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**D E C I S I O N**  
**of 22 July 2003**

**Case Number:** T 1030/00 - 3.3.1

**Application Number:** 94870107.3

**Publication Number:** 0688748

**IPC:** C07C 2/20

**Language of the proceedings:** EN

**Title of invention:**

Method for removing catalyst from an oligomer product

**Patentee:**

Fortum Oil and Gas Oy

**Opponent:**

Mobil Oil Corporation Office of Patent Counsel

**Headword:**

Catalyst removal from oligomer product/FORTUM OIL

**Relevant legal provisions:**

EPC Art. 54, 56

**Keyword:**

"Novelty (yes)"

"Inventive step (yes) - non-obvious solution"

"A document available to any person subject to payment is  
prior art under Article 54 EPC"

**Decisions cited:**

T 0300/86, T 0666/89

**Catchword:**

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Case Number: T 1030/00 - 3.3.1

**D E C I S I O N**  
**of the Technical Board of Appeal 3.3.1**  
**of 22 July 2003**

**Applicant:** Mobil Oil Corporation  
(Opponent) Office of Patent Counsel  
3225 Gallows Road  
Fairfax  
Virginia 22037 (US)

**Representative:** Hucker, Charlotte Jane  
Gill Jennings & Every  
Broadgate House  
7 Eldon Street  
London EC2M 7LH (GB)

**Respondent:** Fortum Oil and Gas Oy  
(Proprietor of the patent) Keilaniemi  
FI-02150 Espoo (FI)

**Representative:** Claeys, Pierre  
Gevers & Vander Haeghen  
Intellectual Property House  
Brussels Airport Business Park  
Holidaystraat 5  
BE-1831 Diegem (BE)

**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office posted  
17 August 2000 concerning maintenance of  
European patent No. 0688748 in amended form.

**Composition of the Board:**

**Chairman:** P. P. Bracke  
**Members:** P. F. Ranguis  
S. C. Perryman

## Summary of Facts and Submissions

I. The Appellant (Opponent) lodged an appeal against the interlocutory decision of the Opposition Division to maintain the European patent No. 0 688 748 (European patent application No. 94 870 107.3) in the form as amended pursuant to Article 102(3) EPC.

II. The patent was maintained with a set of fifteen claims (cf. Annex A of the contested decision). Independent Claim 1 (the sole independent claim) read as follows:

"1. Method for removing catalyst from an olefinic oligomerization product, comprising the steps of

- oligomerizing one or more olefins in presence of a  $\text{BF}_3$  cocatalyst complex,
- distilling at low pressure and temperature the oligomerization product by feeding the latter into a distillation column, between its top and its bottom, and
- separating a distillate and a bottom product, the distillate containing vaporized  $\text{BF}_3$  cocatalyst complex and the bottom product containing dimers, trimers and higher oligomers,

characterized in that the distillation comprises

- maintaining at the top of said distillation column a temperature higher than the boiling temperature of the unreacted monomer and of the cocatalyst complex and lower than the decomposition temperature of said cocatalyst complex at the applied pressure,
- maintaining in a portion of said distillation column, which is located lower than said feeding, a temperature higher than the boiling temperature of the unreacted monomer and of the cocatalyst complex and lower than

the boiling temperature of the dimer fraction at the applied pressure, and

- separating at the top of the column a substantially dimer-free distillate containing, simultaneously to said vaporized  $\text{BF}_3$  cocatalyst complex, vaporized unreacted monomer, and at the bottom of the column a bottom product containing said dimers, trimers and higher oligomers, which is substantially free from  $\text{BF}_3$  cocatalyst complex and from monomer,
- heating the bottom product within the bottom of the column in order to evaporate optionally residual unreacted monomer and  $\text{BF}_3$  cocatalyst complex, and
- removing from the bottom of the column a heated bottom product which is free from  $\text{BF}_3$  cocatalyst complex and from monomer".

III. The opposition sought revocation of the patent in suit under Article 100(a) (lack of novelty or inventive step), (b) and (c). It was supported by documents:

(1) SRI International Report No. 125, "Synthetic Lubricants", May 1979, pages 38-52 and 165.

(2) EP-A-0 318 186

IV. The Opposition Division held that the claimed subject-matter (cf. point II above) did not give rise to objection under Article 100(b) and (c). The Opposition Division also found that the claimed subject-matter was novel since neither document (1) nor document (2) disclosed a method for removing catalyst from an olefin oligomerization product whereby  $\text{BF}_3$  cocatalyst and monomer were simultaneously separated from the oligomerization product in a one step procedure using a

single distillation column. Regarding inventive step, the problem to be solved was to be seen in the provision of a method for removing and recovering the  $\text{BF}_3$  cocatalyst complex from an olefinic oligomerization product, which method was suitable to achieve efficient removal of traces of the cocatalyst complex and unreacted monomer without the necessity of a washing step as achieved in document (2) or without the necessity of more than one distillation step as used in document (1). Although the drawbacks of the methods as used in documents (1) or (2) were apparent, none of said documents mentioned that this situation could be remedied nor did they give any indication as to the problem the presently claimed method attempted to solve.

- V. Oral proceedings took place on 22 July 2003. In a written communication, the Board had previously informed the parties that it would be discussed at the oral proceedings whether or not document (1) was prior art under Article 54 EPC.
- VI. Neither in the statement setting out the grounds of appeal nor at the oral proceedings did the Appellant take up the objections under Article 100(b) and (c). He however contested the decision of the Opposition Division regarding novelty and inventive step and submitted the following arguments:

The subject-matter of Claim 1 was anticipated by the disclosure of document (2). Described therein was a process for producing poly-alpha-olefin-type lubricant including a continuous distillation step, implying as a matter of fact that the oligomerization product was fed between the top and the base of the distillation

column. Furthermore, there was a substantial overlap between the range of distillation conditions disclosed in that document, i.e. 0.1 to 3 mbar and 20 to 100°C, and the claimed conditions. It followed that the person skilled in the art would have seriously contemplated applying the technical teaching of document (2) in the range of overlap with the claimed invention. Since the last two requirements defined in Claim 1, namely heating the bottom product and removing that heated bottom product from the distillation column were essentially implicit in any distillation column, document (2) disclosed each and every one of the features required by Claim 1, with the result that it lacked novelty.

Regarding inventive step, document (1) was prior art since the restriction of the diffusion of such a document as evidenced by the introductory offer in document

(4) Proposal for an introductory offer for the process economics program 1996

was purely to safeguard financial interests of the originators of the document. The report in the document was available to any person prepared to pay the subscription.

Starting from document (1) as the closest state of the art, the technical problem to be solved might be viewed as being simplification of the disclosed process, namely avoiding the separate distillation of  $\text{BF}_3$  cocatalyst complex and unreacted monomer.

It was true that document (1) did not disclose simultaneously removing of cocatalyst complex and unreacted monomer but separating of the complex from the oligomerization product and subsequently removing of the unreacted 1-decene monomer from C<sub>20</sub> dimers and higher oligomers by a separate distillation step. However, as confirmed by Mr. Norman Yang in his

(5) Statutory declaration attached to the statements of grounds of appeal,

the volatilities of the BF<sub>3</sub> cocatalyst complex and 1-decene monomer are sufficiently close, compared to the volatility of the C<sub>20</sub> dimer, and the person skilled in the art could envisage as a routine process optimisation to allow separation of both those materials from the dimer in a single separation step.

Furthermore, document

(3) US-A-4 855 488

newly cited, provided evidence that it was common general knowledge to distill simultaneously the BF<sub>3</sub> addition compound and the excess starting material for recycling. It would, therefore, have been obvious to avoid separate distillation according to document (1) by applying the teaching of document (3). Further, it would have been routine for the skilled man to select distillation conditions capable of achieving the desired result. The same arguments applied starting from document (2) which also disclosed the separate distillation of BF<sub>3</sub> cocatalyst residue.

VII. The Respondent (Proprietor of the patent) admitted at the oral proceedings that document (2) disclosed a continuous process for producing poly- $\alpha$ -olefin-type lubrications including a continuous distillation of the oligomerization product but disputed that the conditions, in the column arranged for a continuous distillation, would be applied in a range of temperatures and pressures such as to obtain the greatest possible amount of monomer at the top of the column, differing, therefore, from the claimed invention. Furthermore, the ranges of temperatures and pressures set out in document (2), i.e. 0.1 to 3 mbar and 20 to 100°C, as demonstrated by the examples gave no indication on the conditions prevailing at the bottom and at the top of the distillation column.

Regarding the inventive step, the Respondent relying upon the decision T 300/86 argued that since the diffusion of document (1) was restricted to a possibly large but still limited circle of persons given it was subject to a subscription, that document was not available to the public. In case the Board would admit that document in the proceedings, the following was submitted thereon:

The conditions of distillation of the column C-201 of document (1) were intentionally provided to recover the cocatalyst complex at the top of the column and the monomer at the bottom. Recovering also the monomer would oblige one to elevate the temperature with a risk that the cocatalyst complex might be decomposed as evidenced by document



- (6) SRI International Report No. 125A, "Synthetic Lubricant Base Stocks", September 1989, pages 4-1 to 4-41,

newly cited with the response to the statement of grounds of appeal.

In addition, it was remarkable to note that in the process conceived in document (6), the oligomerization product was directly washed in a caustic wash vessel, the authors having renounced reuse of the cocatalyst complex.

Document (3) was not relevant since it related to another type of reaction involving the addition of organic acid on dicyclopentadiene. Document (2) was no more helpful since it also recovered the 1-decene monomer with the oligomerization product and furthermore required a subsequent washing step.

- VIII. The Appellant requested that the decision under appeal be set aside and the patent be revoked.

The Respondent requested that the appeal be dismissed.

- IX. At the end of the oral proceedings the decision of the Board was announced.

### **Reasons for the Decision**

1. The appeal is admissible.

2. *Novelty - Article 54 EPC*
- 2.1 Document (2), which is prior art under Article 54(1)(2) EPC, discloses a method for producing poly- $\alpha$ -olefine-type lubricant by oligomerizing olefins with the aid of a  $\text{BF}_3$  cocatalyst complex involving the distillation of the cocatalyst complex, preferably at a low, about 0.1 to 3 mbar, pressure and at a low, about 20 to 100°C, temperature and reuse of the recovered complex in a similar oligomerizing reaction (cf. page 2, lines 2 to 3, 24 to 26 and 35 to 37). This method may be used as a batch or continuous action process (cf. page 2, lines 45 to 46). The examples disclose batch processes connected in series wherein the distilled cocatalyst complex is used in the next experiment, while the  $\text{BF}_3$  residues are removed from the oligomerization product by washing with a 5% NaOH water solution, and the monomer and part of the dimer are removed by a further distillation (cf. page 3, lines 2 to 7).
- 2.2 The main argument of the Appellant is that the substantial overlap between the range of distillation conditions disclosed in that document and the claimed conditions results inevitably in a process reproducing the claimed combination of features when implementing the method of that document.
- 2.3 However, the information about the range of distillation conditions in document (2) must be read in the context of the whole disclosure of this document. Even though this document discloses a continuous process including a continuous distillation, and even though there is a significant overlap between the pressure and temperature ranges with respect to those

now claimed in the invention when the ranges are considered in isolation, document (2) discloses a process wherein the cocatalyst complex **only** is removed at the top of the column, while the monomer is recovered with the dimers and oligomers in the oligomerization product. It follows that the distillation conditions disclosed in document (2) are applicable to a process achieving that result. Therefore, the features of Claim 1 relating to:

- maintaining at the top of said distillation column a temperature higher than the boiling temperature of the unreacted monomer and of the cocatalyst complex and lower than the decomposition temperature of said cocatalyst complex at the applied pressure,
- maintaining in a portion of said distillation column, which is located lower than said feeding, a temperature higher than the boiling temperature of the unreacted monomer and of the cocatalyst complex and lower than the boiling temperature of the dimer fraction at the applied pressure, and
- separating at the top of the column a substantially dimer-free distillate containing, simultaneously to said vaporized  $\text{BF}_3$  cocatalyst complex, vaporized unreacted monomer, and at the bottom of the column a bottom product containing said dimers, trimers and higher oligomers, which is substantially free from  $\text{BF}_3$  cocatalyst complex and from monomer (cf. point II above)

are not disclosed in document (2).

- 2.4 Since the subject-matter of a claimed invention is novel if it includes even one feature which distinguishes it from the prior art, it must be concluded that Claim 1 and depending Claims 2 to 15 meet the requirements of Article 54 EPC.
- 2.5 The argument put forward by the Appellant relating to the possibility for the skilled person "seriously contemplating" applying the technical teaching of document (2) in the range of overlap with the claimed invention (cf. T 666/89, OJ EPO 1993, 495) has here no factual basis. There is no overlap where, as here, the processes differ in substance from one another (cf. point 2.3 above), even though the ranges for parameters such as pressure and temperature overlap.
3. *Prior art under Articles 54(2) and 56 EPC*
- 3.1 The question to be decided is whether document (1) is prior art under Articles 54(2) and 56 EPC.
- 3.2 Document (1) was relied on by the Appellant in the form of a copy having on its front page in large letters the words "SRI International, Report No. 125, SYNTHETIC LUBRICANTS, Max Sacks, May 1979, A private report by the PROCESS ECONOMICS PROGRAM, Menlo Park, California 94025" and also a date stamp "LIBRARY May 24 1979, MOBIL CHEMICAL CO., Edison N. J. 08817".
- 3.3 That the report is referred to as a private report cannot be taken as indicative that it was not made publicly available as the word "private" might be referring merely to the report not being publicly

funded. The Board notes that the cover page of document (6), which was put forward by the Respondent and is a PEP Report 125a of 1989 (still some five years before the priority date of the patent in suit), states "...this report summarizes relevant patents issued since the publication of PEP Report 125..." (PEP Report 125 being document (1)).

3.4 The document most relevant to the question of whether PEP reports are available to the public or not is document (4), relied on by the Respondent in its challenge on the issue of the public availability of document (1). Document (4) reads inter alia as follows:

"PROPOSAL FOR AN INTRODUCTORY OFFER FOR THE PROCESS ECONOMICS PROGRAM 1996

The Process Economic Program (PEP) at SRI Consulting is pleased to make this introductory offer whereby PEP reports may be purchased according to the following sliding scales:

PEP Yearbook International	US\$ 20,000
First PEP report	US\$ 7,100
Second PEP report	US\$ 6,100
Third PEP report	US\$ 4,300

The client may purchase the PEP Yearbook only or one or more PEP reports and the Yearbook. When an aggregate payment of US\$ 37,500 has been reached, the client may convert this introductory offer to a PEP subscription at no additional cost. That subscription will comprise: One copy of 10 PEP reports of the client's choice (seven reports in addition to the first three selected)

.....  
 Both the options and services extend through June 30, 1998.

The information disclosed in the PEP reports and other PEP publications is for the sole and confidential use of the PEP clients and affiliates in which the client's ownership is 100%. By acceptance of this proposal, the client agrees to take reasonable precautions to ensure that the PEP material is: (1) not reproduced or published, in whole or part; and (2) not made available to third parties except for temporary and specific use for the sole benefit of the client in the client's own research or commercial activities. However clients or SRI Consulting may donate any PEP report 15 years old or older to any university for exclusive use by the faculty for educational purposes only. The editor of the Process Economics Program shall be notified of each such client donation."

3.5 The Respondent, despite having itself put forward document (4), contested at the oral proceedings before the Board that this document gave the conditions of availability relating to document (1) because it referred to a period of time many years later. However in the absence of any evidence suggesting that these conditions are not typical for those on which PEP reports were made available, the Board can only presume that the conditions of document (4) are applicable. From this document the Board concludes that PEP reports were available to anybody who was prepared to pay for them. There is no indication that there was only a restricted group to whom they could be made available by SRI Consulting. That at the price asked, the number

of purchasers would be likely to be small does not mean that the reports were only available to a restricted group.

- 3.6 The purchasers accept restrictions on their dealings with the report, but not on use for their own purposes but only on making the report accessible to third parties for the latter's own purposes. Such third parties can however be told to purchase the report for themselves. The restrictions serve merely as an additional contractual safeguard, in addition to reliance on copyright, of SRI's financial interests in being the sole disseminator of the PEP reports, and not for any purpose of keeping the information confidential as such. There is no evidence that the purchasers had to fulfil any condition other than being willing to pay. This is quite different from the type of situation as in case T 300/86, relied on by the Respondent, where a report was only available to licensees of a particular company, that is to a restricted number and thus not to the public at large.
- 3.7 The Board finds that on the evidence the PEP reports were available to an unrestricted number of purchasers, and certainly at least one copy of Report 125 (document (4)) was made available to Mobil Chemical Co. before the priority date. Thus document (1) is to be treated as made available to the public for the purposes of Article 54(2) EPC, as Article 54(2) EPC does not require that a written description be made available free of charge for it to be considered to be made available to the public.

3.8 It follows from the above that document (1) is prior art under Article 54(1), (2) EPC and, therefore, Article 56 EPC.

4. *Inventive step - Article 56 EPC*

4.1 The patent-in-suit as reflected by Claim 1 (cf. point II above) relates to a method to recover by a single step distillation catalyst and unreacted monomer from an oligomerization product obtained by oligomerizing one or more olefins in presence of a  $\text{BF}_3$  cocatalyst complex, avoiding any additional washing step and further separation of the monomer from the oligomerization product.

4.2 In accordance with the "problem-solution approach", it is necessary to establish the closest state of the art to determine in the light thereof the technical problem which the invention addresses and solves. The "closest prior art" is normally a prior art document disclosing subject-matter aiming at the same objective as the claimed invention and having the most relevant technical features in common.

4.3 Document (1) relates to a process for producing hydrogenated 1-decene oligomer by oligomerizing 1-decene monomer in presence of  $\text{BF}_3/\text{BF}_3 \cdot 2\text{C}_2\text{H}_4\text{OH}$  (cf. pages 38 to 40). The crude oligomer is fed to a continuous distillation column C-201, operating under a slight vacuum to keep the bottoms temperature below  $230^\circ\text{C}$ , to recover the catalyst complex at the top of the column for recycling to the oligomerization reactor and the unreacted 1-decene, decane and oligomers at the bottom. This oligomerization product is pumped to a



distillation column C-202 to recover unreacted 1-decene for recycle to oligomerization (cf. pages 40, 41, Table 4.5 and Figure 4.2).

This document aims at the same objective as the claimed invention and the only difference, as acknowledged by the Appellant, between the disclosure in document (1) and the claimed invention is that document (1) conducts separation of 1-decene monomer and  $\text{BF}_3$  cocatalyst complex in different distillation columns.

Document (1) is closer to the claimed invention than document (2) since the latter requires a subsequent washing step (cf. point 2.1 above).

The Board considers, therefore, in agreement with both parties that document (1) represents the closest state of the art and, thus, the appropriate starting point in the assessment of inventive step.

4.4 In view of this state of the art, the problem underlying the patent in suit may be viewed as the provision of a method enabling simplification of the process of recovery of products resulting from the oligomerization of olefins in the presence of a  $\text{BF}_3$  cocatalyst complex as disclosed in document (1).

4.5 As the solution to this problem, the patent-in-suit proposes the method as set out in Claim 1 (cf. point II above).

The detailed description of the process of the patent-in-suit (cf. column 3, line 15 to column 5, line 9) shows convincingly that this technical problem is

solved within the claimed area. This finding has never been contested by the Appellant.

- 4.6 It remains to be decided whether or not the claimed solution is obvious in view of the cited prior art.

The relevant question is whether the person skilled in the art guided by the technical problem to be solved would have been led to simplify the method disclosed in document (1) in the way proposed by the claimed invention.

- 4.7 In that context, document (2), published ten years after document (1), directs the person skilled in the art to distill after oligomerization the cocatalyst complex at low pressure and low temperature (cf. point 2.1 above). This process requires then the treatment of the crude oligomerization product recovered at the bottom of the column with a 5% NaOH water solution to remove  $\text{BF}_3$  residues. Furthermore, the monomer which is present in the bottom product must be recovered by a further distillation step. Such a document confirms at best the teaching of document (1) and gives no hint to the person skilled in the art in the direction of the claimed process.

The Appellant however argued that document (3) gave the evidence that it was common general knowledge to simultaneously distill the monomer and the cocatalyst complex providing, therefore, the required information to arrive at the claimed invention.

Document (3) relates to a process for the preparation of dicyclopentenol esters by condensation of

dicyclopentadiene with an organic acid in the presence of catalyst which comprises a readily volatile addition compound of  $\text{BF}_3$ . Thereafter, the reaction mixture is distilled under vacuum. The first distillate, the carboxylic acid excess and  $\text{BF}_3$ -addition compounds, can be used for a following batch following replacement of lost quantities. The ester, which passes over as the main fraction, is led over a washing column of marble or activated charcoal to bind any traces of free acid, residues of the catalyst and small oligomeric components (cf. column 2, lines 12 to 16 and column 3, lines 3 to 11).

Contrary to the Appellant's submissions, document (3) cannot be considered as common general knowledge since it appears only in a specific context in a patent concerned with a different process, and not as a generally applicable suggestion appearing in a handbook or textbook concerned with this general technical field (cf. Case Law of the Boards of Appeal of the European Patent Office, 4<sup>th</sup> edition 2001, I.D.5.3). Furthermore, document (1) contains neither explicit nor implicit information urging the person skilled in the art to explore technical fields relating to the manufacture and recovery of dicyclopentenol esters to solve the above defined technical problem. It is also observed that document (3) gives no instructions regarding the applicability of the disclosed process to the oligomerization of olefins and no relevant information can be deduced from the examples in that respect. In particular, Example No. 1 discloses the simultaneous distillation of  $\text{BF}_3 \cdot 2$  acetic acid, acetic acid and dicyclopentenol acetate and Example No.5 discloses the simultaneous distillation of  $\text{BF}_3 \cdot \text{O}(\text{CH}_3)_2$  and

dicyclopentadiene. In the absence of any information pointing to a close relationship between both reactions, the Board holds that the person skilled in the art would not have considered the teaching of document (3) to solve the above technical problem.

4.8 Regarding the declaration of Mr. Yang concerning the closeness of the volatilities of the  $\text{BF}_3$  cocatalyst complex and 1-decene monomer compared to the volatility of the  $\text{C}_{10}$  dimer, such data might have been considered by the person skilled in the art who had envisaged recovering simultaneously by distillation both cocatalyst complex and monomer to solve the above defined technical problem, i.e. once the invention was made. The person skilled in the art might have then recognised that those data confirmed that this step could be achieved without difficulty. This approach, however, is dependent upon the knowledge of the teaching of the patent in suit, and does not arise from the state of the art. An argument based on such considerations is an *ex post facto* argument and so not legitimate.

4.9 Since starting from document (1) and in the light of the other documents cited, the person skilled in the art would not have been led in an obvious manner to the claimed solution in order to solve the technical problem defined above (cf. point 4.4 above), the subject-matter of Claim 1 meets the inventive step requirement. The same applies to dependent Claims 2 to 15 which represent particular embodiments of the subject-matter of Claim 1.

**Order**

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

The appeal is dismissed.

The Registrar

The Chairman

N. Maslin

P. P. Bracke