the subsequent values of the objective function converge within the predefined threshold, generating the optimal coarse grid proxy based on the adjusted coarse grid;

conducting reservoir simulation using the optimal coarse grid proxy to generate result; and

determining, based on the results, injection rates and production rates to optimize cumulative oil production or net present value of the reservoir.

Claim 8 reads:

A system for determining injection and production rates for controlling production from a reservoir using optimal gridding in a reservoir model, comprising:

Establishing an optimal coarse grid proxy that can replace all or parts of a fine grid with a coarse grid while preserving the accuracy of a predetermined simulation model output, the step of establishing an optimal coarse grid proxy including:

a processor;

a memory comprising software instructions which, when executed, cause the processor to:

construct a training set by using the fine grid to calculate a plurality of fine-grid solutions for the predefined simulation model output, wherein each of the fine-grid solutions is calculated using one of a plurality of control variables;

until subsequent values of an objective function converge to within a predefined threshold, iteratively;

adjust coarse grid line positions to obtain an adjusted coarse grid;

evaluate the objective function to compare simulation results obtained using the adjusted coarse grid results of the training set, wherein the adjusted coarse grid includes a plurality of coarse grid cells, the fine grid including a plurality of fine grid cells, each coarse grid comprising more than one coarse grid cell; and

average a set of material properties of the fine grid cells in each coarse grid cell; and

once the subsequent values of the objective function converge within the predefined threshold, generate the optimal coarse grid proxy based on the adjusted coarse grid;

conduct reservoir simulation using the optimal coarse grid proxy to generate result; and

determine, based on the results, injection rates and production rates to optimize cumulative oil production or net present value of the reservoir.

## The Law

- 10 The examiner has raised an objection under section 1(2)(c) of the Patents Act 1977 that the invention is not patentable because it relates to a computer program. The relevant provisions of this section of the Act are shown in bold below:

**1(2) It is hereby declared that the following (amongst other things) are not inventions for the purpose of the Act, that is to say, anything which consists of –**

- (a) a discovery, scientific theory or mathematical method;
- (b) .....
- (c) a scheme, rule, or method for performing a mental act, playing a game or doing business, or a **program for a computer**;
- (d) .....

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

- 11 As explained in the notice published by the UK Intellectual Property Office on 8 December 2008<sup>1</sup>, the starting point for determining whether an invention falls within the exclusions of section 1(2) is the judgment of the Court of Appeal in *Aerotel/Macrossan*<sup>2</sup>.
- 12 The interpretation of section 1(2) has been considered by the Court of Appeal in *Symbian Ltd's Application*<sup>3</sup>. *Symbian* arose under the computer program exclusion, but as with its previous decision in *Aerotel*, the Court gave general guidance on section 1(2). Although the Court approached the question of excluded matter primarily on the basis of whether there was a technical contribution, it nevertheless (at paragraph 59) considered its conclusion in the light of the *Aerotel* approach. The Court was quite clear (see paragraphs 8-15) that the structured four-step approach to the question in *Aerotel* was never intended to be a new departure in domestic law; that it remained bound by its previous decisions, particularly *Merrill*

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<sup>1</sup> <http://www.ipo.gov.uk/pro-types/pro-patent/p-law/p-pn/p-pn-computer.htm>

<sup>2</sup> *Aerotel Ltd v Telco Holdings Ltd and Macrossan's Application* [2006] EWCA Civ 1371; [2007] RPC 7

<sup>3</sup> *Symbian Ltd v Comptroller-General of Patents*, [2009] RPC 1

*Lynch*<sup>4</sup> which rested on whether the contribution was technical; and that any differences in the two approaches should affect neither the applicable principles nor the outcome in any particular case.

- 13 Subject to the clarification provided by *Symbian*, it is therefore still appropriate for me to proceed on the basis of the four-step approach explained at paragraphs 40-48 of *Aerotel* namely:
- 1) Properly construe the claim.
  - 2) Identify the actual contribution.
  - 3) Ask whether it falls solely within the excluded matter, which (see paragraph 45) is merely an expression of the “as such” qualification of section 1(2).
  - 4) If the third step has not covered it, check whether the actual or alleged contribution is actually technical.
- 14 Mr Hyden accepted that this is the right approach to take.

### **Properly Construe the Claims**

- 15 In the first step, there is no issue about the construction of the claims.

### **Identify the actual contribution**

- 16 As is often the case, the real dispute is about identifying the actual contribution. Before I turn to the actual contribution in this instance it is I believe useful to reiterate that in *Aerotel/Macrossan*, the Court of Appeal sought to provide guidance on how the actual contribution should be identified. It noted that :

“It is an exercise in judgment probably involving the problem said to be solved, how the invention works, what its advantages are. What has the inventor really added to human knowledge perhaps best sums up the exercise.”

- 17 Mr Hyden believes that the actual contribution here should take into account the real-world context in which the invention is applied, that is in determining values that may be used in operational control of a reservoir. Mr Hyden refers in support to paragraph 0063 of the application, which states:

“The real value of the ‘coarsening software’ 12 of figure 1 is realized in ‘reservoir optimization problems’ where an operator wishes to find the best values of certain ‘reservoir control parameters’, such as injection and production rates, in order to maximize such quantities as ‘cumulative oil production’ or ‘net present value’”

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<sup>4</sup> *Merrill Lynch’s Application* [1989] RPC 561

- 18 From this he argues that it is clear that the invention relates to a real-world problem, namely the control of oilfield operations. Such operations take place outside of the computer
- 19 Mr Hyden believes that if the contribution is considered in this way then the application is on all fours with *NEC Corporation's Application*<sup>5</sup> which was not refused under section 1(2).
- 20 *NEC's Application* related to a method for deciding tilt angles for antenna. The angles were determined with regard to the positions and tilt angles of neighbouring antennas having directivity in a vertical plane, which are provided in a plurality of radio base stations constituting a radio communication system. In paragraph 3 of the decision the Hearing Officer notes that the invention

“.. automatically calculates an optimal tilt angle for the antenna of interest, not in isolation but having regard to the positions and tilt angles of neighbouring antennae, more quickly, accurately and consistently than would be possible for manual calculation and adjustment of angles even by an experienced operator”

He goes on in paragraph 12 to state that it is this calculation together with the outputting of the optimal angle for the purpose of controlling the antenna that constitutes the contribution as a matter of substance.

- 21 So the contribution in *NEC* appears to lie in the nature of the data produced ie the tilt angle, how that data is produced and what that data can be used for. That contribution was sufficient to take the invention outside of section 1(2).
- 22 The actual contribution in this case is however in my opinion significantly different. As noted the problem here is the long computer simulation run times and associated 'costs' of existing methods. I accept that the coarsening software of the invention leads to a reduction in computation time and hence most likely a reduction in the cost of running the simulation. But that is all that the invention has really contributed to human knowledge. The invention utilises the same input data and produces the same output data as the methods currently known in the prior art. If both the method of the invention and an existing method were performed side-by-side, the method set out in the application would provide the output data first but it would be the same data as that which is eventually produced by the prior art method. There is nothing in the application to suggest that a quicker simulation time allows for the exploration of the reservoir to be controlled any differently. Hence in contrast to *NEC* the contribution here as a matter of substance lies solely in how the data is produced, notwithstanding that the data might subsequently be used in a real world application.

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<sup>5</sup> BL O/202/08

### **Does the contribution fall solely within excluded matter**

23 I can be brief here. The actual contribution as I have set out above lies clearly in my opinion solely in the field of a computer program and is therefore excluded.

### **Check whether the contribution is actually technical in nature**

24 Having failed the third step, I need not consider the fourth step of the test.

25 For completeness I would note that there was a brief discussion at the hearing of two other Office decisions, *Schlumberger Technology Corporation*<sup>6</sup> and *Halliburton Energy Services Inc*<sup>7</sup> though in the end nothing turns on either of these cases.

### **Conclusions and findings**

26 I have found that the invention defined by independent claims 1 and 8 of the application relate to a computer program and as such the application is therefore excluded from patentability under section 1(2)(c) of the Patents Act 1977.

27 Mr Hyden highlighted the possibility of including the features of claim 4 or 5 in claim 1 if it would aid patentability. These claims refer to particular ways of modeling the coarser parts of the grid. There is I think some uncertainty, as Mr Hyden appeared to accept, as to whether the features in these claims are already included in claim 1. However even if I accept that they are not already included, then I do not believe it helps Mr Hyden. Indeed having read the specification I do not think there is anything in the original disclosure that would take the invention beyond a computer program.

28 I therefore refuse the application under section 18(3).

### **Appeal**

29 Under the Practice Direction to Part 52 of the Civil Procedure Rules, any Appeal must be lodged within 28 days.

**P Thorpe**

Deputy Director acting for the Comptroller

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<sup>6</sup> BL O/343/07

<sup>7</sup> BL O/080/11