PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

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.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP2018/071677	09.08.2018	10.08.2017

International Patent Classification (IPC) or both national classification and IPC
INV. C02F1/44 E21B43/20

Applicant
BP EXPLORATION OPERATING COMPANY LIMITED

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 43*bis*.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 notifed the International Bureau under Rule 66.1*bis*(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:	Date of completion of this opinion	Authorized Officer
European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	see form PCT/ISA/210	Dekker, Derk Telephone No. +31 70 340-0

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/EP2018/071677

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 43*bis*.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:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file.

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

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 forming part of 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 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	4-10, 13-25, 28-31, 33-35
	No:	Claims	1-3, 11, 12, 26, 27, 32
Inventive step (IS)	Yes:	Claims	5-7
	No:	Claims	1-4, 8-35
Industrial applicability (IA)	Yes:	Claims	1-35
	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 Reference is made to the following documents:

D1 WO 2007/138327 A1 (NATCO UK LTD [GB]; BP EXPLORATION OPERATING [GB]; WESTON ROBERT [GB];) 6 December 2007 (2007-12-06)

D2 US 2015/083656 A1 (WILLIAMS JOHN DALE [GB]) 26 March 2015 (2015-03-26)

2 Claim 1

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.

The document D1 discloses (the references in parentheses apply to this document)

An integrated system (figure 1) comprising:

a desalination plant comprised of a reverse osmosis ("RO System") array* to produce an RO permeate blending stream (23) and a nanofiltration ("NF System") array* to produce an NF permeate blending stream (27);

a blending system (29);

a control unit (page 9, line 3: "automatic flow control system"); and

an injection system (30) for an injection well that penetrates an oil-bearing layer of a reservoir, the injection system comprising an injection line and at least one injection pump (implicit);

wherein the blending system is configured to blend the RO permeate blending stream and the NF permeate blending stream to produce a blended injection water stream and to pass the blended injection water stream to the injection system,

wherein the control unit is configured to dynamically alter operation of the blending system to adjust amounts of at least one of the RO permeate blending stream and the NF permeate blending stream to alter the composition of the blended injection water stream from an initial composition to a target composition (dynamic control is disclosed in response to a measured variable, such as conductivity readings of the mixed water supply or to other measurements, such as measurements of calcium ion concentration, see page 9, lines 2-12).

The subject-matter of claim 1 is therefore not new in view of D1.

* If it is argued that the subject-matter of claim 1 is new in view of D1, because D1 does not disclose an "RO **array**" or "RF **array**", then this feature is not considered to render the subject-matter of claim 1 inventive, because it would be obvious for the skilled person to combine the teaching of D1 with that of D2. D2 discloses "trains" of RO membrane units and NF membrane units.

3 Claim 11

The same reasoning applies to the corresponding method of claim 11, which is therefore also not new in view of D1, or at least not inventive in view of D1 when combined with D2, for the reasons as mentioned above for claim 1.

4 Claim 17

The system of claim 17 is more narrowly defined than the system of claim 1, essentially because it requires a "reverse osmosis dump line" and a "nanofiltration dump line" and because the control unit is defined by the functional feature: "configured to adjust, **in response to measured flow rate data, pressure data or composition data** [...]".

The system of D1 also includes a "reverse osmosis dump line" ("RO reject stream") and a "nanofiltration dump line" (NF reject stream), so that these features do not differentiate the subject-matter of claim 17 further from the system of D1.

The functional feature "configured to adjust, **in response to measured flow rate data, pressure data or composition data** [...]" is unclear (Article 6 PCT), because it is not clear which flow rate, pressure or composition is to be measured.

Since unclear features cannot contribute to an inventive step, the subject-matter of claim 17 does not involve an inventive step over D1, eventually combined with D2.

Furthermore, D1 discloses adjustment in response to composition data, see again page 9, lines 2-12: "measurements of calcium ion concentration".

5 Claims 26 and 32

The methods of claims 26 and 32 are broader than that of claim 11 and are therefore also considered disclosed or at least not inventive in view of D1, see the same passages of D1 as cited above for claim 1.

6 Dependent claims

6.1 Dependent claims 2-4, 8-10, 12-15, 18-25, 27-31 and 33-35 do not contain any features or method steps which, in combination with those of any claim to which they refer, meet the requirements of novelty and/or inventive step, see documents D1 and D2 and the corresponding passages cited in the search report, considering also the general knowledge of the person skilled in the art.

In particular: the features are considered constructional details that are either disclosed or do not involve an inventive step. The method steps are obvious possibilities, when the equipment of D1, eventually combined with that of D2, is available.

6.2 The subject-matter of claims 5-7 is neither disclosed, nor rendered obvious by the available prior art. The features of these claims require a real, real time, integration of the water treatment system and the injection system: the composition of the blended injection water stream is made dependent on a measurement that is made with respect to the injection well. In other words: this requires feedback from the injection well: the composition of the injection water stream is adapted depending on whether injection is proceeding successfully or not.

This is clearly new with respect to D1 and is considered to involve an inventive step.

In D1, it is assumed that there is "an optimal range of salinity, and the optimum values will vary from reservoir to reservoir". There is no hint in D1, that the "optimal range of salinity" may vary in time, for one and the same reservoir. It is also not suggested to measure certain values in the well which can indicate whether injection is proceeding successfully, and then to adapt the composition of the injection stream accordingly.

In this context, it should be noted that the "real time" aspect is missing from dependent claim 35. This is the reason why the subject-matter of dependent claim 35 is not considered to involve an inventive step. In D1, for determining an optimal range of salinity for a given reservoir, it would be obvious to use measurements relating to that reservoir, for example: "pressure in the wellbore", especially since this claim does not require such measurements to be taken in real time, during injection.

Re Item VII

Certain defects in the international application

7 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).