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Datasheet for the decision of 13 December 2013

Case Number: T 0282/11 - 3.3.06

Application Number: 02789268.6

Publication Number: 1438374

IPC: C10L1/16

Language of the proceedings: EN

Title of invention:
Components for blending of transportation fuels

Applicant:
IFP Energies nouvelles

Headword:
Fuel composition/IFP

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step (all requests) - no

Decisions cited:

Catchword:

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Case Number: T 0282/11 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 13 December 2013

Appellant: (Applicant)	IFP Energies nouvelles 1 & 4 avenue de Bois Préau 92852 Rueil-Malmaison (FR)
Representative:	Mathys & Squire LLP 120 Holborn London EC1N 2SQ (GB)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 10 August 2010 refusing European patent application No. 02789268.6 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman: B. Czech
Members: L. Li Voti
U. Lokys

Summary of Facts and Submissions

I. This appeal lies from the decision of the Examining Division to refuse European patent application no. 02789268.6.

II. The Examining Division decided that the claims according to the then pending main and auxiliary requests complied with the requirements of Articles 123(2) EPC and 84 EPC 1973 and that their subject-matter was novel over the following cited prior art:

D1: WO 98/30655 A1;
D2: WO 99/09117 A1;
D3: US 5 599 441 A1; and
D4: WO 00/14182 A2.

However, the claimed subject-matter was found to lack an inventive step in the light of document D1.

As regards inventive step, the Examining Division found in particular that

- there was no evidence that the composition of the "*test blend*" of table VII corresponded to the definition of claim 1;

- moreover the results of table VII had to be expected and it could not be concluded that they were due to the presence of alkylated aromatics;

- therefore, even accepting that the technical problem underlying the invention concerned the provision of a fuel composition having improved cleanliness reflected in reduced valve deposits, the skilled person would have derived such a fuel composition from the teaching

of document D1, which already disclosed the use of an alkylated feedstock having a reduced sulfur content.

III. In its statement of the grounds of appeal the Appellant contested the findings of the Examining Division and maintained the main request and the three auxiliary requests already submitted during examination.

IV. In the course of the written proceedings the Board raised objections under Article 123(2) EPC and questioned the novelty and inventiveness of the claimed subject-matter, citing the following additional documents:

D5: WO 96/17810 A (listed in the Search Report); and

D6: Kirk-Othmer Encyclopaedia of Chemical Technology, 4th edition, volume 12 (1994), pages 350, 351 and 365 to 368 (as proof of common general knowledge).

V. The Appellant submitted with letter of 22 May 2012 twelve amended sets of claims as main request and auxiliary requests 1A, 1B, 2, 2A, 2B, 3, 3A, 3B, 4, 4A and 4B, as well as the following document:

E1: "Automotive Fuels Reference Book", second edition, 1995, pages 76 and 161 to 172.

With letter of 7 June 2013 the Appellant withdrew its previous main request and auxiliary requests 2, 3 and 4, and filed a set of claims (corresponding to the previous auxiliary request 1A) as new main request.

VI. The Appellant was summoned to oral proceedings in accordance with an auxiliary request to this end. In its communication pursuant to Article 15(1) RPBA of

22 August 2013 the Board indicated *inter alia* its provisional opinion that the claimed subject-matter lacked an inventive step.

VII. By letter of 13 November 2013 the Appellant's representative informed the Board that he would not be attending the oral proceedings.

VIII. Oral proceedings were held on 6 December 2013 in the absence of the Appellant.

IX. The Appellant requested in writing that the decision under appeal be set aside and that a patent be granted on the basis of the claims according to the main request submitted with letter of 7 June 2013 or, in the alternative, on the basis of any of the auxiliary requests 1B, 2A, 2B, 3A, 3B, 4A and 4B submitted with letter of 22 May 2012.

Claim 1 according to auxiliary request 4B reads as follows:

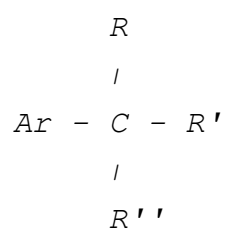
"*1. A fuel composition which comprises:*

(a) more than fifty percent by weight of an organic distillate comprising hydrocarbons boiling in a temperature range of from 30 °C to 230 °C; and

(b) a low-sulfur fraction having a distillation end point in the range from 80 °C to 220 °C obtained from distillation of an alkylated petroleum feedstock which process comprises:

(A) providing a petroleum feedstock comprising a mixture of hydrocarbons which includes olefins and sulfur-containing organic compounds, the feedstock consisting essentially of material boiling between

60 °C and 345 °C and having a sulfur content up to 5,000 parts per million;
(B) in at least one contacting stage at elevated temperatures, contacting the feedstock with an acidic catalyst under conditions which are effective to convert a portion of the impurities to a sulfur-containing material of higher boiling point through alkylation by the olefins, thereby forming a product stream; and
(C) fractionating the subsequent product stream by distillation to provide at least one low-boiling, low-sulfur fraction consisting of a sulfur-lean fraction having a sulfur content less than 50 parts per million, and a high-boiling fraction consisting of a sulfur-rich, fraction containing the balance of the sulfur; wherein the petroleum feedstock consisted of material boiling between 60 °C and 345 °C and comprised alkene compounds having from 4 to about 6 carbon atoms, including as a reactive class of alkene compounds, trans and cis butene-2, pentene-1, trans and cis pentene-2,2-methyl butene-1, 2-methyl butane-2, 2-methyl pentene-1, and 2-methyl pentene-2, and the amount of this reactive class is from 40 to 60 percent by weight of the alkene compounds having from 4 to 6 carbon atoms; wherein the alkylated petroleum distillate comprises one or more aromatic compounds represented by the formula:



where Ar is an aryl moiety of 6 or 7 carbon atoms, R is hydrogen or an alkyl group of 1 or 2 carbon atoms, and R' and R'' are each an independently selected alkyl group of from 1 to 4 carbon atoms;

wherein the compounds represented by the above formula are present in an amount of from 0.01 percent to 20 percent based on the total weight of aromatic compounds in the fuel composition; and

wherein the fuel composition has a sulfur content of less than 50 parts per million and exhibits a suitable Reid vapor pressure of at least 41.4 kPa (6 psi)."

X. Concerning the pending requests and the issue of inventive step, the Appellant submitted in essence that

- table VII of the application as filed showed a significant reduction in valve deposits for the compositions of the invention compared with a commercially available composition obtained from the same feedstock and having similar RON, MON, RVP, IBP, FBP, carbon and hydrogen content and differing from that of claim 1 insofar as it did not contain a fraction which had undergone alkylation to remove sulfur compounds, i.e. differing from the subject-matter of claim 1 insofar as it contained a greater amount of sulfur and did not contain the alkylated aromatics of claim 1;

- document D1 was not a suitable starting point for the evaluation of inventive step since it concerned solely a desulfurization process by alkylation of a heavy naphtha feedstock and did not concern the use of the obtained composition for solving the technical problem

of providing a fuel composition capable of reducing valve deposit;

- in any case, there was no suggestion in the prior art to blend the compositions of document D1 or the alkylate reformate of document D5 with other petroleum fractions in order to obtain a fuel composition with all the features of claim 1 at issue having in particular an RVP of at least 6 psi and a sulfur content of less than 50 ppm, let alone in order to provide improved cleanliness in terms of reduced valve deposits;

- the claimed subject-matter thus involved an inventive step.

Reasons for the Decision

1. None of the Appellant's requests was found to be allowable. In the following, auxiliary request 4B is thus dealt with first for the sake of editorial conciseness.

2. Moreover, considering that the claimed subject-matter according to all requests fails to meet the requirement of inventive step for the reasons set out below, there is no need to address pending issues of allowability of the amendments to the claims under Articles 123 or 84 EPC.

Admissibility of the Appellant's requests

3. The amended claims according to all the requests at issue were filed in response to objections raised by the Board and can be considered to constitute an

attempt to overcome said objections. They were filed before the Appellant was summoned to oral proceedings.

The Board thus decided to admit all the requests at issue despite their late filing (Article 114(2) EPC and Article 13(1) RPBA).

Auxiliary request 4B

4. The meaning of claim 1

4.1 As regards the wording of claim 1 at issue (see point IX above) the Board remarks that the distillation end point of the low sulfur fraction (b) is comprised in the range from 80 °C to 220 °C, i.e. in a range fully encompassed by the boiling point range of from 30 °C to 230 °C of the hydrocarbons contained in the organic distillate (a). Moreover, since the chemical nature of the hydrocarbons belonging to the organic distillate (a) is not specified, the hydrocarbons contained in the organic distillate (a) can be of the same type as those contained in the low sulfur fraction (b). Consequently, the types of hydrocarbons contained in components (a) and (b) at least overlap with each other and may also be identical. Hence, components (a) and (b) cannot necessarily be distinguished from each other, let alone when present in a mixture.

4.1.1 The Board remarks also that the specification of the boiling point of the alkylated petroleum feedstock (60 °C to 345 °C), from which component (b) is distilled, does not imply a more precise definition of the chemical characteristics of the low sulfur fraction (b), which has a narrower boiling point range of 80 °C to 220 °C. Likewise, the specification of the alkene content in such alkylated petroleum feedstock and of

the process by which the alkylated petroleum feedstock is prepared and component (b) is distilled do not imply a more precise definition of the chemical characteristics of the low sulfur fraction (b), apart from the included requirement that such fraction (b) must have a sulfur content of less than 50 ppm. However, also this feature does not distinguish further the low-sulfur fraction (b) from the organic distillate (a) which may also contain an amount of sulfur below 50 ppm. Moreover, the amount of sulfur in fraction (b) has by itself no limiting effect on the sulfur content of the whole fuel, which is already otherwise specified in claim 1 to be less than 50 ppm.

4.1.2 From the above, the Board concludes that claim 1 according to auxiliary request 4B is to be understood as relating to fuel compositions having an RVP of at least 6 psi and containing, irrespective of their origin, the following components:
- more than 50% by weight of hydrocarbons boiling between 30 and 230 °C;
- aromatic compounds;
- 0.01 to 20% by weight, based on the total content of aromatic compounds, of the alkylated aromatics having the structural formula indicated in the claim (hereinafter referred to as ALKAR) and
- less than 50 ppm sulfur.

5. Inventive step

5.1 The invention concerns the provision of a low-sulfur fuel compositions suitable for spark-ignition internal combustion engines (see claim 1 at issue and page 1, lines 11 to 17; page 4, line 28 to page 5, line 5; and page 7, lines 1 to 19, of the published application WO 03/035808 A2).

5.2 For the Board, document D1 represents the closest prior art since it also relates to a process for the removal of sulfur from a liquid hydrocarbon feedstock without significantly reducing its octane number (page 8, lines 13 to 15) in order to obtain a product suitable as a fuel for spark-ignition internal combustion engines (see page 19, lines 9 to 15).

The process disclosed in document D1 (see e.g. page 21, lines 1 to 19) also inevitably leads to the formation of ALKAR. This consideration of the Board was not disputed by the Appellant.

D1 thus generically discloses low-sulfur fuel compositions which compositions comprise hydrocarbons, including hydrocarbons boiling below 230°C and compounds of the ALKAR type.

Consequently, D1 represents a suitable starting point for the evaluation of inventive step.

5.3 The Appellant submitted in writing that even when D1 was considered as the closest prior art, the technical problem underlying the invention had to be seen in the provision of a low-sulfur fuel product suitable for spark-ignition internal combustion engines which upon use resulted in reduced valve deposits.

5.4 As a solution to the technical problem, the application proposes the fuel composition according to amended claim 1 at issue, which is characterised in particular in that it comprises (emphasis added)

(a) more than fifty percent by weight of an organic distillate comprising hydrocarbons boiling in a temperature range of from 30 °C to 230 °C; and

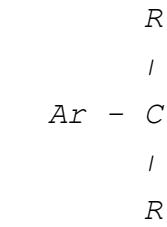
(b) a low-sulfur fraction having a distillation end point in the range from 80 °C to 220 °C obtained from distillation of an alkylated petroleum feedstock which process comprises:

...

(C) fractionating the subsequent product stream by distillation to provide at least one low-boiling, low-sulfur fraction consisting of a sulfur-lean fraction having a sulfur content less than 50 parts per million,

...

wherein the alkylated petroleum distillate comprises one or more aromatic compounds represented by the formula:



where Ar is an aryl moiety of 6 or 7 carbon atoms, R is hydrogen or an alkyl group of 1 or 2 carbon atoms, and R' and R'' are each an independently selected alkyl group of from 1 to 4 carbon atoms;

in that "*the compounds represented by the above formula are* ***present in an amount of from 0.01 percent to 20 percent*** *based on the total weight of aromatic compounds in the fuel composition*",

and in that "*the fuel composition has a* ***sulfur content of less than 50 parts per million*** *and exhibits a suitable* ***Reid vapor pressure of at least 41.4 kPa (6 psi)***".

5.5 As regards the alleged success of this solution, the Board observes the following:

5.5.1 According to the Appellant, the improvement in terms of valve deposits reduction was evidenced by the comparison contained in table VII of the application (page 26 of the description) between a fuel composition according to the invention ("*test blend*") and a commercially available fuel composition ("*reference blend*") obtained from the same feedstock but not containing a fraction which had undergone alkylation to remove sulfur compounds, i.e. differing from the subject-matter of claim 1 insofar as it contained a greater amount of sulfur and did not contain ALKAR.

5.5.2 As regards this specific technical advantage invoked, the Board remarks that said reference blend, the general composition of which is given in table IV, does not appear to represent a fuel product in accordance with the teaching of document D1. In contrast to said reference blend, the fuel product disclosed in D1 also contains, like the products according to the invention, a low-sulfur fraction obtained from distillation of a petroleum fraction like naphtha (a fraction known to contain aromatic compounds) which has previously undergone an alkylation, to remove sulfur compounds (D1 page 9, line 15 to page 11, line 17; page 19, line 9 to page 20, line 30). This low-sulfur fraction obtained according to document D1 undisputedly also inevitably contains ALKAR.

Therefore, the test results contained in table VII regard a comparison with a prior art product which is more remote from the present invention than a product obtainable according to the teaching of the closest prior art represented by document D1 (use of a low-

sulfur and ALKAR-containing hydrocarbon composition as fuel).

5.5.3 The Board remarks also that the amount of any ALKAR contained in both the test and the reference blends is not explicitly indicated in D1. Moreover the reference blend contains 40% of a reformate fraction, which fraction could also comprise some ALKAR as shown by e.g. document D5 (see e.g. table III, "feed" components cumene (page 16, line 28), i-C4-Bz/sec-C4-Bz (page 16, line 35) and p-, o-Cymene (page 17, line 5)).

Therefore, it cannot be derived from the disclosure of the application whether or not the reference blend tested differs in the content of ALKAR from the test blend and, hence, whether the observed reduction in valve deposits can actually be attributed to such difference, if any.

5.5.4 As regards the sulfur content of both the test blend and the reference blend, the Board notes that it can be understood to derive essentially from the sulfur content of the so-called low sulfur fraction and feedstream fraction contained in the test blend and in the reference blend, respectively. The sulfur contents of these two blends are, however, not indicated in table IV wherein the tested blend compositions are reported. However, as suggested by the Board during the written procedure, they appear to be those indicated in example 8 for the feedstream fraction before (184 ppm) and after (5.7 ppm) reaction (see D1, page 20, lines 10 to 12). Using the values indicated in example 8 for evaluating the sulfur content of both the test blend and the reference blend permits to conclude the following: Since the reference blend of table IV contains 33 vol.% of the so-called feedstream fraction,

the content in sulfur compounds of the reference blend can be assumed to be roughly 1/3 of 184 ppm, i.e. about 61 ppm, which figure represents the total of all sulfur compounds boiling at temperatures below 110°C contained in the feedstream fraction (see page 20, lines 10 to 11). Hence, the amount of elemental sulfur in the reference blend can be assumed to be lower than 61 ppm, and even lower than 50 ppm, i.e an amount in accordance with claim 1 at issue.

Therefore, it appears that both the test blend (representing the invention and containing a sulfur content below 50 ppm) and the reference blend are based on compositions falling under the scope of claim 1. This consideration of the Board was also never disputed by the Appellant.

5.5.5 In summary, the comparative test reported in table VII does not, therefore, permit to conclude that the observed reduction in valve deposits may be attributed to a sulfur content of less than 50 ppm or to a particular ALKAR concentration in the fuel, let alone to some other feature possibly distinguishing the fuel according to claim 1 at issue from a fuel according to the generic disclosure of D1.

5.5.6 The Board thus concludes that no improvement over a fuel according to D1 has been convincingly shown, let alone across the full breadth of claim 1.

5.6 Therefore, the formulation of the technical problem as proposed by the Appellant cannot be accepted. Consequently, the technical problem must be re-formulated in a less ambitious manner. On the basis of the arguments put forward above, the Board considers that the technical problem credibly solved by the

invention across the full breadth of claim 1 can be seen only in the provision of a further fuel composition suitable for spark ignition internal combustion engines and having low sulfur content.

5.7 It remains thus to be evaluated whether or not it was obvious for the skilled person, starting from the generic disclosure and teaching of D1 and considering the cited prior art and common general knowledge, to reduce said teaching to practice by providing a fuel falling within the terms of claim 1 at issue.

5.7.1 Since it is not disputed that the process disclosed in document D1 (see e.g. page 21, lines 1 to 19) inherently leads to the formation of ALKAR, the products obtainable by the generic process disclosed in document D1 differ from the subject-matter of claim 1 according to the main request insofar as they do not explicitly comprise a sulfur content of less than 50 ppm and a relative amount of ALKAR as required by claim 1 at issue. Moreover, document D1 does not disclose the RVP of any fuel obtained or prepared therefrom.

5.7.2 Firstly, the Board remarks that it belonged to the common general knowledge of the skilled person, illustrated e.g. by document E1 (page 172, second full paragraph) that a minimum RVP of 0.6 bar, i.e. of about 8.7 psi, was a desirable characteristic of fuels suitable for spark ignition internal combustion engines in most geographic locations.

5.7.3 Secondly, it was also common general knowledge (see e.g. D6, page 368, lines 7 to 11) to blend different petroleum distillates and fractions in order to obtain

a fuel having optimal critical properties, such as octane and volatility as expressed by the RVP value.

It was thus obvious for the skilled person, faced with the goal of obtaining a fuel having a specific RVP, to blend appropriately the fuels or fractions obtained by following, for example, the process disclosed in document D1 in order to obtain a fuel having an RVP above 6 psi.

5.7.4 Thirdly, as regards the sulfur content of a fuel, it is explicitly indicated in the present application that the legislation on sulfur in gasoline in the U.S. limited each refinery to an average of 30 ppm and that the average specification for gasoline fuels was expected to be replaced in and after 2006 by a cap of 80 ppm maximum (page 2, lines 32 to 34).
Therefore, it was an obvious desideratum for the skilled person to provide fuels below this limit and also below 50 ppm at the priority date of the present application in view of the forthcoming legislation.

As explained in document D1, the goal of the process of document D1 was indeed that of obtaining a distilled fraction suitable for spark-ignition internal combustion containing as little sulfur compounds as possible; see e.g. page 10, lines 26 to 29 reading: "...*an alkylating agent must be selected which will convert the sulfur-containing impurities to sulfur-containing products which are of a sufficiently high boiling point that they can be removed by distillation.*" and page 17, lines 9 to 11 and 15 to 17 reading: "*The sulfur-containing impurities are highly reactive and can be selectively converted to sulfur-containing products of higher boiling point by reaction with the alkylating agent of this invention...In the*

case of a naphtha feedstock from a catalytic cracking process, this means that sulfur-containing impurities can be removed without significantly affecting the octane of the naphtha."

Therefore, it was obvious for the skilled person, when reducing to practice the process of document D1, to aim for a distilled fraction containing as little sulfur as possible and even less than 50 ppm sulfur, if desired.

5.7.5 Finally, as regards the amount of ALKAR defined in claim 1, it is undisputed that it was known to the skilled person that the alkylation of the sulfur containing compounds in the feedstock is competitive with the alkylation of the aromatics and that it was known to the skilled person how to influence the reaction and how to obtain fractions wherein more sulfur compounds than aromatics have been alkylated and viceversa (see e.g. document D1, page 17, lines 9 to 23 as well as document D4, page 5, line 13 to page 6, line 12; page 13, lines 10 to 18).

For the skilled person, setting any desired concentration of ALKAR with respect to the total aromatics in the fuel by means of the process disclosed in document D1, e.g. the concentration required by claim 1 at issue, was one of many options equally at hand to provide a further, not necessarily better fuel composition. Moreover, knowing the amount and type of aromatics present in other hydrocarbon fractions suitable for blending with a hydrocarbon fraction obtained by the process of document D1, adjusting the final amount of ALKAR as desired with respect to the total content of aromatic compounds of the fuel by means of such a blending is also one of several options

at hand for a skilled person aiming at merely providing a further such fuel composition.

5.7.6 The Board concludes that the provision of a fuel having all the features of claim 1 at issue was one of several equally obvious options available to the skilled person following the teaching of document D1 and reducing it to practice using his common general knowledge.

5.7.7 Hence, the subject-matter of claim at issue does not involve an inventive step (Article 52(1) and 56 EPC)

5.7.8 Auxiliary request 4B is thus not allowable.

Main request and auxiliary requests 1B, 2A, 2B, 3A, 3B and 4A

6. Inventive step

6.1 The respective claims 1 according to the main request and the auxiliary requests 1B, 2A, 2B, 3A, 3B and 4A do not contain any technical feature which is not contained in claim 1 according to auxiliary request 4B and the non-inventive subject-matter of claim 1 according to auxiliary request 4B falls entirely within the terms of each of said claims 1. The arguments put forward with respect to the inventiveness of claim 1 according to auxiliary request 4B thus apply *mutatis mutandis* to these requests.

6.2 Therefore, each claim 1 according to these requests also lacks an inventive step (Article 52(1) and 56 EPC).

6.3 The Board concludes that the main request and the auxiliary requests 1B, 2A, 2B, 3A, 3B and 4A are not allowable either.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Magliano B. Czech

Decision electronically authenticated