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**Datasheet for the decision  
of 19 January 2007**

**Case Number:** T 0214/05 - 3.3.06

**Application Number:** 99925990.6

**Publication Number:** 1097186

**IPC:** C10G 2/00

**Language of the proceedings:** EN

**Title of invention:**

An integrated process for converting natural gas and gas field condensate into high valued liquid products

**Patentee:**

ExxonMobil Research and Engineering Company

**Opponent:**

Chevron U.S.A. Inc.

**Headword:**

Integrated hydroisomerization process/EXXON

**Relevant legal provisions:**

EPC Art. 108, 110, 111, 56, 52(1)  
RPBA Art. 10a, b

**Keyword:**

"Second and fourth auxiliary requests - admissibility (no)"  
"Main, first and third auxiliary requests - inventive step (no)"

**Decisions cited:**

T 0153/85

**Catchword:**

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Case Number: T 0214/05 - 3.3.06

**DECISION**  
of the Technical Board of Appeal 3.3.06  
of 19 January 2007

**Appellant:** ExxonMobil Research and Engineering Company  
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**Respondent:** Chevron U.S.A. Inc.  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 22 December 2004  
revoking European patent No. 1097186 pursuant  
to Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** P.-P. Bracke  
**Members:** G. Dischinger-Höppler  
A. Pignatelli

## Summary of Facts and Submissions

- I. This appeal is from the decision of the Opposition Division to revoke the European patent No. 1 097 186 relating to an integrated process for converting natural gas and gas field condensate into high valued liquid products.
- II. A notice of opposition had been filed against the granted patent, wherein the Opponent sought revocation of the patent on the grounds of Article 100(a) for lack of inventive step (Article 56 EPC). The opposition was based, amongst others, on the following documents:

D1 WO-A-97/28106,

D2a "Post-Commissioning Operation Experience at the Mossgas Reforming Plant" prepared by H. de Wet et al. for presentation at the AIChE Ammonia Safety Symposium, San Francisco, USA, 22 to 26 September 1997.

During the opposition proceedings, the Patent Proprietor filed, amongst others, the following further document

D11 "Hydrocracking Science and Technology" by J. Scherzer and A. J. Gruia, Marcel Dekker, Inc., New York, 1996, pages 66 to 81,

and an amended set of claims in an auxiliary request.

III. Claim 1 as granted (main request) reads as follows:

"1. An integrated process for producing a hydroisomerate in the presence of sulphur comprising the steps of:

(a) separating a natural gas into a first stream comprising a C<sub>5+</sub> gas field condensate containing sulphur and a second stream comprising said natural gas having C<sub>5+</sub> gas field condensate removed therefrom;

(b) removing sulphur from said second stream;

(c) subjecting said second stream to a synthesis gas generation process to produce synthesis gas;

(d) subjecting said synthesis gas to a hydrocarbon synthesis process to produce hydrocarbons;

(e) hydrotreating and hydroisomerizing said hydrocarbons of step (d) in the presence of said first stream over a catalyst having an acidic functionality and comprising a Group VIII non-noble metal or tungsten and a hydrocracking suppressant, wherein said hydrocracking suppressant is selected from the group consisting of Group IB metal, sulphur and mixtures thereof."

Claim 1 of the auxiliary request differs therefrom in that in step (e) the term "selected from the group consisting of Group IB metal, sulphur and mixtures thereof" has been replaced by "sulphur in the form of sulfided catalytically active metal wherein the sulphur

is present on the catalyst in an amount in the range of from 0.1-10 wt% and the sulphur in the C<sub>5+</sub> condensate acts to keep the catalyst sulfided".

IV. In its decision, the Opposition Division found that the subject-matter claimed in the main and auxiliary request was not based on an inventive step in view of D1 as the closest prior art when combined with the common general knowledge of someone skilled in the art.

V. This decision was appealed by the Patent Proprietor, now Appellant, who filed, inter alia, a copy of a declaration by Mr Berlowitz including tests in relation to a synergistic effect of the claimed subject-matter.

The Appellant maintained the claims as granted as its main request, re-filed the auxiliary request as its first auxiliary request with a letter dated 29 April 2005 setting out the statement of grounds of appeal and filed a further amended set of claims in a second auxiliary request with the same letter.

Claim 1 of the second auxiliary request differs from that of the main request in that step d) has been limited to an FT process producing hydrocarbons having  $\leq 0.1$  wppm of sulphur and in that in step (e) the term "selected from the group consisting of Group IB metal, sulphur and mixtures thereof" has been replaced by "sulphur and in the form of sulfided catalytically active metal wherein the sulphur is present on the catalyst in an amount in the range of from 0.1-10 wt% and the sulphur in the C<sub>5+</sub> condensate acts to keep the catalyst sulfided while the HI step simultaneously lowers the sulphur level in the C<sub>5+</sub> condensate".

In a letter dated 20 September 2005, the Opponent, now Respondent, in reply, filed objections under Articles 84 and 123(2) EPC as regards the auxiliary requests and under Article 56 EPC with respect to all requests.

Under cover of a letter dated 19 December 2006, the Appellant filed another amended set of claims in a third auxiliary request.

Claim 1 of the third auxiliary request differs from that of the main request in that in step (e) the term "selected from the group consisting of Group IB metal, sulphur and mixtures thereof" has been replaced by "sulphur in an amount in the range of from 0.1-10 wt% and the said acidic functionality is in the form of an amorphous silica-alumina support, wherein the silica content is in the range of from 15-30 wt%".

VI. At the very beginning of the oral proceedings held before the Board on 19 January 2007, the Appellant replaced its second auxiliary request by another amended set of claims and filed a further amended set of claims in a fourth auxiliary request.

Claim 1 of the new second auxiliary request differs from that of the main request in that in step (e) the term "selected from the group consisting of Group IB metal, sulphur and mixtures thereof" has been replaced by "sulphur in the form of sulfided catalytically active metal wherein the sulphur is present on the catalyst in an amount in the range of from 0.1-10 wt% and the sulphur in the C<sub>5+</sub> condensate acts to keep the catalyst sulfided, and the acidic functionality is in

the form of an amorphous silica-alumina support, wherein the silica content is less than about 50 wt%".

Claim 1 of the fourth auxiliary request differs from that of the second auxiliary request in that the term "less than about 50 wt%" at the very end of the claim has been replaced by "in the range from 15-30 wt%".

VII. In relation to inventive step, the Appellant submitted essentially the following arguments:

- In view of D1 as the closest prior art, the technical problem to be solved by the claimed subject-matter consisted in the provision of an integrated process producing increased yields of high valued products as well as decreased amounts of gas. It was apparent from Example 6 of the patent in suit that less gas was produced by the claimed process. In addition, the pour point data provided by Mr Berlowitz showed that the claimed co-processing of streams provided higher valued products as if the streams were processed separately. Therefore, it was evident that the above technical problem was actually solved by the claimed process. However, D1 taught away from the claimed co-processing of a highly sulphided gas field condensate with a low sulphur FT (Fischer-Tropsch) wax. Also a skilled person would not have combined such different streams because the low sulphur FT wax would be polluted by the highly sulphided condensate and because it was known from D2a that in an integrated process the condensate stream was purified before being combined with the FT wax for hydrotreatment.

- Therefore, a skilled person would not have expected that the claimed co-processing would provide high valued products as compared with the process of D1.
  
- The same applied the more to the auxiliary requests which were further distinguished from the prior art. Concerning the first auxiliary request reference was also made to D11 where it was suggested to a skilled person to add H<sub>2</sub>S (hydrogen sulphide) in order to prevent sulphur to be stripped from the catalyst during hydroisomerisation.

VIII. At the oral proceedings, the Respondent objected to the admission of the auxiliary requests filed during oral proceedings and to the tests submitted with the declaration by Mr Berlowitz for being defective. Concerning inventive step, the following arguments were submitted:

- D1 disclosed a process for hydroisomerisation of FT wax as well as of sulphur containing gas field condensate over the same catalyst as defined in step e) of the claimed process. Further, D1 taught the requirement of adding sulphur to the hydroisomerisation catalyst to obtain higher selectivity and yield. It did not teach against the co-processing of sulphur-free FT wax and sulphur-containing condensate if the disadvantage of polluting the sulphur-free product derived from the FT wax was accepted. Therefore, the subject-



matter of Claim 1 of the main request was not based on an inventive step over D1 alone.

- The subject-matter claimed in the auxiliary requests was not inventive either since the additional features contained therein were also known from D1.

IX. The Appellant requested that the decision under appeal be set aside or alternatively that the patent be maintained on the basis of the set of claims submitted with the first auxiliary request filed under cover of the letter dated 29 April 2005, or according to the second auxiliary request filed during oral proceedings, or according to the third auxiliary request filed under cover of the letter dated 19 December 2006, or according to the fourth auxiliary request filed during oral proceedings.

The Respondent requested that the appeal be dismissed.

## **Reasons for the Decision**

1. *Admissibility of the second and fourth auxiliary requests*
  - 1.1 At the outset of the oral proceedings before the Board, the Appellant replaced the claims of the second auxiliary request filed with the statement of grounds of appeal by a new set of claims and introduced an additional fourth auxiliary request.

1.2 It is apparent from points V and VI above that these auxiliary requests have been filed for the first time approximately 21 months after the statement of grounds of appeal; about 16 months after the Respondent had filed observations in regard of the Appellant's requests presented with the statement of grounds of appeal and about one month after the Appellant's reply to the Respondent's observations.

1.3 It is the established jurisprudence of the Boards of Appeal of the EPO that the appeal procedure as laid down in Articles 108, 110 and 111 EPC is designed to ensure that the proceedings are as brief and concentrated as possible and ready for decision at the conclusion of oral proceedings, if scheduled. Therefore, amendments to the claims shall be filed at the earliest possible moment and the Board may disregard amended claims, if they are not submitted in good time prior to oral proceedings and if they are not clearly allowable (see e.g. T 153/85, OJ EPO 1988, 1, reasons no. 2.1).

This principle is set out in the RPBA as published in the OJ EPO 2003, 89 and 2004, 541. Accordingly, Article 10a(2) RPBA stipulates that an Appellant's complete case shall be presented with the statement of grounds of appeal.

It is appropriate to observe that amendments made to the previously filed requests made at a late stage of the proceedings may be admissible, if they are justified in the particular circumstances of the case. However, this does not mean that a party is completely free as to which steps are to be taken to that end. On the contrary, Article 10b(1) of the RPBA rules that the

Board's discretion to admit amendments to a party's case shall be exercised in view of, *inter alia*, the need for procedural economy. In other words, late requests shall not be admitted if their admission could delay the proceedings, for example, if the amendments are not clearly allowable.

1.4 The Appellant sought to justify the late filing of the new requests by the reason that it was recognised only shortly before the oral proceedings that the claims according to the old second auxiliary request might indeed violate the provisions under Article 123(2) EPC and that the aspect of the invention as set out in Claim 1 of the new auxiliary requests had not yet been considered.

1.5 However, the Board cannot accept this argument as a justification for filing new auxiliary requests for the first time at the oral proceedings. The reasons are as follows:

It is not adequate in appeal proceedings merely to present new aspects for consideration, if those aspects are not essential for the invention. However, if the amended claims relate to an essential aspect of the invention, they could and should have been filed already during opposition proceedings.

Concerning the argument that objections under Article 123(2) EPC against the old second auxiliary request shall be overcome by the new second auxiliary request, the Board observes that they could and should have been filed, at the latest, with the Appellant's reply to the Respondent's letter of 20 September 2005

where the respective objections had been raised. However, the Appellant in this reply chose to maintain its former second auxiliary request and to file a further, third, auxiliary request.

Further, the amendments made in the new requests result in a different scope of the claimed subject-matter as compared to all former requests. Namely, Claim 1 of the new fourth auxiliary request essentially corresponds to a combination of the features of Claim 1 of the first and third auxiliary requests whereas Claim 1 of new second auxiliary request differs from that of the fourth auxiliary request only by a less limited silica content but essentially from that of the old second auxiliary request (see points III, V and VI above).

When presenting the new requests, the Appellant has not indicated why the new combination of features would overcome the objections raised against the higher ranking requests.

Thus, it is apparent that any estimation of whether such a different scope of the claimed subject-matter would be clearly allowable under the EPC is not immediately possible and could, therefore, cause a delay of the proceedings since patentability of that scope had never been assessed in opposition or appeal proceedings. Apart from that it is evident from the Board's view set out below in relation to Claim 1 of the first and third auxiliary requests that the amalgamation of the features of those claims which result in the subject-matter claimed in the new requests would be clearly not allowable under the provisions of Article 52(1) EPC.

1.6 Therefore, the new second and the fourth auxiliary requests are not admitted.

2. *Amendments of the claims of the main, first and third auxiliary requests*

The Board is convinced that the amendments made to the claims do not violate the provisions of Articles 84 and 123 EPC. Since the Appellant's requests fail for lack of inventive step, no further details need to be given.

3. *Main request - Inventive Step*

3.1 The patent in suit and in particular the claimed subject-matter relate to an integrated process for producing a hydroisomerate in the presence of sulphur by converting natural gas and gas field condensate over a particular catalyst (Claim 1 and page 2, paragraph [0007]).

It is explained in the description of the patent in suit that isomerisation processes in the presence of hydrogen effected with unsulphided catalysts are prone to hydrogenolysis, e.g. hydrocracking, so that significant amounts of gases, methane or C<sub>1</sub> to C<sub>4</sub> hydrocarbons, are produced. It is, therefore, desired to eliminate or substantially reduce hydrogenolysis to increase the yield of desired products and decrease the yield of gaseous products (page 2, paragraph [0002]).

As D1 also deals with this same technical problem, i.e. the improvement of the yield of desired products during hydroisomerisation processes (page 1, third paragraph),

the Board agrees with both parties that D1 qualifies as a suitable starting point for the assessment of inventive step.

- 3.2 According to D1, the above mentioned technical problem has already been solved by conducting the hydroisomerisation process in the presence of a catalyst having an acidic functionality and comprising a Group VIII non-noble metal and a hydrocracking suppressant selected from the group consisting of a Group 1B metal, sulphur or mixtures thereof (see in D1, Claims 1 and 2, page 1, last paragraph and page 2, last but one paragraph).

However, D1 does not disclose an integrated process wherein natural gas is first separated into a gas stream and a sulphur-containing gas field condensate and the gas stream is further processed to remove sulphur, produce synthesis gas and therefrom hydrocarbons which are then combined with the gas field condensate for hydroisomerisation.

- 3.3 As is stated in the patent in suit, natural gas fields contain significant amounts of liquid C<sub>5+</sub> material, i.e. gas field condensate which has to be upgraded to remove e.g. sulphur, if it is to be used as liquid petroleum fuel. According to the patent in suit, the gas field condensate is, for this purpose, separated from the gaseous material and upgraded in separate vessels. It is, thus, indicated that an integrated process would be advantageous which can, in a single unit, upgrade into high valued liquid petroleum products both the natural gas field condensate and the FT liquids derived from the natural gas (paragraphs [0003] and [0004]).

- 3.4 The Appellant argued that the technical problem to be solved by the claimed process in view of D1 can be defined to consist in the provision of an integrated process producing increased yields of high valued products and decreased amounts of gas.

In the Appellant's opinion, it was shown in Example 6 of the patent in suit that the claimed process provided a highly valuable product due to the production of low amounts of gas. Further, the experimental data submitted by Mr Berlowitz showed on the basis of the pour point data that the claimed co-processing (co-hydroisomerisation) of sulphur-containing gas field condensate and sulphur-free FT wax provided higher valued products (i.e. lower pour point) as if the streams were separately hydroisomerised and thereafter mixed. Therefore, it was evident that the above mentioned technical problem has actually been solved by the claimed process.

- 3.5 The Board agrees with the Appellant insofar as the tests provided by Mr Berlowitz may show an improved pour point (0 or  $-1^{\circ}\text{C}$ ) for product 3 which is co-processed in accordance with the claimed subject-matter as compared with the product 4 ( $6^{\circ}\text{C}$ ) obtained by separate processing and thereafter mixing of the processed streams (see Table 1 of the Berlowitz declaration).

However, a process where sulphur-containing and sulphur-free feeds are separately hydroisomerised and, thereafter, mixed is not disclosed in D1. Instead, D1 teaches that the feed to be hydroisomerised may be any

hydrocarbon containing material having a final boiling point of less than 566°C. Preferred materials are waxy feeds obtained from an FT process, but feeds containing high levels of sulphur, such as gas field condensates may also be used (page 3, last paragraph and page 4, lines 1 to 4 and 16 to 20). Hence, D1 embraces the embodiments of hydroisomerising either FT wax or gas field condensate.

It is conspicuous from the Berlowitz data that the co-processed product 3 as a representative of the claimed subject-matter has a better (lower) pour point (0 or -1°C) than the hydroisomerised product 1 obtained from a sulphur-free surrogate for an FT wax alone (10 or 11°C) but a substantial worse pour point than the hydroisomerised product 2 obtained from a sulphur-containing gas field condensate (less than -30°C).

The Board concludes that the products obtained from the claimed process are not improved over each and every embodiment disclosed in D1, as far as the pour point is concerned.

Concerning the alleged improvement by reducing the gas yield, the Board observes that Example 6 of the patent in suit provides only a comparison of the claimed process (second and third embodiment in Table 4) with a process of hydro-isomerisation of FT wax over a catalyst comprising neither a Group IB metal nor sulphur, hence a catalyst which differs from that used in Claim 1 of the patent in suit in the same way as from that used in accordance with D1. Example 6 is, therefore, not suitable to show a beneficial effect in this respect. It is to be noted that the effect of



suppressing gas production over a catalyst in accordance with Claim 1 versus such a different catalyst is already illustrated in D1 (page 6, example).

Since an improvement of other properties indicating the value of the products has not been shown, the Board cannot accept the Appellant's argument that in view of D1, the claimed subject-matter solved the technical problem of improving the value of the product.

Further, according to the well-established case law of the Boards of Appeal, objective criteria must be used to determine the technical problem, i.e. the problem which can be seen to have been actually solved in view of the closest prior art. Therefore, in formulating this problem, any pointers to the solution must be avoided in order to avoid an ex post facto view during the assessment of inventive step (Case Law of the Boards of appeal, 2001, chapter I.D.4.1 and 4.2). However, this would be the case if the technical problem to be solved in view of the disclosure of D1 was defined to consist in the provision of an integrated process as suggested by the Appellant.

The Board is, therefore, of the opinion that the technical problem solved by the claimed subject-matter in view of the disclosure of D1 has rather to be seen to consist in the provision of an alternative process for hydroisomerising hydrocarbon containing feed.

- 3.6 It remains to be decided whether, in view of the available prior art documents, it was obvious for someone skilled in the art to solve the above-stated

technical problem by the means claimed, namely by an integrated process wherein natural gas is first separated into a gas stream and a sulphur-containing gas field condensate and the gas stream is further processed to remove sulphur, produce synthesis gas and therefrom hydrocarbons which are then combined with the gas field condensate for hydroisomerisation as specified in Claim 1.

- 3.7 D1 does not mention an integrated process. However, as acknowledged by the Appellant, such an integrated process where FT wax is produced from the gas fraction of natural gas and combined with the condensate fraction hydroisomerisation, is already known in the art, specifically from the Mossgas reforming plant presented in e.g. D2a (Figure 2).

The Appellant argued that it was apparent from this Figure in D2a that the condensate was purified before being combined with the FT wax for hydrotreatment. This fact confirmed the teaching of D1 that prior to hydroisomerisation sulphur has to be removed completely from the feed.

The Board accepts that means for purification (fractionation towers) are shown in Figure 2 in D2a. However, the quality of the product after hydrotreatment is not an issue in present case (point 3.5 above) and the wording of Claim 1 does not exclude steps for purifying the condensate. Therefore, a skilled person had no reason to disregard the integrated process of D2a if the intention merely consisted in providing an alternative process to that disclosed in D1.

Concerning the relevant teaching of D1, the Board agrees with the Appellant insofar as it discloses the removal of essentially all of the sulphur if the feed is treated for that purpose. Such treatment is, however, not prerequisite in the process of D1. Instead, D1 generally states that the feed may be treated or not for sulphur removal (page 4, last paragraph).

3.8 In view of the above, the Board finds that it was at the disposal of someone skilled in the art seeking to provide an alternative process to that disclosed in D1, to perform that process as an integrated process as suggested in D2a, thereby arriving at the subject-matter of Claim 1.

3.9 Consequently, the main request must fail since the subject-matter of Claim 1 is not based on an inventive step and does not comply with the requirements of Articles 52(1) and 56 EPC.

#### 4. *First and third auxiliary requests*

4.1 Compared with Claim 1 of the main request, Claim 1 of the first auxiliary request additionally contains the features that

a) the sulphur is in the form of sulphided catalytically active metal

b) wherein the sulphur is present on the catalyst in an amount ranging from 0.1 to 10 wt%

c) and the sulphur in the condensate acts to keep the catalyst sulphided.

As indicated by the Respondent, features a) and b) are also known from D1 (page 2, last two paragraphs). The Appellant did not dispute this fact but argued that D1 did not disclose that the sulphur in the condensate acts to keep the catalyst sulphided. Instead it was known from D1 to add, for that purpose, small amounts of sulphur together with the feed which according to D11 would mean to add H<sub>2</sub>S to prevent that sulphur is stripped from the catalyst.

The Board does not agree since the relevant passage in D11 only mentions that a minimum concentration of H<sub>2</sub>S must be maintained in the reacting gases to keep the catalyst in a sulphided state (page 69, fourth paragraph), but sulphur containing feedstock may as well be used for sulphiding (page 67, lines 1 to 5 and 22 to 25). This is corroborated by the patent in suit where it is indicated in Example 6 that the un-sulphided catalyst 2 is sulphided by the sulphur in the feed. The Board, therefore, agrees with the Respondent that the sulphur present in the condensate feed of D1 also acts to keep the catalyst sulphided.

Therefore, the Board agrees with the Respondent's opinion that the amendments made to the claims of the first auxiliary request do not amount to a technical difference vis-à-vis the disclosure of D1.

Consequently, the subject-matter claimed in the first auxiliary request does not imply an inventive step

(Article 56 EPC) for the same reasons given above for the main request.

4.2 Compared with Claim 1 of the main request, Claim 1 of the third auxiliary request contains as additional features the above feature b) and further that

- the acidic functionality is in the form of an amorphous silica-alumina support wherein the silica content is in the range of 15 to 30 wt%.

During oral proceedings before the Board, the Appellant eventually conceded that this feature is also known from D1 (Claims 7 and 9 and page 3, second paragraph).

The Board therefore concludes that the above reasons for the main and first auxiliary requests apply *mutatis mutandis* to the third auxiliary request.

Therefore, the subject-matter of the third auxiliary request does not amount to an inventive step (Articles 52(1) and 56 EPC).

5. Since none of the Appellant's requests succeeds, the appeal has to be dismissed.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

G. Rauh

P.-P. Bracke