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**Datasheet for the decision  
of 15 April 2008**

**Case Number:** T 1090/05 - 3.3.06

**Application Number:** 98909982.5

**Publication Number:** 1015530

**IPC:** C10L 1/18

**Language of the proceedings:** EN

**Title of invention:**

Synthetic jet fuel and process for its production

**Patentee:**

ExxonMobil Research and Engineering Company

**Opponent:**

Chevron U.S.A. Inc.

**Headword:**

Jet fuel/EXXONMOBIL

**Relevant legal provisions (EPC 1973):**

EPC Art. 56

**Keyword:**

"Inventive step (all requests) - no: obvious modification"

**Decisions cited:**

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**Catchword:**

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Case Number: T 1090/05 - 3.3.06

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.06  
of 15 April 2008

**Appellant I:** Chevron U.S.A. Inc.  
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**Appellant II:** ExxonMobil Research and Engineering Company  
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**Representative:** UEXKÜLL & STOLBERG  
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**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office posted  
24 June 2005 concerning maintenance of European  
patent No. 1015530 in amended form.

**Composition of the Board:**

**Chairman:** P.-P. Bracke  
**Members:** P. Ammendola  
J. Van Moer

## Summary of Facts and Submissions

- I. This appeal is from the interlocutory decision of the Opposition Division concerning the maintenance in amended form of European patent No. 1 015 530 relating to a synthetic jet fuel and the process for its production.
- II. The European patent had been opposed on the grounds of Article 100(a) EPC 1973 for lack of novelty and of inventive step (Articles 54 and 56 EPC 1973) as well as for insufficient disclosure (Article 100(b) EPC 1973) and added subject-matter (Article 100(c) EPC 1973).
- III. During the opposition proceedings the Opponent and the Patent proprietor had made reference, *inter alia*, to the following documents:
- (6)= J. Eiler et al., "*The Shell Middle Distillate Synthesis Process*" Cat. Lett., 1990, 7, 253-270,
- (22)= P.I. Lacey, "*Wear with Low-Lubricity Fuels II. Correlation between Wear Maps and Pump Components*", *Wear*, vol. 160, pg 333-343 (1993).
- IV. The Opposition division refused to maintain the patent in amended form according to the then pending main request and first and second auxiliary requests of the Proprietor, but considered that the patent modified according to the then pending third auxiliary request of the Proprietor complied with the requirements of the EPC 1973 because, *inter alia*, the prior art would not disclose or render predictable that alcohols in general, or specifically C<sub>7</sub>-C<sub>12</sub> primary linear alcohols, were

suitable as lubricating agents for jet fuels obtained from Fisher-Tropsch processes (hereinafter "FT jet fuels").

- V. The Opponent (hereinafter "Appellant I") as well as the Proprietor (hereinafter "Appellant II") appealed against this decision.

Oral proceedings took place before the Board on 15 April 2008.

During the hearing the Appellant II replaced any previously filed sets of amended claims by two new sets thereof, each containing only one claim, respectively labelled as main request and as auxiliary request.

The sole claim of the main request read:

*"1. A material useful as a jet fuel or as a blending component for a jet fuel, having a freeze point of  $-47^{\circ}\text{C}$  or lower, boiling in the range of from  $250-550^{\circ}\text{F}$  ( $121.1-287^{\circ}\text{C}$ ), derived from a non-shifting Fischer-Tropsch process and containing*

- at least 95 wt % paraffins with an iso to normal ratio within the range of from 0.3 to 3.0*
- $\leq$  50 ppm (wt) each of sulfur and nitrogen*
- less than about 1.0 wt % unsaturates, and*

- *from 0.01 to less than 0.5 wt % oxygen, the oxygen being present primarily as C<sub>7</sub>-C<sub>12</sub> primary linear alcohols.*"

The sole claim of the auxiliary request differed from that of the main request only in that the wording "oxygen, the oxygen" was replaced by "oxygen, water free basis, the oxygen".

VI. During the oral proceedings, the Board decided that the sole claim of the main request complied with the requirements of Article 84 EPC 1973 and of Article 123(2) EPC.

VII. The Appellant I did not dispute the novelty of the subject-matter of any of the two final requests of Appellant II, but argued, *inter alia*, that they both lacked of an inventive step for substantially identical reasons. These reasons may be summarized as follows.

The improvement of lubricity allegedly obtained by the claimed FT jet fuel vis-à-vis the most relevant prior art, i.e. the completely hydroisomerized FT jet fuels disclosed e.g. in document (6), had not been credibly demonstrated.

However, even if the Board would found credible that the claimed jet fuels possessed such lubricity improvement, still this latter would be predictable. Indeed, it would already be known, as indicated e.g. in document (22), that polar oxygenated compounds, such as alcohols, would act as lubricating components in the conventional petrol derived jet fuels (hereinafter "petrol jet fuels"). Hence, the skilled person would

have considered obvious that these polar components would improve the lubricating property of FT jet fuels as well.

Moreover, the patent in suit would not even allege that the selection of the C<sub>7</sub>-C<sub>12</sub> primary linear alcohols resulted in a surprisingly high level of lubricity in comparison to the other polar substances already known as lubricating agents.

Hence, the claimed subject-matter would at most result from an arbitrary selection among the solutions to the posed technical problem that were already suggested in document (22).

VIII. Appellant II agreed that the subject-matters of its two requests was evidently identical and that the fully hydroisomerized FT jet fuels of document (6) represented the most appropriate starting point for inventive step assessment. Nevertheless, it disputed the reasoning of Appellant I in this respect for substantially the following reasons.

Even though the improved lubricity considered in the patent was specifically that needed to prevent "scuffing" as measurable by the same BOCLE test that was considered in document (22), still the knowledge on the lubricating function of the polar components of jet fuels referred to in this citation, inclusive of the teaching that alcohols could act as lubricating agents, was exclusively limited to petrol jet fuels. Taking into account the substantial differences in chemical compositions between these jet fuels and the FT ones, the skilled person could not derive from document (22)

any reliable information on the lubricating agents effective in FT jet fuels.

Also the several years passed between the publication of this citation and the filing date of the patent in suit confirmed that the knowledge in the field of petrol jet fuels would not render immediately evident to the skilled person the possible use of alcohols as lubricating aids in FT jet fuels as well.

Finally, the available prior art contained no pointer motivating the skilled person to select specifically the C<sub>7</sub>-C<sub>12</sub> primary linear alcohols.

Hence, an inventive step would be required for using these alcohols in order to improve the lubricating properties of the FT jet fuel of document (6).

IX. The Appellant I requested that the decision under appeal be set aside and the patent be revoked.

The Appellant II requested that the decision under appeal be set aside and that the patent be maintained on the basis of the main request or, in the alternative, of the auxiliary request both filed during oral proceedings.

## **Reasons for the Decision**

### *Main request of Appellant II*

1. As this request fails for lack of inventive step for the reasons given here below it is not necessary to

give details on the finding of the Board that the sole claim thereof complies with the requirements of Articles 54(1)(2) and 84 EPC 1973 and of Article 123(2) EPC.

2. Inventive step (Article 56 EPC 1973)

2.1 The claim of this request defines a jet fuel or jet fuel component characterised by several properties including a content of from 0.01 to less than 0.5 wt.% of oxygen present primarily as C<sub>7</sub>-C<sub>12</sub> primary linear alcohols (see above section V of the Facts and Submissions).

2.2 According to the patent in suit this fuel has solved the technical problem of avoiding costly lubricity additives for the fully hydroisomerized FT jet fuels of the prior art (see the patent in suit, paragraphs 1 to 3 as well as 44 and 46).

Hence, and since the patent makes specific reference (see paragraph 30) to the fully hydroisomerized FT fuels disclosed in document (6), the Board concurs with the parties that this citation represents a suitable starting point for the assessment of inventive step.

2.3 The Board also concurs with the parties that the sole feature distinguishing the claimed subject-matter from this prior art lies in the additional presence of from 0.01 to less than 0.5 wt.% oxygenated compounds, primarily as C<sub>7</sub>-C<sub>12</sub> primary linear alcohols.

2.4 It has been disputed among the parties whether or not it is credible that this distinguishing feature has



actually produced the improvement of lubricity alleged in the patent in suit.

However, the Appellant I has also argued that even if one assumes that the claimed jet fuels would possess an improved lubricity vis-à-vis the fully hydroisomerized FT jet fuels of the prior art not containing any lubricity agent and, hence, accepts that the technical problem actually solved is that indicated in the patent in suit, i.e. that of **providing the FT jet fuels with improved lubricity**, still the claimed subject-matter would represent an obvious solution to such problem.

2.5 Since the Board concurs with this last argument of the Appellant I (for the reasons indicated here below) and since this implies that the technical effect on which the patent in suit relies is predictable rather than implying an inventive step, it has not been necessary for the Board to assess whether such technical effect was credible or not for concluding that the requests of Appellant II do not comply with Article 56 EPC 1973.

2.6 Accordingly, the Board assumes, for the sake of argument in favour of the reasoning of Appellant II, that the technical problem mentioned in the patent in suit has actually been solved by the subject-matter of the claim of the main request.

Under such circumstances, the inventive step assessment boils down to the question whether the skilled person starting from the FT jet fuels of document (6) would have added therein from 0.01 to less than 0.5 wt.% oxygenated compounds, primarily as C<sub>7</sub>-C<sub>12</sub> primary linear alcohols, in the reasonable expectation that such

modification would result in an improvement of lubricity.

- 2.7 The Board notes that document (22) deals with the problem of low-lubricity in conventional (i.e. petrol) jet fuels. In particular, this citation indicates that the most relevant wearing process, i.e. the adhesive welding known as "scuffing", is that produced in the absence of a film of polar substances strongly bound on the metallic surfaces of e.g. the jet fuel pump (see page 333, left column, from line 13 from the bottom, to right column, line 19 from the bottom, stating, *inter alia*, that "*Problems associated with the lubricity of aviation turbine fuels may be traced back to the 1960s ... Increasing severity in the refining process removes many of the polar and heteroatom compounds necessary to form a strong boundary film ... the lack of polar compounds and reactive species in highly refined fuels allows formation of an oxide layer on metallic surfaces. ... If the applied load is sufficiently great, failure of the surface layers is found to occur, allowing adhesive welding between the metallic substrates. This catastrophic form of adhesive wear is commonly known as scuffing...*").

Document (22) also indicates that the BOCLE test is the testing method commonly used for measuring the lubricity of jet fuels (see e.g. the abstract of document (22) and the statement at page 342, left column, lines 26 to 29 "*Indeed, the BOCLE is the most accurate test currently available and attains at least qualitative agreement with the majority of pump components.*")

The Board notes further that this citation discloses specifically alcohols among the polar oxygenated substances known to act as good lubricating agent in jet fuels (see document (22) page 342, left column, lines 14 to 17 "*Fuel oxidation reactions form various oxygenated species (i.e. carboxylic acids, aldehydes, and alcohols) that, because of their polar nature, act as good lubricity agents.*").

2.8 As expressly stated by Appellant II at the oral proceedings before the Board, the BOCLE test of document (22) is the same test used in the patent in suit for assessing the improved lubricating properties of the claimed jet fuel, because only such test allows to reliably evaluate the efficacy of jet fuels in preventing "scuffing".

Hence, the Board concludes that document (22) discloses the solution in the case of petrol jet fuels of substantially the same problem addressed by the patent in suit in respect of the FT jet fuels and, thus, that the skilled reader of this citation would have expected that the polar oxygenated compounds mentioned therein as good lubricating agents were suitable as lubricating ingredients of the FT jet fuels as well.

The Board notes also that the patent in suit does not even allege that the fact that the oxygenates in the claimed fuel are primarily present as C<sub>7</sub>-C<sub>12</sub> primary linear alcohols and/or present in the claimed amounts resulted in a surprisingly high lubrication (or in another surprisingly advantageous property) that is/are not present when using the other polar substances

already known to improve lubricity in jet fuels or not to be expected for such amounts of the alcohols.

Therefore, the Board concludes that the skilled person would arrive at the claimed subject-matter by arbitrarily selecting the alcohols among the polar substances disclosed in document (22) as good lubricity agents and then, possibly, by carrying out some routine optimization experiments as to the kind and the amounts of alcohols that are miscible with jet fuels and compatible with the other requirements of these latter (e.g. in terms of boiling range and freeze point).

2.9 The Appellant II, although conceding that it was well known to the skilled person that polar substances promoted lubricity in petrol jet fuels, has nevertheless argued that it could not be predicted that the same polar compounds that were known to be effective as lubricating agents for the petrol jet fuels would also produce the same lubrication effect when added to the FT ones, because these two sorts of fuels would possess substantially different chemical compositions.

Moreover, in the opinion of Appellant II, the fact that the use of alcohols as lubricity agents in FT jet fuels was not self-evident to the skilled reader of document (22) was proven by the fact that during the several years passed between the publication of this citation and the filing of the patent in suit, only compounds different from alcohols, and much more costly than these latter, had been used as lubricating agents in FT jet fuels.

Finally, the Appellant II stressed that not even the available documents in the field of petrol jet fuels pointed towards the use of specifically C<sub>7</sub>-C<sub>12</sub> primary linear alcohols as lubricating agents.

2.10 The Board finds however not credible that the skilled person would have considered the teaching of document (22) as not applicable to the case of FT jet fuels as well. As apparent from the portions of document (22) cited above at point 2.7, the lubrication mechanism taking place during the use of petrol jet fuels derives from the polarity of the indicated substances, resulting in the formation of a strong boundary film on the metal surfaces of e.g. the moving elements of the fuel pumps. In other words, such property appears totally independent on the specific structure of the remaining (non polar) components of petrol jet fuels, i.e. the hydrocarbons. Hence, and since the fully hydroisomerized FT jet fuels are substantially only made of (paraffinic) hydrocarbons, the skilled reader of document (22) would reasonably expect that the same polar oxygenated substances that are able to prevent scuffing in the hydrocarbon environment of petrol jet fuels, would also form a strong lubricating film onto metallic surfaces in the hydrocarbon environment of FT jet fuels.

Accordingly, the Board concludes that the skilled reader of document (22) would have reasonably expected that polar oxygenated compounds, such as alcohols, would produce a lubricity improvement also in the FT jet fuels of document (6).

Nor is any sound conclusion as to the non-obviousness of the claimed subject-matter derivable from the time span of several years passed between the publication of document (22) and the filing date of the patent in suit. Indeed, any conclusion in this respect would require, *inter alia*, unsupported speculative assumptions as to the other factors which could have rendered uninteresting for the person skilled in the art the use of fatty alcohols as lubricating agents.

Finally, even in the absence of a specific disclosure of C<sub>7</sub>-C<sub>12</sub> primary linear alcohols in the available citations in the field of jet fuels, it remains the fact that, in the Board's conviction, the person skilled in this technical field is necessarily aware of abundant common general knowledge as to the nature of the alcohols possibly compatible with the hydrophobic nature of hydrocarbons and with the other requirements for these fuels. The existence of this common general knowledge is not only evident already from the disclosure of document (22) referred to at point 2.7 above and undisputed by the Appellant II, which appears to imply the existence of an established field of research as to the nature and the function of the polar compounds possibly present or formed in jet fuels, but also from the fact that small amounts of primary linear alcohols are undisputedly known to be initially present in the FT products before their hydroisomerization into the final jet fuels of document (6) (see document (6), page 265, lines 20 to 21).

- 2.11 Accordingly, the Board finds obvious for a skilled person to improve the lubricity of the FT jet fuels of document (6), i.e. to overcome the technical problem

that the patent in suit aims at solving, by putting into practice, possibly by means of some arbitrary selections among equivalent alternatives and routine optimization experiments, the teaching provided in document (22) that alcohols are known to act as anti-scuffing lubricating agents in jet fuels. Thus, the subject-matter of the only claim of the main request of the Appellant II cannot be considered based on an inventive step.

Therefore, the Board concludes that this request does not comply with the requirements of Article 56 EPC 1973.

*Auxiliary request of Appellant II*

3. Inventive step (Article 56 EPC 1973)

The sole claim of this request (see above section V of the Facts and Submissions) only differs from that of the main request in that the former describes explicitly that the oxygen content should not take into account the oxygen due to the presence of traces of water.

Accordingly, as also explicitly conceded by the Appellant II at the oral proceedings before the Board, the subject-matter of the sole claim of this request is evidently the same as that of the main request.

Hence, the subject-matter of this claim is found lacking an inventive step for the same reasons already indicated above for the claim of the main request.

Therefore, the Board concludes that also the auxiliary request of Appellant II does not comply with the requirements of Article 56 EPC 1973.

## **Order**

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

The decision under appeal is set aside.

The patent is revoked.

The Registrar:

The Chairman:

P. Cremona

P.-P. Bracke