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**Datasheet for the decision
of 24 November 2011**

Case Number: T 0181/09 - 3.3.10
Application Number: 98952665.2
Publication Number: 1017654
IPC: C07C 1/04, C10G 2/00, C01B 3/38
Language of the proceedings: EN

Title of invention:

Process for the production of liquid hydrocarbons

Applicant:

Shell Internationale Research Maatschappij B.V.

Opponent:

ExxonMobil Research and Engineering Company

Headword:

Liquid hydrocarbon production/SHELL

Relevant legal provisions:

EPC Art. 54, 56

Relevant legal provisions (EPC 1973):

-

Keyword:

"Main request: novelty (no)"

"Auxiliary requests 1 and 2: inventive step (no) - improvement
not shown - reformulation of problem - obvious alternative"

Decisions cited:

T 0020/81, T 0119/82

Catchword:

-



Case Number: T 0181/09 - 3.3.10

D E C I S I O N
of the Technical Board of Appeal 3.3.10
of 24 November 2011

Appellant II: Shell Internationale Research Maatschappij B.V.
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Representative: -

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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
17 November 2008 concerning maintenance of
European patent No. 1017654 in amended form.

Composition of the Board:

Chairman: P. Gryczka
Members: J. Mercey
F. Blumer

Summary of Facts and Submissions

I. The Appellant I (Opponent) and Appellant II (Patent proprietor) lodged appeals against the interlocutory decision of the Opposition Division which found that European patent No. 1 017 654 in amended form met the requirements of the EPC.

II. Notice of Opposition had been filed by Appellant I requesting revocation of the patent as granted in its entirety on the grounds of lack of novelty and inventive step (Article 100(a) EPC). *Inter alia* the following documents were submitted in opposition proceedings:

- (1) WO-A-97 300 11 and
- (5) "Improve syngas production using autothermal reforming", Hydrocarbon Processing, March 1994, pages 39 to 46.

III. The decision under appeal was based on the patent as granted and on the patent as amended according to the then pending first auxiliary request.

Claim 1 of the patent as granted read as follows:

"Process for producing normally liquid hydrocarbons from a hydrocarbonaceous feed which process comprises the following steps:

- (i) partial oxidation of the hydrocarbonaceous feed at elevated temperature and pressure using a pressurised oxygen containing gas to obtain synthesis gas;

(ii) quenching and/or cooling the synthesis gas obtained in step (i) with water obtained in step (iii) as described below;

(iii) catalytically converting at least part of the synthesis gas mixture obtained in step (ii) at elevated temperature and pressure into normally liquid hydrocarbons, normally gaseous hydrocarbons and water;

(iv) expanding and/or combusting at least part of the normally gaseous hydrocarbons to provide power for compressing and optionally separating the oxygen containing gas used in step (i), and

(v) optionally introducing the process water obtained in step (iii) after use as cooling medium in step (ii) in the expanding/combustion process of step (iv)."

Claim 1 of the then pending first auxiliary request differed from claim 1 as granted in that it was specified that the oxygen containing gas used in step (i) was "oxygen enriched air containing between 30 and 70 percent oxygen".

IV. The Opposition Division held that the subject-matter of claim 1 of the main request, namely the patent as granted, was not novel over the disclosure of document (1). It further held that the amendments made to the claims of the then pending first auxiliary request satisfied the requirements of Article 123(2) EPC, that the subject-matter thereof was novel over the disclosure of document (1), and, starting from this document as closest prior art, involved an inventive step.

- V. With letter dated 19 March 2009, Appellant II filed two sets of claims as a first and a second auxiliary request.

Claim 1 of the first auxiliary request differed from claim 1 as granted in that it was specified that the oxygen containing gas used in step (i) was oxygen enriched air.

The second auxiliary request corresponded to the first auxiliary request on which the decision under appeal was based.

- VI. Appellant I submitted that the Opposition Division had correctly held that the subject-matter of claim 1 of the main request was not novel over document (1).

It held that the subject-matter of claim 1 of the first auxiliary request was also not novel over document (1) for similar reasons, since the term "oxygen enriched air", without reference to the composition of the starting air (air composition depending on the altitude and other conditions at the collection point), to the process or to the scale of enrichment, did not provide any information about the air composition. This unclear term could thus not differentiate the process from that of document (1).

In the assessment of inventive step, Appellant I argued that the subject-matter of the second auxiliary request was not inventive over the teaching of document (1). It argued that there was no technical effect associated with the only possible distinguishing feature of the claimed invention, namely that the feedstock for the

partial oxidation step was oxygen enriched air containing 30 to 70% oxygen, such that the problem to be solved by the patent in suit could only be seen as the provision of an alternative process for producing normally liquid hydrocarbons from a hydrocarbonaceous feed. The use of oxygen enriched air containing 30 to 70% oxygen was arbitrary, document (5) already teaching that in feedstocks for autothermal reforming, oxygen-feedstream concentrations could vary from air to pure oxygen.

- VII. Appellant II submitted that the main request was maintained for procedural reasons, and provided no arguments as to why the decision of the first instance was incorrect regarding the lack of novelty of the subject-matter of this request.

Appellant II argued that document (1) was not novelty destroying for the subject-matter of either of the auxiliary requests, since it did not disclose oxygen enriched air as feedstock for the partial oxidation step, let alone oxygen enriched air containing 30 to 70% oxygen.

Appellant II submitted that the subject-matter of both auxiliary requests was inventive and that document (1) represented the closest prior art. In the light of document (1), the problem to be solved by the patent in suit was the provision of a process for producing normally liquid hydrocarbons from a hydrocarbonaceous feed which enabled a compact, relatively lightweight plant to be used, was more efficient, produced less carbon dioxide and had good power balance. None of the cited documents taught that such advantages could be

obtained by the use of oxygen enriched air, document (1) in fact teaching away from the use of purified oxygen as feedstock for the partial oxidation step.

- VIII. With letter 25 July 2011, Appellant II informed the Board that it did not intend to attend the oral proceedings scheduled for 24 November 2011.

With letter 14 October 2011, Appellant I informed the Board that it did not intend to attend the oral proceedings either.

- IX. Appellant II requested that the decision under appeal be set aside and the patent be maintained on the basis of the main request, namely the patent as granted, or, subsidiarily, on the basis of either of the first or second auxiliary requests, both filed with letter dated 19 March 2009.

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

- X. Oral proceedings were held on 24 November 2011 in the absence of both parties, who, after having been duly summoned, did not attend. At the end of the oral proceedings, the decision of the Board was announced.

Reasons for the Decision

1. The appeals are admissible.

Main request

1. *Novelty*
 - 1.1 The decision under appeal held that the subject-matter claimed is not novel (see point IV above) and Appellant I agreed with this finding. Appellant II submitted that the main request was maintained for procedural reasons and provided no arguments as to why the decision of the first instance was incorrect regarding the lack of novelty of the subject-matter of the main request.
 - 1.2 The Board sees no reason for departing from the considerations and findings of the first instance, thus endorsing the conclusion with respect to the lack of novelty in said decision.
 - 1.3 As a result, the main request is not allowable as the subject-matter of claim 1 thereof lacks novelty within the meaning of Articles 52(1) and 54(1) and (2) EPC.

First and second auxiliary requests

2. *Amendments (Article 123(2) and (3) EPC)*
 - 2.1 Claim 1 of the first auxiliary request is based on original claim 1, together with page 5, lines 32 to 33 of the application as filed. Claim 1 of the second auxiliary request is based on original claim 1,

together with page 5, lines 32 to 33 and page 6, line 1 of the application as filed.

- 2.2 For these reasons, the Board concludes that the subject-matter of claim 1 of both requests does not extend beyond the content of the application as filed, such that the requirements of Article 123(2) EPC are satisfied.
- 2.3 These amendments bring about a restriction of the scope of the claims as granted, and therefore of the protection conferred thereby, which is in keeping with the requirements of Article 123(3) EPC.

2. *Novelty*

Appellant I objected to the novelty of the subject-matter of claim 1 of the first auxiliary request on the basis of document (1). In view of the negative conclusion in respect of the claimed invention for lack of inventive step as set out in point 3 below, a decision of the Board on this issue is unnecessary.

3. *Inventive step*

- 3.1 Independent claim 1 of the second auxiliary request is directed to an embodiment of the first auxiliary request, namely to the embodiment wherein the oxygen-enriched air contains 30 to 70% oxygen. In case this embodiment according to the second auxiliary request lacked inventive step, such a line of requests would mandatorily result in the conclusion that the subject-matter of the first auxiliary request, which embraces this obvious embodiment, cannot involve an inventive

step either. For this reason, it is appropriate that the subject-matter of claim 1 of the second auxiliary request is examined first for inventiveness.

3.2 The patent in suit is directed to a process comprising partial oxidation of a hydrocarbonaceous feed using a pressurised oxygen containing gas (step (i)) and catalytically converting at least part of the synthesis gas so obtained into normally liquid hydrocarbons (step (iii)).

3.2.1 Document (1) discloses a similar process for converting a lighter hydrocarbon to heavier hydrocarbons comprising a) reacting an air feed and a lighter hydrocarbon feed gas to produce a synthesis gas and b) reacting said synthesis gas in the presence of a hydrocarbon synthesis catalyst to produce heavier hydrocarbons, a tail gas and water (see claim 1). These steps a) and b) of document (1), which are also called autothermal reforming and Fischer-Tropsch processes, respectively, correspond to steps (i) and (iii) of claim 1 of the patent in suit. It is an object of the invention disclosed in document (1) to provide a process having reduced power requirements and capital equipment costs, which emits reduced levels of contaminants to the environment (see page 3, lines 25 to 31), which object is similar to that of the invention of the patent in suit (see paragraph [0007]).

3.2.2 Thus, the Board considers, in agreement with both Appellants and the Opposition Division, that in the present case the process of document (1) represents the closest state of the art and, hence, takes it as the starting point when assessing inventive step.

3.2.3 More particularly, document (1) (see also Figure 1) discloses that steps a) and b) are carried out at elevated temperature and pressure, the synthesis gas production step (a) being carried out in an autothermal reformer 12 (ATR) by partial oxidation of the feed at a temperature of 900 to 1050°C and a pressure of 900 to 1100 kPa (see page 9, line 7 to page 10, line 2) and the catalytic conversion (b) being carried out in a Fischer-Tropsch reactor 14 at a temperature of 200 to 235°C and a pressure of 1600 to 2800 kPa (see page 11, lines 7 to 24). Document (1) further discloses that the tail gas from step b) is combusted to produce a combustion gas from which mechanical power is generated with which the air feed is compressed (see steps c), d) and e) of claim 1). These steps c), d) and (e) of document (1) correspond to step (iv) of claim 1 of the patent in suit. Water obtained in step (b) is separated in separators 72 and 76 (see page 13, lines 9 to 12), channelled to pump 94 and from there *via* line 96 to the steam conversion heat exchanger 54, using the high temperature synthesis gas from the ATR outlet line 50 as the heat transfer medium (see page 13, line 26 to page 14, line 9). The synthesis gas is hereby quenched (see page 10, lines 12 to 15), corresponding to step (ii) of claim 1 of the patent in suit.

3.3 In view of this state of the art, Appellant II defined the problem underlying the patent in suit as the provision of a process for producing normally liquid hydrocarbons from a hydrocarbonaceous feed which is more efficient, produces less carbon dioxide, has good power balance and enables a compact, relatively lightweight plant to be used (see page 3, lines 1 to 12

of Appellant II's letter dated 19 March 2009 and paragraph [0007] of the specification of the patent in suit).

- 3.4 As the solution to this problem, the patent in suit proposes the process according to claim 1 of the second auxiliary request, characterised by the use in step (i) of oxygen enriched air containing 30 to 70% oxygen.
- 3.5 There are, however, no examples in the specification of the patent in suit of a process according to the invention, let alone examples comparing the claimed process with that of document (1). Appellant II argued (see page 3, lines 1 to 12 of letter dated 19 March 2009) that the advantages were nevertheless plausible, since the use of oxygen enriched air resulted in a lower amount of nitrogen and a larger amount of carbon monoxide/hydrogen in the synthesis gas mixture produced by the autothermal reforming, said synthesis gas mixture being fed to the Fischer-Tropsch process, which was thereby more efficient. The advantage gained by the resulting reduction of the size of the Fischer-Tropsch plant was larger than the disadvantage of the additional air separation unit.

However, the air separation unit required for the production of oxygen enriched air (see specification of patent in suit, column 4, lines 2 to 5) has in itself considerable capital costs and substantial power requirements (see document (1), page 2, lines 8 to 10). In the absence of any evidence that the benefits of using oxygen enriched air in the partial oxidation step leading to a reduction of the size of the Fischer-Tropsch plant outweigh the disadvantages of having to

additionally employ an air separation unit, the Board holds that the alleged improvements to the process of increased efficiency and good power balance, which enables the use of a compact, relatively lightweight plant, have not been shown. Furthermore, Appellant II provided no arguments as to why the claimed process should produce less carbon dioxide than the process of document (1).

3.6 According to the jurisprudence of the Boards of Appeal, alleged but unsupported advantages cannot be taken into consideration in respect of the determination of the problem underlying the invention (see e.g. decision T 20/81, OJ EPO 1982, 217, point 3, last paragraph of the reasons). Since in the present case the alleged improvements lack the required experimental support, the technical problem as defined in point 3.3 above needs reformulation in a less ambitious way.

3.7 Consequently, the objective problem underlying the patent in suit in the light of the teaching of document (1) is merely the provision of an alternative process for producing normally liquid hydrocarbons from a hydrocarbonaceous feed.

3.8 Finally, it remains to be decided whether or not the proposed solution to the objective problem underlying the patent in suit is obvious in view of the state of the art.

3.8.1 It is known from document (5), which is entitled "Improve syngas production using autothermal reforming", that feedstocks for ATRs are hydrocarbons, oxygen and steam, whereby the oxygen-feedstreams can vary from air

to pure oxygen (see page 39, right hand column, first two sentences of paragraph beginning "**Feedstocks**").

3.8.2 Document (5) thus gives a clear incentive on how to solve the problem underlying the patent in suit of providing merely an alternative process for producing normally liquid hydrocarbons from a hydrocarbonaceous feed (cf. point 3.7 above), namely by using oxygen enriched air as a feedstock in the first partial oxidation step, namely the autothermal reforming step. The particular oxygen content thereof of 30 to 70%, falls within the range of "air to pure oxygen" taught as a feedstock in document (5), and is neither critical nor a purposive choice for solving the objective problem underlying the patent in suit, since no unexpected effect has been shown to be associated with this particular range. The act of picking out at random a range for the oxygen content of the air used as feedstock for the partial oxidation is within the routine activity of the skilled person faced with the mere problem of providing an alternative process. Thus by combining the teachings of documents (1) and (5), the person skilled in the art would arrive at the solution proposed by the patent in suit without exercising an inventive step.

3.9 For the following reasons the Board cannot accept Appellant II's arguments designed for supporting inventive step.

3.9.1 Appellant II submitted that document (1) taught to use pure air as feedstock for the partial oxidation, since said document (see page 2, lines 6 to 12) taught away from using an oxygen separation plant, pointing to the

disadvantages, namely higher power requirements and capital costs associated therewith.

However, if the problem is merely the provision of an alternative process, the skilled person would modify the process according to document (1) in any way that he could, for example, by employing oxygen enriched air in the autothermal reforming step of the process of document (1), as suggested by document (5), even if said modification potentially led to a process that had higher power requirements and capital costs, foreseeable disadvantageous modifications of the closest prior art also not involving an inventive step (see T 119/82, OJ EPO 1984, 217, Headnote II).

- 3.9.2 All of Appellant II's remaining arguments in support of inventive step are based on the premise that the process of the patent in suit was an improvement with respect to that of document (1), said arguments being redundant, since no such improvement has been shown (see point 3.5 above).

- 3.10 For these reasons, the subject-matter of claim 1 of the second auxiliary request is not allowable for lack of inventive step pursuant to Article 56 EPC.

- 3.11 In these circumstances, since the process of claim 1 of the second auxiliary request is encompassed by claim 1 of the first auxiliary request (see point 3.1 above), the first auxiliary request shares the fate of the second auxiliary request in that it too is not allowable for lack of inventive step pursuant to Article 56 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:

C. Rodríguez Rodríguez

P. Gryczka