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**Datasheet for the decision  
of 14 August 2012**

**Case Number:** T 0316/10 - 3.3.06

**Application Number:** 02772614.0

**Publication Number:** 1442099

**IPC:** C10G 9/00

**Language of the proceedings:** EN

**Title of invention:**  
OLEFINS PRODUCTION PROCESS

**Patentee:**  
BP EXPLORATION OPERATING COMPANY LIMITED

**Opponent:**  
Sasol Technology (Pty) Ltd

**Headword:**  
Olefins production process/BP

**Relevant legal provisions (EPC 1973):**  
EPC Art. 56

**Keyword:**  
"Inventive step (all requests): no - obvious simplification"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 0316/10 - 3.3.06

**D E C I S I O N**  
**of the Technical Board of Appeal 3.3.06**  
**of 14 August 2012**

**Appellant I:** BP EXPLORATION OPERATING COMPANY LIMITED  
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**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office posted  
11 December 2009 concerning maintenance of  
European patent No. 1442099 in amended form.

**Composition of the Board:**

**Chairman:** P.-P. Bracke  
**Members:** P. Ammendola  
U. Tronser

## Summary of Facts and Submissions

I. This appeal is from the interlocutory decision of the Opposition Division concerning the maintenance in amended form of European patent No. 1 442 099 relating to an olefins production process.

II. Claim 1 of the granted patent (hereinafter granted claim 1) reads as follows:

*"1. A process for the production of olefins comprising passing a synthetic naphtha to a steam cracker wherein at least a portion of the synthetic naphtha is converted to olefins **characterised in that** the synthetic naphtha is a combined synthetic naphtha produced from a process comprising*

- a) contacting a synthesis gas stream at an elevated temperature and pressure with a Fischer-Tropsch catalyst in a Fischer-Tropsch reactor to generate a hydrocarbon product stream*
- b) separating the hydrocarbon product stream to provide at least one lighter fraction and at least one heavier fraction*
- c) subjecting at least a portion of the heavier fraction to hydrocracking and/or hydroisomerisation in a hydroprocessing reactor to produce an upgraded hydrocarbon product stream*
- d) combining the lighter fraction with the upgraded hydrocarbon product stream to produce a combined hydrocarbon stream and*
- e) fractionating at least a portion of the combined hydrocarbon stream to produce the combined synthetic naphtha stream."*

III. The Opponent had sought revocation of the granted patent for, *inter alia*, lack of novelty and of inventive step vis-à-vis document:

(1) = "PROCESSING OF FISCHER-TROPSCH SYNCRUDE AND BENEFITS OF INTEGRATING ITS PRODUCTS WITH CONVENTIONAL FUELS", presented by L.Dancuart at the NPRA 2000 Annual Meeting, March 26-28, 2000.

IV. During the opposition proceedings the Patent Proprietor (hereinafter Proprietor) filed, *inter alia*, a set of amended claims labelled as Auxiliary Request 5.

Claim 1 of this Auxiliary Request reads as follows:

"1. A process for the production of olefins comprising passing a synthetic naphtha to a steam cracker wherein at least a portion of the synthetic naphtha is converted to olefins **characterised in that** the synthetic naphtha is a combined synthetic naphtha produced from a process consisting of

- a) contacting a synthesis gas stream at an elevated temperature and pressure with a Fischer-Tropsch catalyst in a Fischer-Tropsch reactor to generate a hydrocarbon product stream which is passed via a line to a separator
- b) separating the hydrocarbon product stream in the separator into a lighter fraction and a heavier fraction
- c) subjecting the heavier fraction to hydrocracking in a hydroprocessing reactor to produce an upgraded hydrocarbon product stream

d) combining the lighter fraction with the upgraded hydrocarbon product stream to produce a combined hydrocarbon stream and  
e) fractionating the combined hydrocarbon stream in a fractional distillation column comprising a reboiler to produce the combined synthetic naphtha stream."

In the decision under appeal the Opposition Division considered, *inter alia*, that granted claim 1 did not exclude additional steps in which the lighter fraction (hereinafter **L-fraction**) was possibly hydrocracked. Hence, its subject-matter was anticipated by the disclosure in document (1) that the Sasol process resumed in Figure 4, Table 3 and exemplified in this citation, resulted in an upgraded naphtha particularly suitable for the production of olefins via steam cracking. This Sasol process included generating an hydrocarbon product stream from a Fischer-Tropsch process (hereinafter **FTHP-stream**), hydrocracking both the L-fraction and the heavier fraction (hereinafter **H-fraction**) separated from such stream and possibly combining the hydrocracked products before recovering therefrom the upgraded naphtha contained therein.

The Opposition Division considered instead claim 1 of Auxiliary Request 5 to be limited to processes wherein the L-fraction of the FTHP-stream was not hydrocracked and, thus, concluded that this claim was novel vis-à-vis document (1).

The Sasol process disclosed in document (1) was also considered the prior art of departure for the assessment of inventive step for this claim 1.

Since the patent-in-suit failed to demonstrate any particular benefit of the invention over the prior art, the sole technical problem credibly solved by the process claimed in the Auxiliary Request 5 was the provision of a simpler process for the production of olefins.

The Opposition Division considered that the other available citations did not suggest the possibility of avoiding the intermediate hydrocracking of the L-fraction when converting a FTHP-stream into olefins. Hence, the skilled person starting from document (1) would not arrive in an obvious manner at the claimed subject-matter. Accordingly, claim 1 of the Auxiliary Request 5 was also found to comply with the requirements of Article 56 EPC (1973) and the patent-in-suit was maintained in amended form on the basis of this auxiliary request.

- V. The decision was appealed by the Proprietor (Appellant I, notice of appeal and appeal fee received at the EPO on 15 February 2010, grounds of appeal received on 9 April 2010) as well as by the Opponent (Appellant II, notice of appeal and appeal fee received at the EPO on 11 February 2010, grounds of appeal received on 16 April 2010).

The Proprietor requested that the decision under appeal be set aside and that the patent be maintained on the basis of the Main Request or one of the Auxiliary Requests 1 to 5 submitted during oral proceedings.

The Opponent requested that the decision under appeal be set aside and that the patent be revoked.

VI. The six versions of claim 1 according to the requests filed at the oral proceedings (hereinafter the Main Request and the Auxiliary Requests 1 to 5) are as follows:

Claim 1 of the **Main Request** is identical to granted claim 1 (see above Section II).

Claim 1 of the **Auxiliary Request 1** differs from granted claim 1 only in that the passage of this latter reading:

*"from a process comprising  
a)contacting"*

has been amended into:

*"from a process consisting of  
a)contacting".*

Claim 1 of the **Auxiliary Request 2** differs from that of the Auxiliary Request 1 only in that the passage in step "b)" of this latter reading:

*"at least one lighter fraction and at least one  
heavier fraction"*

has been amended into:

*"a lighter fraction and a heavier fraction".*

Claim 1 of the **Auxiliary Request 3** differs from the claim 1 of the Auxiliary Request 1 in that the step "b)" in this latter reading:

" b) *separating the hydrocarbon product stream to provide at least one lighter fraction and at least one heavier fraction*"

has been amended into:

" b) *separating the hydrocarbon product stream by flash distillation wherein the hydrocarbon product stream is passed to a vessel and the temperature of the steam is raised and/or the pressure of the stream is lowered such that a gaseous lighter fraction is separated from a non-gaseous heavier fraction, wherein the lighter fraction comprises hydrocarbons with between 5 to 14 carbon atoms and the heavier fraction comprises hydrocarbon with between 15 to 30 carbon atoms*"

Claim 1 of the **Auxiliary Request 4** is identical to claim 1 of the set of amended claims found to comply with the EPC by the Opposition Division (i.e. the Auxiliary Request 5 in the opposition proceedings, see above Section IV).

Claim 1 of the **Auxiliary Request 5** reads as follows:

"1. *A process for the production of olefins consisting of:*  
a) *contacting a synthesis gas stream at an elevated temperature and pressure with a Fischer-Tropsch catalyst in a Fischer-Tropsch reactor to*



*generate a hydrocarbon product stream which is passed to a separator*

*b) in the separator, separating the hydrocarbon product stream into a lighter fraction and a heavier fraction*

*c) passing the the heavier fraction to a hydroprocessing reactor wherein it is hydrocracked to produce an upgraded hydrocarbon product stream*

*d) combining the lighter fraction from the separator with the upgraded hydrocarbon product stream to produce a combined hydrocarbon stream*

*e) passing the combined hydrocarbon stream to a fractional distillation column comprising a reboiler*

*f) fractionating the combined hydrocarbon stream to produce a combined synthetic naphtha stream and*

*g) passing the combined synthetic naphtha stream to a steam cracker wherein it is converted to olefins."*

VII. The Proprietor disputed the interpretation of granted claim 1 made by the Opposition Division by arguing that this claim explicitly required the (same) L-fraction collected in step "b)" to be used in step "d)" and, thus, also implied the exclusion of any intermediate hydrocracking of such fraction. Hence, already the subject-matter of granted claim 1 was novel and non-obvious vis-à-vis document (1) for substantially the same reasons indicated by the Opposition Division in respect of claim 1 of the then pending Auxiliary Request 5.

In particular, the Proprietor concurred with the findings in the decision under appeal that document (1)

represented the closest prior art and that the technical problem credibly solved vis-à-vis this prior art was the provision of a simpler process for the production of olefins.

However, it stressed that the essence of the invention could only be correctly understood taking into account the previously existing common general knowledge in the relevant technical field that a high content of olefins in the naphtha undergoing steam cracking was normally expected to result in large amounts of coking and, thus, was detrimental to the yield in olefins. In particular, this common general knowledge was also reflected in the explicit teaching of document (1) indicating that both fractions of a FTHP-stream which contained 35% by weight olefins, had to be hydrocracked in order to obtain therefrom an "*essentially paraffinic*" or "*highly paraffinic*" synthetic naphtha suitable for olefins production via steam cracking (see document (1) the last paragraph on page 4 and that on page 11).

Hence, document (1) would instruct the skilled person searching for a simpler process for converting FTHP-streams into olefins with excellent yields, to retain in any case the intermediate hydrocracking of both fractions.

Instead, the experimental data reported in the patent-in-suit proved for the first time that the L-fraction as *such* (i.e. not subjected to any hydrocracking) although containing substantial amounts of olefins, resulted in better ethylene yield and lower CO<sub>2</sub> emissions than e.g. an **upgraded hydrocarbon product**

stream (hereinafter **UHP-stream**) which had been obtained by hydrocracking the H-fraction and, thus, contained much less olefins. Hence, the evidence in the patent-in-suit rendered also credible that it was surprisingly possible to produce olefins with excellent yields and without extensive coking by using the process of granted claim 1, i.e. by steam cracking a combined synthetic naphtha fractionated from the combination of the UHP-stream with the (untreated) olefin-rich L-fraction (this combination is named in granted claim 1 as **combined hydrocarbon stream**, hereinafter **CH-stream**).

Since no available citation dealing with the process of converting FTHP-stream into olefins contained a clear instruction that excellent yields could also be obtained when using a naphtha rich in olefins such as that contained in an (untreated) L-fraction, the subject-matter of granted claim 1 could not possibly descend in an obvious manner from the prior art.

In the opinion of the Proprietor the reasoning given above applied identically to the subject-matter of each version of claim 1 according to the Auxiliary Requests 1 to 5, all being attempts to express more clearly the exclusion of any hydrocracking of the L-fraction via the additional indication of features of the preferred embodiments of the invention as schematically illustrated by Figure 5 and described in paragraph [0056] of the patent-in-suit (hereinafter these preferred embodiments of the claimed process are also indicated as the **processes of Figure 5**) and by further specifying (only in claim 1 of the Auxiliary Request 3) that, as disclosed in paragraph [0033] of the patent-

in-suit, the separation step "b)" was made by flash distillation.

VIII. The Opponent considered the Auxiliary Request 3 filed by the Proprietor at the oral proceedings to be belated and, thus, inadmissible.

It concurred with the finding of the Opposition Division that granted claim 1 did not exclude the possible intermediate hydrocracking of the L-fraction and, thus, was not novel vis-à-vis document (1).

It also argued that, even in case the Board would find granted claim 1 to be implicitly limited to novel processes in which the L-fraction was not hydrocracked, still all Proprietor's requests were to be rejected because document (1) would, for the following reasons, render obvious even the most preferred embodiments of the claimed process, i.e. the olefins production processes of Figure 5 which were encompassed by each version of claim 1 according to these requests.

The Opponent concurred with the Proprietor's statement that a high olefin content in the naphtha feed to be steam cracked was regarded by the skilled person as detrimental since it was known to result in extensive coking when steam cracking such feed into olefins. Hence, it also considered evident to the skilled reader of document (1) that in this prior art the intermediate hydrocracking of the L-fraction had the function to remove the 35% by weight of olefins present therein.

The Opponent stressed, however, that no version of claim 1 according to the Proprietor's requests set any

limits for the olefin content of the L-fraction and the UHP-stream to be combined in the CH-stream, or for the amount ratio with which these two ingredients were combined therein. Nor was the claimed process limited to the use of a specific FT catalyst and process in step "a)" which necessarily resulted in FTHP-streams with low amount of olefins.

Hence, claim 1 of each of the Proprietor's requests was so broadly formulated to also encompass, for instance, the possibility of starting from the same FTHP-stream of document (1) whose L-fraction contained 35% by weight of olefins.

However, the sole L-fraction described in the examples of the patent-in-suit only contained a much smaller amount of olefins (about 10% by weight, see Tables 1 and 2 of the patent-in-suit). Thus, the data reported in the patent-in-suit could not possibly render credible the obtainment of reduced coking and high yield in olefins over the whole claimed range of processes.

Hence, the problem solved vis-à-vis the process of document (1) by e.g. the variants of the processes of Figure 5 in which the L-fraction was as rich in olefins as that formed in the Sasol process, was not, as implied by the Opposition Division, the provision of comparably effective but simpler olefins production processes (i.e. processes achieving about the same yields in olefins as those observed in the prior art of departure in less steps), but rather the provision of further, possibly not even simpler, olefins production processes whose yields in olefins could as well be much

worse than those obtained by the process of document (1), due to extensive coking.

The Opponent concluded that no inventive ingenuity was required in order to solve such problem by removing one or the other of the intermediate hydrocracking steps only used in document (1) to upgrade the naphtha contained in the FTHP-stream. In addition, the skilled reader of document (1) would even find suggested in that very same document the possibility of by-passing the hydrocracking of the L-fraction, as apparent from the dotted lines in Figure 4 of document (1).

Hence, at least those variants of the claimed processes of Figure 5 in which the generated L-fractions had high olefin contents and, thus, produced much worse yields, were nothing else than obvious modifications for the worse of the prior art.

These unsatisfactory variants of the preferred process depicted in Figure 5 were also encompassed by the other versions of claim 1 according to the Auxiliary Requests 1 to 5. Hence, the same reasoning applied to all the other Proprietor's requests as well.

In particular, the Opponent stressed in respect of the Auxiliary Request 3, that claim 1 therein just further arbitrarily limited the process of Figure 5 by requiring that the step "b)" had to occur via flash distillation. In the opinion of the Opponent this latter feature, which was only indicated in the patent-in-suit as an optional characteristic without explicitly or implicitly attributing to it any specific advantage or particular contribution to the

inventiveness of the process claimed, was just a conventional alternative for separating hydrocarbon products and, thus, just a further obvious modification of the prior art.

Thus, neither the Main Request nor any of the Auxiliary Requests 1 to 5, would possibly comply with Article 56 EPC (1973).

### **Reasons for the decision**

#### *Main Request (patent as granted)*

1. Claim 1 of the Main Request (i.e. granted claim 1, see above Section VI of the Facts and Submissions) manifestly embraces the preferred embodiments of the claimed process schematically illustrated by Figure 5 and described in paragraph [0056], i.e. olefins production processes wherein the combined synthetic naphtha stream that is converted into olefins by steam cracking has been obtained by:

- generating a FTHP-stream;
- passing this stream to a separator and collecting therefrom a L-fraction and a H-fraction;
- hydrocracking exclusively the H-fraction to produce the UHP-stream;

and

- combining the L-fraction (as collected) with the UHP-stream to generate a CH-stream which is then fractionated in a fractional distillation column comprising a reboiler to produce the combined synthetic naphtha stream.

It has become apparent to the Board that already certain variants of the processes of Figure 5 violate Article 56 EPC (1973), for the reasons indicated here below. Hence, it has turned out unnecessary for the Board to establish if this claim encompasses as well processes in which the L-fraction is hydrocracked and to decide on the novelty of granted claim 1.

2. Inventive step (Article 56 EPC 1973): claim 1
  - 2.1 The Board concurs with the finding of the Opposition Division, undisputed by the Proprietor, that the assessment of inventive step may reasonably be made starting from the prior art disclosed in document (1) which mentions, *inter alia*, that the naphtha obtained from the Sasol process illustrated in Figure 4 of this citation is an excellent feed for the production of olefins via steam cracking (see document (1), page 6, point 3, the passage reading "*In addition, the process also delivers a significant fraction of naphtha, an excellent feed for the production of olefins via steam cracking*"; and at page 11, last paragraph, the passage reading: "*The Sasol SPD naphtha is an excellent feed for the production of lower olefins, in particular ethylene, by steam cracking*").
  - 2.2 The Board notes that the processes of Figure 5 only differ from the prior art of departure in that the L-



fraction is not hydrocracked, but combined **as such** with the UHP-stream (i.e. with the hydrocracked H-fraction).

- 2.3 The Opponent has argued that according to undisputedly previously existing common general knowledge (that a high content of olefins in the naphtha stream undergoing steam cracking resulted in large amounts of coking and, thus, was detrimental to the yield in olefins) even the most preferred processes of Figure 5 could produce substantially worse yields in olefins in comparison to the prior art, when the L-fractions generated in these processes have high olefin contents. Hence, the only problem credibly solved over the whole ambit of granted claim 1 would be that of providing in general further olefins production processes possibly simpler than the prior art, regardless as to whether these further processes achieve or not the excellent yields of the Sasol process.

The Proprietor has rejected such argument by stating that the experimental data reported in the examples of patent-in-suit would instead prove false this common general knowledge, demonstrating that good yields in ethylene could even be obtained by steam cracking L-fractions *as such* (i.e. L-fractions rich in olefins). Hence, according to the Proprietor's line of argument, the technical problem solved over the whole ambit of the granted claim was rather that - also acknowledged by the Opposition Division (for the then pending Auxiliary Request 5) - of providing a simpler olefins production process whose yields in olefins were excellent, i.e. comparable to those of the process of document (1).

2.4 The Board finds unconvincing the reasoning of the Proprietor because the examples in the patent provide experimental data that (beside not being in accordance with granted claim 1) are based on a single L-fraction only containing about 10% by weight of olefins (see in the patent-in-suit the Table at page 6 entitled "*Straight Synthetic Naphtha*").

Instead, as noted by the Opponent (see above section VIII of the Facts and Submissions) and undisputed by the Proprietor, granted claim 1 does not limit in any way the amount of olefins possibly present in the L-fraction. In particular, the granted claim sets no limitation for the kind of FT-process taking place in step "(a)" and, thus, embraces the possibility of using, for instance, the same FT-process used in document (1), that results in L-fractions possibly containing up to 35% by weight olefins.

Thus, the experimental data provided with the examples in the patent-in-suit are insufficient at rendering credible that e.g. also the claimed processes in which the L-fractions contain **much more than 10% by weight of olefins** are nevertheless steam cracked to olefins without substantial coking and, thus, with excellent yields.

Hence, the Board concludes that the technical problem credibly solved over the whole range of granted claim 1 (and thus also by the processes of Figure 5 in which the generated L-fractions substantially more than 10% by weight olefins) can only be that identified by the Opponent, i.e. that of **providing in general further olefins production processes simpler than the prior**

**art, regardless as to whether these further processes produce yields in olefins comparable or worse than those produced in the prior art of departure.**

- 2.5 In the opinion of the Board, a person skilled in the art who is aiming at **further** olefins production processes that are simpler than that of document (1) but who does **not** attribute any particular relevance to the (normally implicit) aim of also retaining the convenience of the prior art of departure in terms of yields in the final product, would consider obvious to solve the posed problem by suppressing any of the steps of the prior art of departure that are not absolutely essential in order to obtain some olefins in the final product.

Such person would thus attempt to identify any such suppressible steps among all the process steps used in document (1) that are not essential for the production of olefins, including those that are explicitly or implicitly identified in this citation as essential for the achievement of low coking and high yields or of other advantages.

The Board notes that document (1) not only undisputedly teaches to such skilled person that the intermediate separate hydrocracking steps of both fractions are only needed for upgrading the naphtha - i.e. that the hydrocracking steps are only mandatory if one aims at the formation of an "*essentially paraffinic*" naphtha (see in document (1) e.g. the last paragraph at page 4) that allows to minimize the coking during steam cracking and, thus, to maximizing the yields in olefins - but even implicitly disclose at least the possibility

to by-pass the intermediate hydrocracking of the L-fraction, as apparent from the dotted lines in Figure 4.

The Board concludes that no inventive ingenuity is required to the skilled person for arbitrarily selecting the solution to the posed technical problem consisting in suppressing the intermediate hydrocracking of the L-fraction, i.e. a simplification of the prior art of departure that is not only obvious *per se* but even suggested by the dotted lines in Figure 4.

In solving the posed technical problem in such an obvious manner the skilled person arrives at variants of the processes of Figure 5 that are also manifestly encompassed by granted claim 1.

The Board concludes, therefore, that this claim embraces processes for the production of olefins that are obvious in view of document (1). Accordingly, the Main Request is found to violate Article 56 EPC (1973) and is refused.

*Auxiliary Requests 1 to 5*

3. The Proprietor has only relied on the arguments already discussed above in respect of the Main Request for maintaining also the non-obviousness of the subject-matter of the Auxiliary Requests 1 to 5 vis-à-vis document (1). In particular, it has not disputed the arguments of the Opponent that:

a) the most preferred embodiments of the claimed process, i.e. the olefins production processes of Figure 5, are manifestly also encompassed by each version of claim 1 according to the Auxiliary Requests 1, 2, 4 and 5

and

b) the additional requirement that the use of flash distillation for separating the L- and H-fraction, only present in claim 1 of the Auxiliary Request 3, amounts to the application of a conventional fractionation technique, to which the patent-in-suit attributes any particular (alleged or proved) advantage or surprising effect.

Accordingly, the Board finds that:

i) the subject-matter of claim 1 of each of the Auxiliary Requests 1, 2, 4 and 5 is obvious for substantially the same reasoning given above for the Main Request

and

ii) the subject-matter of claim 1 of the Auxiliary Request 3 is also obvious for substantially the same reasoning given above, combined with the further consideration that the common general knowledge renders obvious to carry out the fractionation of the FTHP-stream also of e.g. the Sasol process of departure by means of any of the conventional techniques manifestly apt for fractionating FTHP-streams and, thus, also by means of flash distillation.

Thus, it has become immediately apparent to the Board that none of the Auxiliary Requests complies with Article 56 EPC (1973).

In view of this conclusion, it has turned out unnecessary for the Board to decide on the admissibility of the Auxiliary Requests or to further investigate on their compliance with the other requirements of the EPC.

## **Order**

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

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

D. Magliano

P.-P. Bracke