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D E C I S I O N
of 22 May 2001

Case Number: T 0218/98 - 3.3.1

Application Number: 91200963.6

Publication Number: 0454256

IPC: C07C 1/04

Language of the proceedings: EN

Title of invention:

Process for the preparation of an olefins-containing mixture
of hydrocarbons

Patentee:

SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.

Opponent:

ExxonMobil Research and Engineering Company

Headword:

Olefins/SHELL

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step (no) - alleged unexpected effect not shown -
obvious combination of two process steps"

Decisions cited:

-

Catchword:

-



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Boards of Appeal

Chambres de recours

Case Number: T 0218/98 - 3.3.1

D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 22 May 2001

Appellant: SHELL INTERNATIONALE RESEARCH
(Proprietor of the patent) MAATSCHAPPIJ B.V.
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Representative: -

Respondent: ExxonMobil Research and Engineering Company
(Opponent) P.O. Box
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New Jersey 07932 (US)

Representative: Hornby, John Richard
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 15 January 1998
revoking European patent No. 0 454 256 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: A. J. Nuss
Members: P. P. Bracke
J. P. B. Seitz

Summary of Facts and Submissions

I. The appeal lies from the Opposition Division's decision to revoke European patent No. 0 454 256 due to lack of inventive step over the teachings of documents

(1) EP-A-0 347 003 and

(2) US-A-4 159 995.

II. The Appellant filed with letter of 24 March 1998 a set of 17 claims, with the only independent claim reading:

"1. Process for the preparation of an olefins-containing mixture of hydrocarbons, which process comprises converting a gas mixture comprising carbon monoxide and hydrogen into a mixture of hydrocarbons by contacting it at elevated temperature and pressure with a catalyst in a first step, wherein the catalyst used in the first step comprises 3-80 pbw of Co and 0.1-100 pbw of at least one other metal chosen from the group formed by Zr, Ti, Re, Ru and Cr per 100 pbw of silica, alumina, silica-alumina or titania carrier, and contacting at least a fraction of the mixture of hydrocarbons obtained with a zeolitic catalyst comprising a zeolite with a pore diameter of 0.3 to 0.7 nm at a temperature above 480°C during less than 10 seconds in a second step."

III. Oral proceedings before the Board took place on 22 May 2001.

IV. The Appellant submitted that document (1) represented the closest state of the art, that starting from document (1) the problem to be solved consisted in

improving the yield of olefins and that this was achieved by using the effluent of a Fischer-Tropsch process employing a cobalt-based catalyst as feedstock in the cracking reaction. Since, according to document (1), a higher yield of olefins is obtained when aromatic and naphthenic feedstock instead of n-paraffinic feedstock are used in the cracking reaction, a skilled person could not derive therefrom that by using the reaction product of a Fischer-Tropsch process the yield of olefins could be increased.

- IV. The Respondent argued that the claimed process consists of two steps which were well-known at the priority date and that a skilled person would have known from document

(4) EP-A-0 127 220

that a Fischer-Tropsch process using a cobalt-based catalyst produced n-paraffins and, consequently, that effluents thereof would be suitable feedstock for the olefin-producing process disclosed in document (1). Moreover, the Respondents contested that it could be deduced from document (1) that a higher yield of olefins is obtained when aromatic and naphthenic feedstock instead of n-paraffinic feedstock are used as starting materials in the cracking reaction.

- V. The Appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the new set of 17 claims filed with letter of 24 March 1998.

The Respondent requested that the appeal be dismissed.

VI. At the end of the oral proceedings the decision of the Board was given orally.

Reasons for the Decision

1. The appeal is admissible.
2. The only point at issue in the present case is whether the claimed process meets the requirement of inventive step.
3. *Inventive step*
- 3.1 In the contested decision the Opposition Division considered document (2) to represent the closest state of the art.

In selecting the closest prior art, however, the first consideration is that it must be directed to the same purpose as the claimed subject-matter. Otherwise, the skilled person could hardly ever be lead to the claimed invention. Since in the patent in suit a process for the conversion of hydrocarbonaceous feedstock achieving a rather high yield of olefins is claimed, document (2), which concerns the conversion of synthesis gas to highly aromatic or highly olefinic **gasoline**, is not related to the same purpose as the claimed invention. Document (1), however, which is the only cited document concerned with the conversion of a feedstock into a hydrocarbonaceous product with high yield of olefins, is more suitable as representing the closest prior art and, consequently, an appropriate starting point for assessing inventive step.

3.2 Document (1) is related to a process for the conversion of a hydrocarbonaceous feedstock by contacting the feedstock with a zeolitic catalyst comprising a zeolite with a pore diameter of 0.3 to 0.7 nm at a temperature above 500°C during less than 10 seconds (page 2, lines 14 to 17) and it is taught in example 1 that n-paraffins are preferentially cracked and yield gaseous products which comprise a significant amount of olefins (see page 4, lines 29 and 30).

3.3 The Appellant submitted that, in view of document (1), the problem underlying the patent in suit was the provision of a process wherein the yield of olefins is increased and wherein simultaneously the yield of methane is reduced.

The patent in suit claims to solve this problem by the two-step process according to Claim 1.

3.4 The first point to be considered in assessing inventive step is whether it has been convincingly shown that by the two-step process defined in present Claim 1 the problems underlying the patent in suit have effectively been solved.

In an attempt to show that the above mentioned problems are effectively solved by the claimed process, the Appellant referred to the data presented in Tables 1 and 2 of document (1) and to the data presented in Table 1 of the patent in suit.

According to the jurisprudence of the Boards of Appeal of the EPO, the nature of a comparison with the closest state of the art must be such that the effect obtained is convincingly shown to have its origin in the

distinguishing feature of the invention (see T 197/86 OJ EPO, 1989, 371). As the second step in the presently claimed process is identical with the process described in document (1), the distinguishing feature between the process known from document (1) and the claimed process can only be the nature of the feedstock to the second step of the claimed process.

Table 1 in the patent in suit summarises the amounts of products obtained in the presently claimed process, wherein in the second step the reactor temperature is 580°C, 670°C or 700°C, the catalyst/oil ratio is 86, 69 or 65 respectively, the contact time is 1.4 seconds and the pressure is 2 bar, whereas Table 1 of document (1) summarises the amounts of product obtained by conducting the second step according to the present invention at 400°C, 500°C or 550°C with a catalyst/oil ratio of 8.0, 5.8, 30.1 or 34.9 respectively, at a contact time of 2 seconds and atmospheric pressure and Table 2 of document (1) summarises the amounts of products obtained by conducting the second step of the present invention at 580°C, a catalyst/oil ratio of 112 and a contact time of 1.9 at atmospheric pressure.

The data in Table 1 of the patent in suit and in Tables 1 and 2 of document (1) thus result from experiments, which not only differ in the nature of the feedstock to the second step of the claimed process, but also in the reactor temperature, the catalyst/oil ratio, the contact time and the pressure, thereby precluding any reasonable comparison. Therefore, the data referred to by the Appellant are not suitable for showing an improved yield due to the nature of the feedstock to the second step of the claimed process.

3.5 Consequently, in view of the teaching of document (1) the problem underlying the invention can only be seen in providing a further process for the conversion of hydrocarbonaceous feedstock with comparable yields of olefins and methane.

That this problem is solved by the process according to Claim 1 was never put into question, neither by the Respondent nor by the Board.

3.6 Therefore, it remains to be decided whether a skilled person, when trying to solve the above stated problem would have been lead by the cited state of the art to a process, such as the claimed one, with comparable yields of olefins and methane.

The Appellant was of the opinion that a skilled person would not have expected so, since from a comparison of example 1.4 and example 2 of document (1) it follows that starting from a feedstock containing more aromatic and naphthenic hydrocarbons a higher yield of olefins was obtained than when starting from a feedstock containing more paraffins. Consequently, a skilled person looking for a process for preparing hydrocarbonaceous mixtures containing high amounts of lower olefins would not have taken a paraffin rich effluent of a Fischer Tropsch reaction as feedstock in the cracking reaction into consideration.

According to example 1.4 of document (1), however, the cracking is conducted at 550°C, with a catalyst/oil ratio of 34.9 and a contact time of 2.0 seconds, whereas the cracking according to example 2 of document (1) is conducted at 580°C with a catalyst/oil ratio of 112 and a contact time of 1.9 seconds. As both

reactions thus not only differ by the nature of the feedstock but also by the cracking temperature, the catalyst/oil ratio and the reaction time, these are not suitable for concluding what kind of feedstock would be more suitable in the second step according to Claim 1 (see point 3.4). Therefore, the data presented in examples 1.4 and 2 of document (1) would not discourage a skilled person from taking the teaching of document (1) into consideration.

A skilled person would thus not have any reason to call the teaching under Table 1 of document (1) into question, concluding that from the results presented in that table it is apparent that n-paraffins are preferentially cracked and yield gaseous products which comprise a significant amount of olefins.

As it was specifically known from document (4) that in the conversion of a gas mixture comprising carbon monoxide and hydrogen into a mixture of hydrocarbons a substantially paraffinic product is obtained when the catalyst comprises 3-60 pbw of Co and 0.1-100 pbw of at least one other metal chosen from the group formed by Zr, Ti and Cr per 100 pbw of silica, alumina, silica-alumina or titania carrier (page 2, lines 1 to 6 and 16 to 22, and page 11, lines 4 to 8), a skilled person would have expected that the effluent of a Fischer Tropsch reaction using catalysts as described in document (4) would be a suitable feedstock in a cracking reaction as described in document (1) yielding comparable yields of olefins and methane.

Therefore, the Board comes to the conclusion that, in order to solve the problem stated in point 3.5, it was obvious for a skilled person to arrive at the process

according to Claim 1 by merely combining the teachings of documents (1) and (4) and, thus, that it does not involve an inventive step in the sense of Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

N. Maslin

A. Nuss