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D E C I S I O N
of 15 February 2006

Case Number: T 0951/04 - 3.3.06

Application Number: 95942211.4

Publication Number: 0743974

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Language of the proceedings: EN

Title of invention:

FUEL OIL COMPOSITIONS comprising petroleum based fuel oils,
ethylene-unsaturated ester copolymers and esters of polyhydric
alcohols with carboxylic acids

Patentee:

Infineum USA L.P.

Opponent:

Clariant Verwaltungsgesellschaft mbH
Ethyl Corporation
Associated Octel Company Limited Global House
BASF Aktiengesellschaft

Headword:

Fuel oils/INFINEUM

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step: no"

Decisions cited:

-

Catchword:

-



Case Number: T 0951/04 - 3.3.06

D E C I S I O N
of the Technical Board of Appeal 3.3.06
of 15 February 2006

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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 27 May 2004
revoking European patent No. 0743974 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: P. Krasa
Members: G. Dischinger-Höppler
U. Tronser

Summary of Facts and Submissions

I. This appeal is from the decision of the Opposition Division to revoke the European patent No. 0 743 974 relating to fuel oil compositions comprising petroleum based fuel oils, ethylene-unsaturated ester copolymers and esters of polyhydric alcohols with carboxylic acids.

II. Four notices of opposition had been filed against the granted patent, wherein the Opponents sought revocation of the patent on the grounds of, inter alia, Article 100(c) EPC for extension beyond the content of the application as filed (Article 123(2) EPC), and Article 100(a) for lack of novelty and inventive step (Article 54 and 56 EPC). The oppositions were based, amongst others, on the following documents:

D1 DD-A-126 090,

D2 EP-A-0 605 857,

D5 WO-A-94/17160 and

D6 WO-A-95/33805.

During the opposition proceedings, the Patent Proprietor filed amended sets of claims and

D22 Bovington et al., "Development of a laboratory test to predict lubricity properties of diesel fuels and its application to the development of highly refined diesel fuels" in Ecological and economical aspects of tribology, Technische Akademie Esslingen, 9th International Colloquium,

11-13 January 1994, Vol. 1, W.J. Bartz (Ed.),
pages 3.11-1 to 3.11-16,

amongst other documents. The Opponents filed, inter alia, the following further documents:

D102 Wei et al., "The lubricity of diesel fuels" in
Wear, 111 (1986), pages 217 to 235,

D126 Bovington et al., "Latest diesel fuel additive
technology development" in CEC/93/EF13, 4th
International Symposium on the performance
evaluation of automotive fuels and lubricants,
5-7 May 1993,

D128 Owen et al., Automotive fuels handbook, 1st ed.
1990, pages 299, 300, 353 to 403, 417, 421 and
445,

D130 Owen et al., Automotive fuels reference book, 2nd
ed. 1995, pages 419 to 474, 487 to 496 and 519 to
522 and

D137 Jenkins et al., SAE 932691 "Diesel fuel lubricity
development of a constant load scuffing test using
the ball on cylinder lubricity evaluator (BOCLE)"
in Fuels and Lubricants Meeting and Exposition,
Philadelphia, PA 18-21 October 1993, pages 33 to
41.

III. The decision under appeal was based on amended sets of claims according to a new main and three auxiliary requests. In its decision, the Opposition Division found that the amended claims were allowable under the

provisions of Articles 123 and 84 EPC. Their subject-matter was, however, not based on an inventive step in view of D5 as the closest prior art when combined with the disclosure of D1.

IV. This decision was appealed by the Patent Proprietor (hereinafter Appellant) who filed experimental data in relation to the subject-matter disclosed in D1 (hereinafter Appellant's data), document

D188 Attfield et al., "Formulating multi-functional detergent additive packages to assist in minimising diesel fuel emissions - the combination of lubricity performance with detergency" in Petroleum and Coal, Vol. 37(3), pages 25 to 28,

and, under cover of a letter dated 27 January 2005, amended sets of claims in a new main and four auxiliary requests.

V. The single claim of the main request (Set A) reads:

"1. The use of at least one ethylene-unsaturated ester copolymer to enhance the lubricity of a petroleum-based fuel oil composition having a sulphur content of at most 0.05% by weight and also comprising a lubricity enhancer, wherein the lubricity enhancer is one or more esters of a polyhydric alcohol and a carboxylic acid, and wherein the composition resulting from the use has a lubricity such as to give a wear scar diameter, as measured by the HFRR test at 60°C, of at most 500 µm."

Claim 1 of the first auxiliary request (Set A-1) differs therefrom in that the term "such that the lubricity is enhanced relative to that achieved by the use of the lubricity enhancer alone," has been inserted between "carboxylic acid," and "and wherein".

The single claim of the second auxiliary request (Set A-2) differs from that of the main request in that the word "further" has been inserted between "to enhance" and "the lubricity" and the term "such that the combination of the lubricity enhancer and at least one such copolymer obtains a higher level of lubricity enhancement for a fixed amount of lubricity enhancer" has been inserted between "carboxylic acid," and "and wherein".

The single claim of the third auxiliary request (Set E) differs from that of the main request by the addition of the feature ", wherein the lubricity enhancer is used in a proportion within the range of from 0.015% to 0.3% by weight, based on the weight of the fuel oil" at the very end of the claim.

The single claim of the fourth auxiliary request (Set F) reads:

"1. A composition comprising a major proportion of a petroleum-based diesel fuel oil having the following characteristics:

Specific Gravity		0.8184
Sulphur, wt%:		0.03
Distillation, °C,	IBP	155
D86, °C	10%	192
	50%	233
	90%	303
	95%	326
	FBP	355

and minor proportions of

a) a lubricity enhancer being the ester obtained by esterifying dilinoleic acid with ethylene glycol, and neutralizing free acid groups with methanol

and

b) a mixture of 1 part by weight of an ethylene-vinyl acetate copolymer having a vinyl acetate content of 13.5% weight and a number average molecular weight of 5000, as measured by gel permeation chromatography, and 6.47 parts by weight of an ethylene-vinyl acetate copolymer having a vinyl acetate content of 36.5% weight and a number average molecular weight of 3000, as measured by gel permeation chromatography,

wherein the concentration of (a) is 180 ppm active ingredient by weight and the concentration of (b) is 469 ppm active ingredient by weight, each based on the weight of the fuel oil, said composition having a lubricity such as to give a wear scar diameter, as measured by the HFRR test at 60°C, of 330 µm."

VI. Upon requests made by all parties, oral proceedings before the Board of Appeal were held on 15 February 2006, in the absence of Opponent II (Respondent II) as announced by letter of 12 July 2005. In the course of these proceedings, the Appellant replaced its fourth auxiliary request by one which differed from the previous one (V above) in that the feature ", and a friction, as measured by the HFRR test at 60°C, of 0.239" has been added at the very end (Set F-1).

VII. The Appellant, orally and in writing, submitted the following arguments:

- The patent in suit related to the problem of pump failure of diesel engines due to friction and mild wear on the surfaces of the fuel injection pump of diesel engines, and a specific type of lubricity, as measured by the HFRR (High Frequency Reciprocating Rig) test, provided by the lubricity additives used according to the claimed subject-matter. This type of lubricity was based on the boundary lubrication mechanism by forming a protective layer by physical adsorption of the additives (i.e. the oiliness mechanism) on the rubbing contact surfaces in the injection pump.

In contrast D1 related to the problem of scuffing, a severe kind of wear, detectable by the Almen-Wieland test but not the HFRR test and, thus, to another type of lubricity provided by the additive used.

- The closest prior art was represented by the disclosure of D5 which differed from the claimed subject-matter in that no additive was used to further enhance the lubricity of the low sulphur petroleum-based fuel composition already containing a conventional ester lubricity enhancer.

- It was apparent from the claim construction that the claimed subject-matter was limited to those embodiments where the ester lubricant was present in an amount sufficient to give lubricity as measured by the HFRR test (lower amount) but below saturation in the response curve.

- The technical problem in view of D5 consisted in the provision of a technical means to further enhance the lubricity of the fuel oil containing an ester lubricity enhancer and was solved by using for that purpose at least one ethylene-unsaturated ester copolymer such as ethylene-vinyl ester copolymer (hereinafter EVA) as was evident from Table 1 of the patent in suit.

The effect shown in that table was surprising since the skilled person would not have expected EVA to be a potential lubricant in a fuel system where an ester additive is present. If anything, he would have expected EVA to dilute the lubricity effect of the ester which was a strong lubricant as compared with the weak effect on lubricity of EVA disclosed in D1, or negative interactions between EVA and the ester additive due to a competition between them concerning their

adsorption on the metal surfaces of the pump. In this latter respect, reference was made to D188.

- At the priority date of the patent in suit, a skilled person had no incentive to combine the disclosure of D5 and D1 since they related to different kinds of wear and lubrication and since it was evident from D22 and D126 that the reasons for the failure of the pump due to the using of low sulphur diesel fuel were not understood up to 1993. Moreover it was shown by D128 and D130 that between 1990 and 1995 EVA was known to improve only the cold flow properties of a fuel even though in this period of time the problem of insufficient lubrication due to the requirement of low sulphur diesel fuel became apparent.

Neither would a combination of D5 and D1 result in the claimed subject-matter since a stable film which was required for lubrication would not form on the surfaces due to the different molecular structure of EVA and the ester. Moreover, EVA was not mentioned in D5. Therefore, as pointed to in D128, any other suitable olefin-ester copolymer could be used as MDFI (middle distillate cold flow improver) mentioned in D5 as possible co-additive.

- It was shown in the Appellant's data that the addition of EVA did not improve the lubricity of low sulphur diesel fuel both, as measured by the HFRR test and the Almen-Wieland test.
- The subject-matter of Claim 1 of the main request was, therefore, based on an inventive step.

- The same applied to the subject-matter of Claim 1 of the first to third auxiliary requests which were explicitly limited to those situations where surface competition between EVA and ester additive occurred and where it was excluded that one of them did not contribute to the final lubricity.

 - The subject-matter of Claim 1 of the fourth auxiliary request was an alternative to the fuel composition of D5. However, in the light of the available prior art, it was not obvious to expect that a combination of EVA and ester additive would perform similarly to the ester additive alone.
- VIII. The Opponents (hereinafter Respondents), orally and in writing, submitted in essence the following arguments:
- The claimed subject-matter was not sufficiently disclosed and the amendments made to the claims were not allowable since they were unclear and introduced subject-matter which extended beyond the content of the application as filed.

 - The subject-matter claimed in the main request was not inventive over D5 disclosing the addition to diesel fuel of a combination of an ester additive and MDFI which usually was EVA.

The technical problem to be solved in view of D5 by the claimed use of EVA consisted in a further improvement of the lubricity of the low sulphur fuel oil. However, the improvement was not limited to those instances where light wear was the origin

of pump failure since according to the patent in suit methods other than the HFRR test could be used for measuring the lubricity. Reference was made in this respect to D137 and D102.

The solution of the technical problem consisted in the finding that EVA was a potential lubricant, in addition to its cold flow improving properties. This was, however, known from D1 disclosing that EVA was suitable to improve the friction and wear decreasing properties of highly refined low sulphur diesel fuel as measured by the Almen-Wieland test. Therefore, a skilled person would have tried to use EVA in the composition of D5, irrespective of any lubrication mechanisms or kinds of wear. He would also not have disregarded D1 simply for its age since D2 showed that in 1993 the Almen-Wieland test was still in use for measuring lubrication of the diesel injection pump by low sulphur diesel fuel.

The Appellant's data were not in accordance with the disclosure of D1 and, therefore, unsuitable for demonstrating whether D1 would provide any lubrication effect.

- The same applied to the subject-matter claimed in accordance with the first to third auxiliary requests since the additional features did not include any technical limitation.

- The subject-matter of Claim 1 of the fourth auxiliary requests was not inventive since it resulted in a worse effect as compared with D5.

IX. The Appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of

Claim 1 of Set A (main request), or

Claims 1 and 2 of Set A-1 (first auxiliary request), or

Claim 1 of Set A-2 (second auxiliary request) or

Claim 1 of Set E (third auxiliary request) respectively filed under cover of the letter dated 27 January 2006 and a description to be adapted thereto, or

Claim 1 of Set F-1 (fourth auxiliary request) submitted during oral proceedings and a description to be adapted thereto.

The Respondents requested that the appeal be dismissed.

Reasons for the Decision

All requests

1. The Board is convinced that the claimed subject-matter is sufficiently disclosed in accordance with the requirements of Article 83 EPC and 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.

Main request (Set A)

2. *Inventive Step*

2.1 The patent in suit and in particular the claimed subject-matter relate to the use of selected compounds for improving the lubricity of low sulphur diesel fuel, i.e. diesel fuel having a sulphur content of at most 0.05% by weight (page 2, paragraph [0001] in combination with paragraph [0008]).

As is explained in the description of the patent in suit, environmental concerns have led to the need for low sulphur diesel fuels. These show, however, a worse lubricity which causes an increased wear and failure in the fuel pumps, in particular because of the reduced amounts of polar and aromatic polycyclic compounds due to the refining processes, (page 2, paragraphs [0002] to [0004]).

D5 also deals with the improvement of lubricity of light diesel fuels. It identifies the same technical problem and its origin, namely excessive wear and pump failure of diesel engines due to the reduced content of sulphur, polyaromatic and polar compounds after refining (page 1, lines 3 to 36).

As agreed by all parties, D5 qualifies therefore as a suitable starting point for the assessment of inventive step.

2.2 According to D5, the above mentioned technical problem of excessive wear in the injection pumps of diesel engines has already been solved by using as lubricity

enhancers in the diesel fuel the same esters as defined in the patent in suit, i.e. one or more esters of a polyhydric alcohol and a carboxylic acid. On the example of glycerol monooleate it has been shown that, if applied in amounts of at least 150 ppm, it was possible to bring down the HFFR wear scar diameter as measured at 60°C, from 630 µm of the untreated sample to a value of 240 µm, and hence of at most 500 µm as required in the patent in suit (see in D5, tables on page 10; in the patent, paragraphs [0010] to [0012] in combination with Table 1).

2.3 According to the patent in suit, it has been found that ethylene-unsaturated ester copolymers, such as EVA, used in accordance with Claim 1 were able to enhance the lubricity of low sulphur diesel fuel oils containing a conventional ester lubricity enhancer in the sense that either a higher level of lubricity is obtained for a fixed amount of conventional lubricity enhancer or that an equivalent level of lubricity is obtained at a lower amount of conventional lubricity enhancer (paragraph [0007]).

2.4 In view of D5, so the Appellant argued, the technical problem to be solved can be defined to consist in the provision of a technical means to further improve the lubricity of low sulphur fuel oil comprising a given amount of ester lubricant.

The Appellant indicated that it was apparent from the experimental data in the patent in suit that this problem had actually been solved by the claimed use of EVA.

2.5 The Board agrees with the Appellant insofar as the experiments in the patent in suit (see Table 1) show that the application of an ester, obtained by esterifying dilinoleic acid with ethylene glycol and neutralizing free acid groups with methanol, in an amount of 180 ppm (active ingredient) brings the HFFR wear scar diameter, measured at 60°C in a specific fuel, from 595 µm of the untreated sample down to 400 µm, whereas a mixture of 1 part by weight of EVA of 13.5% by weight of vinyl acetate content and a molecular weight (Mn) of 5000, measured by gel permeation chromatography (GPC) and 6.47 parts by weight of EVA of 36.5% by weight of vinyl acetate content and a Mn of 3000 (GPC) in an amount of 670 ppm, hardly changes the wear scar diameter at all (590 µm versus 595 µm of the untreated sample), considering the standard deviation for the HFFR test given in D22 of around ± 10 µm (D22, page 3.11-4, left-hand column, last full paragraph). If however, in accordance with the claimed subject-matter, the EVA mixture and the ester additive are applied in combination in amounts of 469 ppm and 180 ppm respectively, an improvement in the fuel's lubricity is obtained down to a wear scar diameter of 330 µm.

It is conspicuous from a comparison of the examples of the patent in suit with those of D5, that in the former the addition of more ester (180 ppm) gives a wear scar diameter (400 µm) inferior to that obtained in D5 (240 µm) with less additive (150 ppm), despite the fact that the fuel in D5 has a lower inherent lubricity (630 µm) than that used in the examples of the patent in suit (595 µm).

The Board concludes from this that the effect on a fuel's lubricity largely depends also on the specific kind of ester additive used. However, the Board is satisfied that the experiments credibly show that the above technical problem is solved in those instances where a specific ester lubricant is present in an amount sufficient to improve the lubricity of a particular diesel fuel oil, but insufficient (see point VII above) if applied alone, to give full lubrication as measured by the HFRR test, i.e. insufficient to give saturation in the respective HFRR response curve (see also point 2.9.3 below).

2.6 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 of further improving the lubricity of low sulphur fuel oil comprising a given amount of ester lubricant which is, however insufficient for complete lubrication, by the means claimed, namely by adding at least one ethylene-unsaturated ester copolymer (e.g. EVA) as specified in Claim 1.

2.7 D5 does not mention ethylene-unsaturated ester copolymers such as EVA nor that the lubricating additive could be partly replaced by any compound other than an ester of a carboxylic acid and a polyhydric alcohol (see page 3, lines 12 to 13), but indicates several classes of co-additives to be used in combination with the ester lubricants, inter alia, middle distillate cold flow improvers (hereinafter MDFI) (page 7, lines 16 to 23).

It is stated in D128 (published in 1990) and D130 (published in 1995), that all cold flow improvers in "current" commercial use, hence also encompassing the priority date of the patent in suit in 1994, are ashless copolymers of ethylene and vinyl acetate or other olefin-ester copolymers (D128, page 368, first full paragraph in combination with page 364, last paragraph; D130, page 437, second paragraph in combination with page 433, last paragraph). Despite the possibility to select the MDFI from an undefined group of different olefin-ester copolymers, a skilled person, in the Board's view, would have seriously contemplated using EVA as a cold flow improver in the fuel compositions of D5 in combination with the ester lubricants since it is explicitly mentioned for that purpose in D128 and D130.

D128 and D130 do not suggest that EVA might confer lubricating properties to diesel fuel. Instead it is stated in those documents (loc. cit.) that "(T)these additives have no influence on the fuel other than its low-temperature properties and are compatible with the other types of additive used in automotive diesel fuel". This statement might be interpreted as meaning that someone skilled in the art would not have contemplated EVA for the purpose of lubrication but it is to be noted that the respective paragraphs in D128 and D130 do not refer to highly refined low sulphur diesel fuel, i.e. diesel fuel of low inherent lubricity (see also point 2.9.4 below).

However, regardless of what the particular meaning of the above statements in D128 and D130 is, D1 (published in 1977) specifically suggests EVA, known as cold-flow

improver for diesel fuels (page 1, second paragraph), as additive for improving the wear and friction reducing properties in case of highly refined, low sulphur diesel fuel oils (page 3, first paragraph, in combination with page 1, last paragraph to page 2, line 16). It is mentioned in D1 that other additives suggested in the art for that purpose are disadvantageous, e.g. due to high costs as far as fatty acids and their esters are concerned (page 2, lines 17 to 30).

According to D1, EVA is a cheap and easily available product suitable to improve the wear and friction reducing properties, measurable for example by the Almen-Wieland test (page 5, last paragraph), of highly refined diesel fuels without affecting the other properties of the fuel oil (page 3, first paragraph). In the example it is shown that an addition of 1500 ppm EVA considerably improves the wear and friction reducing properties, as measured by the Almen-Wieland test, of diesel fuel refined to a sulphur content of 0.05% without affecting the pour point of the fuel oil. A particular advantage is further seen in the fact that EVA is also suitable to improve other properties of practical value, such as combustion and cold flow properties of the fuel oils (paragraph bridging pages 4 and 5).

- 2.8 In view of the above information in D1 about the effect of EVA on the lubricity of low sulphur diesel fuel, the Board finds that the skilled person had ample reasons to add EVA to such fuel oil if any lubricity additive, such as an ester lubricant as in D5, is present in an insufficient amount to give complete lubrication.

2.9 The Appellant's counter-arguments (point VII above) are not convincing for the following reasons:

2.9.1 All parties have agreed on the broad definition of the term "lubricity" suggested in 1966 by Appledoorn and Dudek according to which, for a given viscosity, the lubricity of a liquid is improved, the less the liquid causes friction, wear or scuffing (D102, page 218, second paragraph; D136, page 34, left-hand column, first paragraph). Hence, a fuel's lubricity is another expression for its ability to reduce friction, wear or scuffing in the engine.

2.9.2 It may be true, as argued by the Appellant, that the reason for pump failure and also the mechanism of lubrication was not understood before 1993, at least by the authors of D126 which postulated in 1993 that scuffing, a severe kind of wear, might be a reason for that failure (page 4, right column, point 1 of paragraph 4b) whereas in 1994, the same authors found in a field test that scuffing was not seen in the damaged pumps (D22, page 3.11-5, left-hand column, point 7(b)). This does not mean, however, that the mechanism of lubrication was fully understood thereafter. In particular, it does not mean that a skilled person would have considered an additive suitable to prevent scuffing to be unsuitable to prevent less severe wear.

There was agreement between the parties that the Almen-Wieland test used in the example of D1 is a means to measure a severe kind of wear. However, as correctly observed by the Respondents, D1 is not limited to this

kind of test (see page 5, last paragraph), and the Appellant agreed at the oral proceedings that tests for measuring mild wear, e.g. the "Four Ball Test", were available at the time of D1.

Likewise, neither D5 nor the subject-matter claimed in the patent in suit are limited to a problem raised by mild wear (as measured by the HFRR test) since both explicitly mention the BOCLE (Ball on Cylinder Lubricant Evaluator) test as a means for measuring lubricity (D5, page 8, lines 22 to 26; patent page 4, lines 4 to 7), which - undisputed by the Appellant - is a suitable technique for evaluating scuffing (D137, page 34, left-hand column, line 34 to right-hand column, line 5). Attention is drawn in this respect to the fact that the claimed use to enhance the lubricity is not restricted to a lubricity measurable by a particular method, even though the use is further defined to be such as to give a product having "a wear scar diameter, as measured by the HFRR test at 60°C, of at most 500 μm ".

Moreover, the patent in suit does not even exclude the Almen-Wieland test (page 4, lines 3 to 4) which contrary to the Appellant's opinion was not an "outdated" test at the priority date of the patent in suit since it was still in use in 1993, the application date of D2 (page 2, lines 48 to 53). The Board is, therefore, not convinced by the Appellant's argument that D1 when dealing with the failure of the injection pump related to a different kind of wear and lubricity as compared with D5 or the patent in suit.

2.9.3 Concerning lubrication, as measured by the HFRR test, the parties based their approach on the HFRR response curve which correlates for a given additive in a given fuel oil the treat rate (amount) of additive with the resulting average wear scar diameter.

It is characteristic for such a curve that with increasing amount of additive, there is a slight response (decrease in the wear scar diameter) in the beginning, then a more or less sharp decrease until "saturation" of the fuel with the additive is obtained, whereas thereafter further additive addition no longer changes the wear scar diameter significantly.

The reasons for that behaviour may be explained by various theoretical models, for example by a concept according to which a protective layer of additive molecules is formed on the rubbing contact surfaces in the injection pump. However, the only information directly obtainable from the response curves is that before saturation further improvement of lubricity is possible whilst afterwards it is not and that the improvement is linked to an increase of lubricating additive. There is no evidence showing that such a layer necessarily consists of chemical compounds of like or similar molecular structure which are adsorbed in a carpet-like structure as was assumed by the Appellant.

2.9.4 It is a fact that D1 discloses EVA to be a lubricant for low sulphur diesel fuel.

It is a further fact, unchallenged by the Appellant, that any fuel oil has an inherent lubricity due to the presence of chemical compounds of quite different chemical structure which contribute to lubricity. Such compounds are, for example sulphur compounds, polycyclic aromatics and polar compounds. It has been observed in the prior art that the more such compounds are removed by refining, the less is the fuel's ability for lubrication (patent in suit, page 2, lines 5 to 11 and page 4 line 1; D102, page 218, fourth paragraph to page 219, line 3 in combination with page 231, last paragraph to page 232, fourth paragraph). The Board is therefore not convinced by the Appellant's argument that a skilled person would have refrained from using different kinds of lubricating additives in combination, because he would assume either that the different additives would not form a stable layer or that one additive might dilute or displace the other.

- 2.9.5 In this respect, the Appellant has relied on D188 as representing an expert opinion since it has been published after the priority date of the patent in suit. It relates to multifunctional additive packages for diesel fuels and focuses on additive packages including a detergent for the purpose of reducing deposit formation in the injector nozzle and, thus particulate emissions (title and page 25, left-hand column, last paragraph). It contains the warning that care must be taken that the detergent additive does not inhibit the performance of the lubricity additive in order to prevent wear problems (page 25, middle column, second paragraph) and that experience is needed when formulating multi-functional packages to ensure that the different additives are not in surface competition

to each other as is shown in Table 3 for an undefined corrosion inhibitor and an undefined lubricity additive, but strongly attracted only to those surfaces where they are expected to be active (page 27, right-hand column, line 21 to page 28, left-hand column, line 11).

Nevertheless, D188 clearly indicates that it is usual in the art to use different kinds of additives. The fact that it recommends to pay attention that the selected additives do not negatively interact with each other does in the Board's opinion not prevent those skilled in the art from trying different additives if such interaction is not to be expected prima facie, as for example in the case of mixtures of acid and alkaline additives.

Moreover, considering the Appellant's assumption that lubrication occurs if a protective layer of additive on the surfaces of the injection pump is formed (point 2.9.3 above), the above warning in D188 concerning surface competition does not apply in the present case, where the ester lubricant is present in an insufficient amount, thus leaving room on the metal surface for the EVA to be adhered.

2.9.6 As a consequence, it is also irrelevant for the present case whether the effect of EVA on lubricity is weak (based on the amount of additive used) as compared with that of the ester additive, if the fuels lubrication properties are inadequate due to an insufficient content of lubricating compounds.

2.9.7 Finally, the Appellant's data (point IV above) are not reliable as evidence showing that in the example of D1 EVA would not improve lubricity either in the HFRR test or in the Almen-Wieland test and that also the ester additive of the patent in suit would not show any effect in the Almen-Wieland test.

One reason is that these data are in contradiction to the finding in the examples of the Appellant's own later patent application D6. These examples represent experimental evidence on the same level as the Appellant's data and show that EVA actually does improve a fuels lubricity as measured in the HFRR test (page 21, "fuel I").

Another reason is that the Appellant's data are not carried out on a fuel representative for that used in D1 according to which the fuel has a boiling range of 240 to 340°C before refining to a sulphur content and not thereafter as in the data.

Therefore, the Appellant's data are not apt to support his case.

2.10 As a consequence of the above reasons, the Board concludes that a person skilled in the art, in the expectation of both, an improvement of the fuel's lubrication properties and reduced costs for the lubricant, would have added the EVA suggested in D1 to fuel oil containing the ester lubricant disclosed in D5 in an insufficient amount.

For these reasons the Board finds that 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.

3. *Auxiliary requests*

- 3.1 As compared with Claim 1 of the main request, Claim 1 of the first auxiliary request (Set A-1) additionally contains the feature that the claimed use is "such that the lubricity is enhanced relative to that achieved by the use of the lubricity enhancer alone" and Claim 1 of the second auxiliary request (Set A-2) contains the additional feature, that the claimed use "further" enhances the lubricity "such that the combination of the lubricity enhancer and at least one such copolymer obtains a higher level of lubricity enhancement for a fixed amount of lubricity enhancer".

The Appellant argued that those claims were explicitly limited to situations where surface competition between EVA and ester additive occurred. Further, it was excluded that one of the two additives did not contribute to the fuel's lubricity.

However, the latter was also accepted by the Board for the wording of the main request by concluding from the evidence in the patent in suit that EVA actually improves a fuel's lubricity in those instances where the ester lubricant is present in an amount insufficient to give full lubrication (see points 2.4 and 2.5 above). As explained in points 2.9.4 to 2.9.6 above, the Board is convinced that someone skilled in the art would not have expected surface competition in

this case, in particular if in comparison with the ester additive, the effect of EVA on lubricity is weak.

Therefore, the Board agrees with the Respondents' opinion that the amendments made to the claims of the first and second auxiliary requests do not amount to a technical difference vis-à-vis the subject-matter claimed in the main request.

Consequently, the subject-matter claimed in the first and second auxiliary requests does not imply an inventive step (Article 56 EPC) for the same reasons given above for the main request.

- 3.2 Claim 1 of the third auxiliary request (Set E) contains the additional feature that "the lubricity enhancer is used in a proportion within the range of from 0.015% to 0.3% by weight based on the fuel oil". However, those amounts are usual in the art as is evident from D5 disclosing additive concentrations in the range of e.g. 1 to 1000 ppm (page 6, line 35 to page 7, line 2), according to the examples (see Tables on page 10) preferably in the range of between 150 and 1000 ppm (i.e. 0.015 to 0.1% by weight).

Therefore, Claim 1 of the third auxiliary request has to be dismissed on the same ground of lack of inventive step in view of D5 and D1.

- 3.3 Claim 1 of the fourth auxiliary request is limited to the third composition disclosed in Table 1 of example 1 of the patent in suit, including a major proportion of a specific fuel oil and specific minor proportions of a particular lubricity enhancer and mixture of EVA's.

The Appellant argued that the technical problem to be solved by the claimed subject-matter was to provide an alternative to the disclosure of D5 and that it was shown in the above example that the performance of a combination of EVA and ester additive was comparable to that of the ester additive alone. This would not have been expected by someone skilled in the art.

The Board notes that maximum performance of neither the particular ester additive alone nor its combination with the particular EVA mixture used is recorded in the patent in suit. Apart from that, it is evident from the examples of D5 (page 7, line 32 and page 8, lines 1 to 16) that a different ester if applied in particular fuels performs much better than the claimed subject-matter (see point 2.5 above).

The Board therefore concludes that it is within the competence of someone skilled in the art to choose within the disclosure of D5 a particular fuel oil and ester additive and combine the latter in specific proportions with a particular EVA mixture chosen within the disclosure of D1 in order to provide an alternative composition if maximum lubrication is not an issue.

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

4. 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. Krasa