

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 1814-65002	FOR FURTHER ACTION		See item 4 below
International application No. PCT/US2011/059518	International filing date (<i>day/month/year</i>) 07 November 2011 (07.11.2011)	Priority date (<i>day/month/year</i>) 12 November 2010 (12.11.2010)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant NATIONAL OILWELL VARCO, L.P.			

<p>1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).</p> <p>2. This REPORT consists of a total of 8 sheets, including this cover sheet.</p> <p>In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.</p>																								
<p>3. This report contains indications relating to the following items:</p> <table> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table> <p>4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).</p>	<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input checked="" type="checkbox"/>	Box No. VII	Certain defects in the international application	<input type="checkbox"/>	Box No. VIII	Certain observations on the international application
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	Date of issuance of this report 14 May 2013 (14.05.2013)
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PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)**

To:

see form PCT/ISA/220

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2011/059518

International filing date (day/month/year)
07.11.2011

Priority date (day/month/year)
12.11.2010

International Patent Classification (IPC) or both national classification and IPC
INV. E21B44/00

Applicant
NATIONAL OILWELL VARCO, L.P.

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application


2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:



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Date of completion of this opinion

see form
PCT/ISA/210

Authorized Officer

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Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - the international application in the language in which it was filed
 - a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
 - a. (means)
 - on paper
 - in electronic form
 - b. (time)
 - in the international application as filed
 - together with the international application in electronic form
 - subsequently to this Authority for the purposes of search
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>2-6, 10-15, 18-24</u>
	No: Claims	<u>1, 7-9, 16, 17</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-24</u>
Industrial applicability (IA)	Yes: Claims	<u>1-24</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. References

Reference is made to the following documents:

- D1 WO 2008/070829 A2 (NABORS GLOBAL HOLDINGS LTD; BOONE SCOTT [US]; ELLIS BRIAN [US]; KUTTEL) 12 June 2008
- D2 WO 01/79658 A1 (NOBLE DRILLING SERVICES INC [US]) 25 October 2001
- D3 US 5 842 149 A (HARRELL JOHN W [US] ET AL) 24 November 1998
- D4 US 2003/015351 A1 (GOLDMAN WILLIAM A [US] ET AL) 23 January 2003

2. Clarity

2.1 The term "*predetermined optimal value*" used in claim 1 is vague and unclear, in particular what exactly is meant by an *optimal value*, and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of said claim unclear, Article 6 PCT.

2.2 Although claims 1 and 17 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and/or in respect of the terminology used for the features of that subject-matter. The aforementioned claims therefore lack conciseness and as such do not meet the requirements of Article 6 PCT.

3. Novelty and Inventive Step

3.1 Independent Claim 1

Furthermore, the above-mentioned lack of clarity notwithstanding, the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT, and the criteria of Article 33(1) PCT are therefore not met.

Document D1 discloses (the references in parentheses applying to this document; abstract; figures 5A-D; paragraphs 95, 99, and 142):

A method for automated drilling of a borehole in a subsurface formation, comprising:
selecting at least one control variable (paragraph 95);
defining a drilling performance objective (see MSE in paragraph 95) having a value that is influenced by drilling of the borehole using the at least one control variable;
drilling a first interval of the borehole maintaining the at least one control variable at a first value (figure 5A and paragraph 99);
drilling a second interval of the borehole maintaining the at least one control variable at a second value (figure 5A and paragraph 99); and
drilling a third interval of the borehole maintaining the at least one control variable at a third value, the third value being selected based on a comparison of the value of the drilling performance objective while drilling the first interval and the value of the drilling performance objective while drilling the second interval to a predetermined optimal value of the drilling performance objective (figure 5D and paragraph 142).

The subject-matter of claim 1 is therefore not new (Article 33(1) and (2) PCT).

For the sake of completeness, it is pointed out that documents D2 - D4 also disclose the subject-matter of claim 1.

3.2 Independent Claim 9

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT.

Document D1 discloses (the references in parentheses applying to this document; figure 5, paragraphs 33 - 34, 95 - 97, 99 - 107):

An apparatus for automated drilling of a borehole in a subsurface formation, comprising:
a drill string (155) for drilling the borehole (160), the drill string controlled by a set of control variables (paragraph 33);
sensors for measuring a plurality of drilling variables during drilling of the borehole (paragraph 34);
a drilling performance optimizer (paragraphs 95 - 97) configured to:
evaluate, based on at least one of the drilling variables, a drilling performance objective having a value that is influenced by drilling of the borehole using the set of control variables (paragraph 97); and
select an operative set of values for the set of control variables based on the value of the drilling performance objective (figure 5D, paragraphs 99 - 107).

The subject-matter of claim 9 is therefore not new (Article 33(1) and (2) PCT).

For the sake of completeness, it is pointed out that documents D2 - D4 also disclose the subject-matter of claim 9.

3.3 Independent Claim 17

As already pointed out in paragraph 2.2, claim 17 is formulated as an independent claim though it contains all the features of the independent claim 1, except that instead of "at least one control variable" in claim 17 the drilling of an interval is controlled by "a set of control variables".

Therefore, the majority of the subject-matter of claim 17 has already been discussed in paragraph 3.1 for independent claim 1. The remaining difference of claim 17 is a computer-readable medium and computer-executable instructions for automated drilling of a borehole. These features are disclosed in document D1 (paragraphs 246 - 247).

The subject-matter of claim 17 is therefore not new (Article 33(1) and (2) PCT).

For the sake of completeness, it is pointed out that documents D2 - D4 also disclose the subject-matter of claim 17.

3.4 Dependent Claims 2 - 8, 10 - 16, and 18 - 24

Claims 2 - 6, 10 - 15, 18 - 24: The subject-matter disclose strategies to solve a linear or non-linear functional relationship by searching the solution parameter space in different manners. These and many other strategies for solving (non-) linear equations are well known to the person skilled in the art and applied on a standard basis in the industry for similar problems without using inventive skill.

Claims 7, 8, 16: The additional features are disclosed in document D1 (paragraph 97).

Re Item VII

Certain defects in the international application

- a) Independent claims 1 and 9 are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art being placed in the preamble (Rule 6.3(b)(i) PCT) and the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
- b) The features of all claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
- c) Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in D2 - D4 is not mentioned in the description, nor are these documents identified therein.
- d) The units of "psi", "lb", "in", "ft-lb", and "ft/hr" employed in claim on pages 9 and 16 are not additionally expressed in terms of the units stipulated by Rule 10.1 (a) and (d) PCT.