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Case Number: T 0842/09 - 3.2.03

Application Number: 03742832.3

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Language of the proceedings: EN

Title of invention:
Dynamic annular pressure control apparatus and method

Patentee:
@Balance B.V.

Opponent:
Secure Drilling International L.P. (Bermuda)

Headword:
-

Relevant legal provisions:
EPC Art. 100(a), 54, 56

Relevant legal provisions (EPC 1973):
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Keyword:
"Novelty - main request (no)"
"Inventive step - first auxiliary request (yes)"
"Admissibility of first auxiliary request (yes)"

Decisions cited:
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Catchword:
-

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Case Number: T 0842/09 - 3.2.03

D E C I S I O N
of the Technical Board of Appeal 3.2.03
of 23 August 2011

Appellant: (Patent Proprietor)	@Balance B.V. Kessler Park 1 NL-2280 AB Rijswijk (NL)
Representative:	Giovannini, Francesca Osha Liang 32, avenue de l'Opéra F-75002 Paris (FR)
Respondent: (Opponent)	Secure Drilling International L.P. (Bermuda) 12777 Jones Road, Suite 280 Houston, TX 77070 (US)
Representative:	Williams, Michael Ian Cleveland 40-43 Chancery Lane London WC2A 1JQ (GB)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted 9 February 2009 revoking European patent No. 1488073 pursuant to Article 101(3)8b) EPC.**

Composition of the Board:

Chairman: U. Krause
Members: E. Frank
K. Garnett

Summary of Facts and Submissions

I. The appeal lies from the decision of the Opposition Division dated 9 February 2009 to revoke the European patent No. 1 488 073 pursuant to Article 101(3)(b) EPC.

II. The Appellant (Proprietor) filed a notice of Appeal on 3 April 2009, paying the appeal fee on the same day. The statement of grounds of appeal was submitted on 9 June 2009.

III. A communication pursuant to Article 15(1) RPBA was issued after a summons to attend oral proceedings, which were duly held on 23 August 2011. During the oral proceedings, the Appellant filed a new first auxiliary request. The claims of this new request substantially correspond to those of the first auxiliary request filed with the grounds of appeal.

IV. The Appellant requested that the decision under appeal be set aside and the patent be maintained as granted, alternatively on the basis of the first auxiliary request filed during the oral proceedings.

The Respondent (Opponent) requested that the appeal be dismissed.

V. The wording of the independent claims reads as follows:

V.1 Claim 1 - main request (as granted):

"1. A system for controlling formation pressure during the drilling of a subterranean formation, comprising: a drill string (112) extending into a borehole, the

drill string including a bottom hole assembly (113) comprising a drill bit (120);
a primary pump (138) for selectively pumping a drilling fluid from a drilling fluid source (150), through said drill string (112), out said drill bit (120) and into an annular space (115) created as said drill string (112) penetrates the formation;
a fluid discharge conduit (124) in fluid communication with said annular space for discharging said drilling fluid to a reservoir (150) to clean said drilling fluid for reuse;
a fluid backpressure system connected to said fluid discharge conduit; said fluid backpressure system comprised of a fluid choke (130), a backpressure pump (128), a fluid source (150), whereby said backpressure pump (128) may be selectively activated to increase annular space drilling fluid pressure;
characterized by:
a sensor (116) and a telemetry system (119) comprised in the bottom hole assembly, capable of receiving and transmitting data, including sensor data, said sensor data including at least pressure data;
a surface telemetry system for receiving data and transmitting commands to the bottom hole assembly;
a flow meter (126) comprised in the backpressure system;
a pressure monitoring and control system (146) capable of receiving information related to the borehole, drill rig and drilling fluid as inputs to a model to predict downhole pressure and of utilizing the information to predict down hole pressure for continued drilling and of comparing the predicted down hole pressure to a desired downhole pressure, and of utilizing the differential to control the fluid backpressure system."

V.2 Claim 1 - first auxiliary request:

the following wording is added at the end of claim 1 of the main request:

"... system, wherein the pressure monitoring and control system (146) is in communication with the surface telemetry system and capable of utilizing actual down hole pressure data to calibrate the model by modifying input parameters to more closely correlate the predicted downhole pressure to the actual down hole pressure data."

V.3 Claim 9 - main request (as granted):

"9. A method for controlling formation pressure during the drilling of a subterranean formation, the method comprising the steps:
deploying a drill string (112) extending into a borehole, the drill string including a bottom hole assembly (113) comprising a drill bit (120);
selectively pumping a drilling fluid utilizing a primary pump (138) from a drilling fluid source (150), through said drill string (112), out said drill bit (120) and into an annular space (115) created as said drill string penetrates the formation;
discharging said drilling fluid from said annular space (115) through a fluid discharge conduit (124) to a reservoir (150) to clean said drilling fluid for reuse;
selectively increasing annular space drilling fluid pressure utilizing a fluid backpressure system connected to said fluid discharge conduit;
characterized by:
a sensor (116) and a telemetry system (119) comprised

in the bottom hole assembly, capable of receiving and transmitting data, including sensor data, said sensor data including at least pressure data;
providing a surface telemetry system for receiving data and transmitting commands to the bottom hole assembly;
utilizing information related to the wellbore, drill rig and drilling fluid as inputs to a model to predict downhole pressure, utilizing the information to predict down hole pressure for continued drilling and comparing the predicted down hole pressure to a desired downhole pressure, and utilizing the differential to control the fluid backpressure system."

V.4 Claim 8 - first auxiliary request:

the following wording is added at the end of claim 9 of the main request:

" ... system, wherein actual down hole pressure data is utilized to calibrate the model and to modify input parameters to more closely correlate predicted downhole pressures to the actual down hole pressures."

VI. The following evidence has been considered for the purposes of the present decision:

D1 = WO 02/50398

VII. The parties submitted the following arguments:

VII.1 Novelty - main request

(a) The Respondent argued that the patent aimed at the control of the pressure at the bottom of the wellbore. Since its value could not be measured instantaneously, the down hole pressure had to be estimated. The estimation was firstly based on pieces of data available to the system at the surface, cf. patent, paragraphs [0029] and [0030]. Moreover, to calculate the pressure differential in the downhole annulus, a "model" was used. However, this model considered various known standard wellbore parameters only, cf. paragraph [0031] of the patent. Finally, the calculated pressure change at the bottom of the wellbore was compared with a "desired value" in the control system, cf. patent, claims 1 and 9. The patent contained no information on such "desired" annulus pressure. If, however, a pressure change away from the desired value was detected in the well, the desired backpressure was then determined and adjusted accordingly, to control the bottom pressure of the wellbore, cf. paragraph [0034] of the patent. This system might also be used when a formation fluid influx was detected, cf. patent, paragraph [0044].

D1 also concerned the control of a required wellbore pressure. When an early influx or fluid loss was detected, the backpressure was pre-emptively adjusted, cf. D1, pages 12 and 15, and claim 5. Various ways for early detection of influx, also including the detection of pressure changes, were described, cf. D1, pages 26, 55, and 59, and claim 27. The bottomhole pressure, ie the downhole pressure, could be calculated indirectly by estimating the hydrostatic head and friction losses

within the wellbore, cf. D1, page 52. Software pertaining to D1's control system would include all the necessary algorithms and empirical correlations, ie a "model", to allow accurate estimation of the hydrostatic head and friction losses, cf. D1, page 40 and 52. As was derivable from figure 5 and page 46 of D1, all the standard drilling parameters required were sent to this control system. Since claims 1 and 9 of the patent did not further specify the "desired" downhole pressure, in the event of an influx the early detected, ie indirectly estimated, downhole pressure change of D1 would clearly also deviate away from a desired value to be obtained. Based on this deviation, the backpressure of D1 was (pre-emptively) adjusted by the control system, cf. D1, page 55. Thus, D1 deprived claims 1 and 9 of novelty.

(b) The Appellant accepted that the control system of D1 calculated an estimated downhole pressure change, which then was compared to a desired pressure to adjust the backpressure accordingly. However, D1 taught to change the pressure in order to stay within the security boundaries, cf. D1, page 51. Thus, no prediction issues were addressed by D1. As opposed to this, the patent did not just work between two security limits, but allowed the system to react instantaneously, and to predict the downhole pressure, eg when signals were delayed. The real forecast of a scenario based on a model according to the patent was more than the real time measurement based on an estimation as in D1, since the forecasting of the patent's model depended on a response (of data). Finally, D1 did not take into account all the parameters of claims 1 and 9 as inputs to a model, eg the fluid pressure. Therefore, the model

according to claims 1 and 9 was different from the estimation of D1, and thus claims 1 and 9 were novel over D1.

VII.2 Admissibility - first auxiliary request

(a) The Respondent argued that the late filed first auxiliary request was prima facie not clearly allowable, since only a calibration of the model had been added and it was, therefore, not admissible. Moreover, there was no proper justification for its late filing.

(b) The Appellant argued that the late filing of the first auxiliary request at the beginning of the appeal proceedings was justified in response to the revocation of the patent, and was clearly based on the granted claims, which were fully known to the Respondent/ Opponent from the first instance proceedings. Moreover, the first auxiliary request addressed the limitation of a feature which was debated in relation to the main request. Hence, the request did not constitute an abuse of procedure.

VII.3 Inventive step - first auxiliary request

(a) The Respondent argued that, as was firstly derivable from figure 5 of D1, the control system was in communication with the surface telemetry system. Moreover, although there was no explicit disclosure of a calibration, the idea of updating D1's model based on actual values was hinted at in D1, eg, a "historical learning" of the software, and a "revision of predicted values" was described, cf. D1, page 49, last paragraph, and page 60, lines 22 to 23. In particular, the

"historical learning", ie the updating of data from the past, was trivial for a control system: as soon as an actual value had been calculated, the model would be updated based on the actual parameters. This could not only be based on flow rates, since page 49 of D1, at the bottom, must also be read in context with early detection parameters, such as pressure changes, cf. D1, page 55. Therefore the subject-matter of claims 1 and 8 was obvious in the light of D1.

(b) The Appellant argued that the passages of D1 merely taught the skilled person to check other means when the algorithm (of the model) was not working properly, but did not hint at any calibration of a model which had to take into account time delays (of an actual downhole pressure measurement), cf. patent, paragraph [0036]. Page 49 of D1, lines 15 to 20, referred to a software input which triggered a chain of investigations of "probable scenarios", and checking of "actual other parameters" and "any other means", without, however, prompting the skilled person to calibrate the model algorithm. Moreover, page 60 of D1, lines 20 to 23, merely described a "revision of predicted values" if parameters relating to the well had changed. The "historical learning" on page 49 of D1, last paragraph, was an extremely generic disclosure and only concerned the comparison of predicted and actual flow out, ie the flow rates, but not the prediction of downhole pressures, cf. also page 59 of D1, last paragraph. Therefore claims 1 and 8 involved an inventive step.

Reasons for the Decision

1. The appeal is admissible.

2. Novelty - main request
(Article 100(a) EPC, see Article 54 EPC)

2.1 The document D1 describes a closed loop drilling system comprising monitoring means, which continuously provide data to a central data acquisition and control system, whereby predicted outflow is continuously revised in response to any adjustment of pressure/flow control to increase or reduce the back pressure, thereby also adjusting the equivalent circulating density (ECD) at the bottom of the well. Moreover, when an early influx or fluid loss is detected by means of, eg, detecting pressure changes, the backpressure is pre-emptively adjusted, such that the bottomhole/downhole pressure regains a value that avoids any further influx or loss (cf. D1, page 14, last paragraph; page 15; page 25, lines 13 to 28; page 26, line 17 to page 27, line 24; page 55, lines 22 to 25; and figures 5,7 and 8).

2.2 The parties agreed that, a pressure change, ie the actual downhole pressure, can be estimated (indirectly) by the algorithms of the control systems software. It then has to be compared with a reference value, ie a "desired" downhole pressure, in order to process any deviation from expected behaviour, so that ultimately the backpressure can be pre-emptively adjusted accordingly (cf. D1, page 40, lines 1 to 11; page 52, lines 1 to 13; page 55 lines 4 to 25; and in particular page 56, line 5: *"This deviation may also be a signal from an early detection device"*).

2.3 In the Appellant's view, the subject-matter of claims 1 and 9 differed from D1's disclosure in that a "model" was defined which depended on the response of data and therefore enabled the patent's downhole pressure to be "predicted", ie forecasted. On the other hand, the software of D1's control system merely provided a real time estimation of the downhole pressure. In addition, the input parameters to the model of claims 1 and 9 were not fully disclosed by D1.

2.4 However, as argued by the Respondent, D1's control system also receives information relating to the borehole, drill rig and drilling fluids, ie all standard drilling parameters, as inputs to the control system's software (cf. D1, page 46, line 14 to page 47, line 4; figure 5; and in particular the box at the bottom on the right of the block diagram of figure 7: *"Conventional data acquisition"*).

Moreover, in the view of the Board, the word "model" in claims 1 and 9 of the patent has no clear meaning so as to define how the parameters mentioned in the claims have to be taken into account by an algorithm of the software, and thus somehow to "predict" the downhole pressure. Following from paragraphs [0031] and [0034] of the patent, the vaguely addressed "prediction" of claims 1 and 9 covers calculation by use of a (various) model(s), ie software algorithms, whereby actual drilling parameters are fed into the algorithm, that is, an estimated calculation of the downhole pressure takes place.

2.5 Consequently, the estimated calculation of the downhole pressure in case of early influx or fluid loss, based on the software pertaining to D1's control system and its standard parameter input, cannot be distinguished from the prediction of the downhole pressure based on the model according to claims 1 and 9, and its information related to the borehole, which is utilized to predict the downhole pressure for continued drilling.

Therefore, the subject-matter of claims 1 and 9 of the main request lacks novelty over the disclosure of document D1.

3. *Admissibility of first auxiliary request*

The Appellant's first auxiliary request submitted with its grounds of appeal was clearly filed as an immediate reaction to the decision under appeal in order to overcome the objection of lack of inventive step, and was based on claims 1 and 2 as granted. During the oral proceedings, the Appellant withdrew this request and in its place a new first auxiliary request was submitted. However, the new request had been only slightly amended as compared to the withdrawn request in that a typographical error in claims 1 and 8 was corrected, and a newly adapted description was added.

Thus, the Respondent could reasonably respond to the new first auxiliary request, and hence the Board exercised its discretion to admit the first auxiliary request of the Appellant, pursuant to Articles 13(1) and (3) RPBA.

4. *Inventive step - first auxiliary request (Article 56 EPC)*

4.1 The parties agreed that the subject-matter of claims 1 and 8 differs from D1's disclosure in that actual downhole pressure data is utilized to calibrate the model by modifying input parameters so as to more closely correlate the predicted downhole pressure to the actual down hole pressure data. Novelty of claims 1 and 8 over the remaining prior art was not disputed by the Respondent, and is also acknowledged by the Board.

The problem underlying these distinguishing features can be seen in an improved model, ie software algorithm, to optimize D1's central data acquisition and control system, in the case where pressure changes are used for early detection of influx or loss.

4.2 Even if the generic disclosure of a *"historical learning"* of the control system's software on page 49 of D1, last paragraph, is interpreted as a calibration of a model in the broadest sense, ie as an "updating of data from the past", D1 in this regard only generally refers to the prediction of an expected, ideal value for the outflow (or predicted ECD value), which is compared with the actual return flow (or actual ECD value), ie to the prediction of flow rates (cf. D1, page 49; and page 59, line 20 to page 60, line 23; and figures 8 and 9).

Moreover, the *"revision of predicted parameters"* on page 60 of D1, lines 20 to 23, does not mean that data from the past are used to update a model/algorithm, but rather, that the whole model/algorithm has to be

revised in order to set a new predicted ECD value if a parameter relating to the well changes due to change of formation.

4.3 Therefore, contrary to the Respondent's view, no teaching is derivable from D1 that data from the past should be used for updating a model to predict pressure changes for early detection, and how such a *"historical learning"* then has to be implemented by the model/algorithm, let alone for considering a particular kind of data.

4.4 Thus, based on his common general knowledge about control systems, and if he was faced with the problem stated under point 4.1 of this decision above, the skilled person would not get any indication from D1 to utilize the actual downhole pressure measurement as a parameter to calibrate the model by modifying (other) model inputs or that, based on this calibration, a new best estimate of the predicted downhole pressure has to be made by the model, to more closely relate the predicted downhole pressure to the actual downhole pressure data, thereby arriving at the subject-matter of claims 1 and 8.

According to the patent, even if a time-stamped downhole pressure while drilling (PWD) is compared with the dynamic annulus pressure control (DAPC) predicted downhole pressure, the DAPC predicted pressure differs significantly. This differential is addressed by modifying the model inputs for fluid density and viscosity. Thus, the DAPC uses the PWD to calibrate the predicted pressure and modify model inputs to more accurately predict downhole pressure throughout the

entire borehole profile (cf. patent, paragraph [0037]; figures 5 and 6).

Therefore the subject-matter of claims 1 an 8 of the first auxiliary request involves an inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Opposition Division with the order to maintain the patent on the basis of:

   (a) Claims 1 to 13 according to the first auxiliary request filed during the oral proceedings;
   (b) Pages numbered 2 to 8 of the amended description as filed during the oral proceedings;
   (c) Figures 1 to 9B as granted.

The Registrar The Chairman

D. Hampe U. Krause