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Datasheet for the decision of 9 September 2020

Case Number: T 1609/16 - 3.3.06

Application Number: 08858300.0

Publication Number: 2222819

IPC: C10G31/08, B01J21/06, C10G75/00

Language of the proceedings: EN

Title of invention:
PROCESS TO REDUCE ACIDITY OF CRUDE OIL

Applicants:
1) Saudi Arabian Oil Company
2) Aramco Services Company

Headword:
Process to reduce acidity of crude oil/Saudi Arabian Oil Company et al

Relevant legal provisions:
EPC Art. 123(2), 56
RPBA 2020 Art. 13(2)

Keyword:
Late-filed main request - admitted (yes)
Amendments - added subject-matter (no)
Inventive step - (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 1609/16 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 9 September 2020

Appellant: (Applicant 1)	Saudi Arabian Oil Company 1 Eastern Avenue Dhahran 31311 (SA)
Appellant: (Applicant 2)	Aramco Services Company 9009 West Loop South Houston, TX 77210-4535 (US)
Representative:	Sessford, Russell Forresters IP LLP Skygarden Erika-Mann-Strasse 11 80636 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 4 February 2016 refusing European patent application No. 08858300.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	C. Heath
Members:	P. Ammendola
	G. Santavicca

Summary of Facts and Submissions

I. The appeal of the applicants has been filed against the decision of the Examining Division refusing European patent application 08 858 300.0. In the decision under appeal, only objections of added subject-matter (Article 123(2) EPC) and of lack of an inventive step (Article 56 EPC) were dealt with.

II. With their response of 14 August 2020 to the Board's communication issued in preparation for the oral proceedings, the applicants/appellants requested that the decision under appeal be set aside and that a European patent be granted on the basis of the set of claims labelled as **Main Request** enclosed in said response of 14 August 2020.

III. Claim 1 of the Main Request reads as follows (the amendments vis-à-vis claim 1 as originally filed are made apparent by the Board):

"*1. A process ~~for~~**of** reducing the acidity of ~~a~~n **whole** acidic crude oil **at an on-site production facility near to a wellhead of a petroleum reservoir,** comprising the steps of:*

*obtaining a petroleum reservoir supply of **whole** acidic crude oil **having a TAN of at least 0.3** ~~,~~ ~~wherein the petroleum reservoir has an on-site production facility~~;*

mixing the acidic crude oil with water at a weight ratio of ~~about~~ 10:1 to ~~about~~ 1:50 to form a crude oil/water mixture~~, such mixing operable to occur at the on-site production facility~~;

heating the crude oil/water mixture to a crude oil/water temperature in the range of ~~about~~ 10°C to

~~about~~ 150°C to form a pumpable crude oil/water mixture;

pumping the pumpable crude oil/water mixture to a pressure of at least ~~about~~ 22.1 MPa to form a pressurized crude oil/water mixture;

pre-heating the pressurized crude oil/water mixture to a pressurized temperature in the range of ~~about~~ 150°C to ~~about~~ 350°C;

contacting the pressurized crude oil/water mixture with a ***ZrO_2*** *~~metal oxide~~ catalyst in a reaction zone, wherein the reaction zone comprises main reactor having an interior portion;*

heating the pressurized crude oil/water mixture to a reaction temperature range of ~~about~~ 400° to ~~about~~ 500°C while maintaining the pressure at or above at least ~~about~~ 22.1 MPa for a reaction period of time operable to produce a treated crude oil having a significantly reduced TAN in comparison to the TAN of the acidic crude oil;

reducing the pressure of the treated crude oil using a pressure regulating device to create a pressure-reduced treated mixture;

separating the pressure-reduced treated mixture into a gas portion and a liquid portion;

separating the liquid portion into recovered water and low acidity oil; and

collecting the low acidity oil wherein the low acidity oil is an upgraded crude oil having reduced amounts of asphaltene, sulfur, nitrogen or metal containing substances as compared to the acidic crude oil."

Claims 2 to 11 of the Main Request define preferred embodiments of the process of claim 1.

IV. The board cancelled the scheduled oral proceedings.

Reasons for the Decision

Main Request

1. Admittance into the appeal proceedings

The main request has been filed after the issue of the summons to oral proceedings. However, this submission is manifestly in reply to new clarity objections raised in the Board's preliminary opinion (based on the consideration that the process claimed in the then pending claim requests did not clearly require that the process be carried out at an on-site production facility near to a wellhead of a petroleum reservoir, see point 4 of the board's communication). Moreover, the amendments made to the the original claims are straightforward, clearly address the outstanding issues in a manner that was already contemplated in the board's written opinion, and do not introduce any new subject-matter or raise new objections requiring further consideration. Hence the board exercises its discretion under Article 13(2) RPBA 2020 and decides to admit the Main Request into the appeal proceedings.

2. Compliance with Article 123(2) EPC

The board notes that claim 1 of the main request (see also III, *supra*) finds its basis in the combination of original claim 1 with the following further items of disclosure, respectively in:

- paragraphs [0009], (acknowledgement of prior art), [0019] (last sentence), [0021], [0025], [0033], [0037] and [0054] of the originally filed description (disclosing that the process takes place on the whole

acidic crude oil at an on-site production facility near to a wellhead of a petroleum reservoir);

- original claim 2 and paragraph [0025] (disclosing a TAN of at least 0.3 of the acidic crude oil), and

- original claim 8, paragraph [0031] and the examples (disclosing the ZrO_2 catalyst).

Dependent claims 2 to 11 of the Main Request find their basis in original claims 3 to 7 and 9 to 13.

Thus, the board concludes that the claims of the Main Request comply with the requirements of Article 123(2) EPC.

3. Clarity, sufficiency of disclosure and novelty

The board is satisfied that the claims of the Main Request are clear and that the subject-matter claimed therein is sufficiently disclosed and not anticipated in the available prior art. Thus, the Main Request is found to comply with the requirements of Article 84, 83 and 54 EPC. No further details need to be given here, as no objections in view of these requirements of the EPC have been raised and dealt with by the Examining Division in the decision under appeal.

4. Inventive step: claim 1

4.1 The technical problem addressed in the patent application and the closest prior art

The patent application identifies the technical problem addressed by the claimed invention in the provision of "*a method for reducing the acidity of highly acidic*

crude oils...[m]ore particularly, the present invention relates to a method for deacidification of highly acidic crude oil to reduce the tendency for corrosion of metal surfaces during transportation, storage, and processing by conventional refining processes" (see the second paragraph on page 1 of the application as originally filed). Further reference to such technical problem are also mentioned, *inter alia*, in original paragraphs [0009], [0019] and [0021].

None of the documents cited by the examining division (i.e. D1 = EP 1 862 527 A; D2 = EP 0 978 552 A; D3 = US 4 840 725 A and D4 = US 4 453 177 A) explicitly addresses the reduction of acidity of the crude oil or of the corrosion of metal surfaces occurring when an acidic crude oil is transported, stored or processed.

In particular, also D2, taken as the closest prior art in the decision under appeal, is silent as to where the disclosed process is to be carried out (i.e. it does not teach whether the described process is carried out e.g. in a refinery - to which the heavy crude oil has been transported - or in an "on-site" facility near the wellhead of the petroleum reservoir).

Nevertheless, as observed by the examining division (and undisputed by the appellant) in reasons 14.1 and 14.2 of the decision under appeal:
"Document D2 discloses a process for reducing the metal content of heavy crude oil by reacting a crude oil/ water mixture in the presence of a catalyst at conditions for temperature and pressure which are at or above the critical temperature and pressure for water (see column 1, line 49, to column 2, line 9, and paragraphs [0010] to [0014]).

Demetallization of crude oils provide always also reduction of the corresponding acid number so that the rection step of D2 also reduces the acidity of the treated crude oils."

Hence, the board finds that the demetallization process of heavy crude oil disclosed in D2 remains a suitable starting point for the assessment of inventive step.

4.2 The technical problem solved and the proposed solution

The board finds that the subject-matter of claim 1 under consideration successfully solves, vis-à-vis the prior art, at least the aspect of the posed technical problem (identified in the above-identified passages of the original description) that relates to the reduction of metal corrosion occurring during transportation of the whole acidic crude oil or a fraction thereof (from the extraction facility).

Indeed, the solution defined in claim 1 at issue requires that the **whole** acidic crude oil (thus, necessarily before any fractionation or further processing of the acidic crude oil) must be treated with supercritical water in the presence of ZrO_2 at an **on-site** production facility near the wellhead of the petroleum reservoir.

4.3 Obviousness

The board notes that none of the cited documents suggests the possibility to carry out "on-site" any treatment of the whole crude oil, or mentions the occurrence of metal corrosion during the transportation of acidic crude oil to refinery.

Hence, the cited prior art cannot possibly render obvious for the skilled artisan to solve the posed technical problem by carrying out e.g. the demetallization process of D2 already on the **whole** crude oil at an **on-site** production facility.

Accordingly, the subject-matter of claim 1 provides a non-obvious solution to the technical problem of reducing the metal corrosion occurring during transportation of the whole acidic crude oil from the wellhead to the refinery.

Thus, the process of claim 1 involves an inventive step.

5. As all dependent claims of the Main Request define preferred embodiments of the process of claim 1, their process too are not obvious and involve an inventive step, for the same reasons as indicated above.

6. The subject-matter defined in the claims of the Main Request therefore complies with the requirements of Article 56 EPC.

7. The Main Request is thus allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the examining division with the order to grant a patent on the basis of claims 1 to

11 of the Main Request filed with the letter of 13 August 2020 and a description to be adapted thereto.

The Registrar: The Chairman:

A. Pinna C. Heath

Decision electronically authenticated