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**D E C I S I O N**  
**of 12 April 2006**

**Case Number:** T 0180/03 - 3.3.06

**Application Number:** 96924452.4

**Publication Number:** 0842243

**IPC:** C10G 55/02

**Language of the proceedings:** EN

**Title of invention:**

Integrated residua upgrading and fluid catalytic cracking

**Applicant:**

ExxonMobil Research and Engineering Company

**Opponent:**

-

**Headword:**

Upgrading/EXXON

**Relevant legal provisions:**

EPC Art. 123(2), 84, 56

**Keyword:**

"Decision on the state of the file"  
"Inventive step (no) - all requests"

**Decisions cited:**

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**Catchword:**

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Case Number: T 0180/03 - 3.3.06

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.06  
of 12 April 2006

**Appellant:** ExxonMobil Research and Engineering Company  
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**Representative:** Dew, Melvyn John  
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**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 11 September 2002  
refusing European application No. 96924452.4  
pursuant to Article 97(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 Examining Division to refuse the European patent application No. 96 924 452.4 entitled "Integrated Residua Upgrading and Fluid Catalytic Cracking". The decision under appeal was based on an amended set of 10 claims filed under cover of a letter dated 4 December 2001, with independent Claim 1 reading:

"1. A two stage process for converting a residua feedstock to lower boiling products wherein the first stage is an upgrading stage wherein the Conradson Carbon content and metals content of a residua feedstock is lowered and the second stage is a catalytic cracking stage, wherein

the upgrading is performed in a short vapor contact time thermal process unit comprised of:

(i) a heating zone wherein solids containing carbonaceous deposits are received from a stripping zone and heated in the presence of an oxidising gas;

(ii) a short vapor contact time reaction zone containing a horizontal moving bed of fluidized hot solids recycled from the heating zone, which reaction zone is operated at a temperature from about 450°C to about 700°C and operated under conditions such that the solids residence time and the vapor residence time are independently controlled, which vapor residence time is less than about 2 seconds, and which solids residence time is in a range of from about 5 to about 60 seconds; and

(iii) a stripping zone through which solids having carbonaceous deposits thereon are passed from the reaction zone and wherein lower boiling additional hydrocarbon and volatiles are stripped with a stripping gas;

which process comprises

(a) feeding the residua feedstock to the short vapor contact time reaction zone wherein it contacts fluidized hot solids, thereby depositing high Conradson Carbon components and metal-containing components thereon, and producing a vaporized product stream;

(b) separating the vaporized product stream from the fluidized solids;

(c) feeding said vaporized product stream to a fluid catalytic cracking reactor where they are catalytically converted to lower boiling products;

(d) passing the solids to said stripping zone where they are contacted with a stripping gas, thereby removing volatile components therefrom;

(e) optionally passing a volatile components stream obtained from step (d) to the catalytic cracker;

(f) passing the stripped solids to a heating zone where they are heated to a temperature effective to maintain the heat requirements of the short vapor contact time reaction zone; and

(g) recycling hot solids from the heating zone to the reaction zone where they are contacted with the feedstock."

Dependent Claims 2 to 10 refer to preferred embodiments of the process of Claim 1.

II. In its decision, the Examining Division held that the claimed subject-matter was novel but not inventive in view of the disclosure of

D2 US-A-4 263 128 or

D3 US-A-4 243 514

as the closest prior art when combined with the disclosure of

D1 Paper presented at the 5th UNITAR Conference in Edmonton, Canada, on 9th August 1988, H. Weiss et al., "Coking of Oil Sands, Asphaltenes and Residual Oils in the LR-Process", pages 1 to 12.

In particular, it was held that D2 and D3 were concerned with the same technical problem as the application in suit and the technical problem solved by the claimed process, thus, consisted in the provision of an alternative method. It was held that the claimed subject-matter differed from the processes disclosed in D2 or D3 only in a different performance of the upgrading step. The claimed upgrading step was, however known from D1, except for the specific residence time of the solids (5 to 60 seconds in the application in suit) which was merely referred to in D1 as being in

the order of a few seconds. Since, however, the Applicant has not provided evidence concerning the criticality of the claimed residence time with respect to a particular effect, it was held to be obvious for a skilled person to replace the upgrading stage in D2 or D3 by that of D1 in order to provide an alternative and to specify the minimum residence time as amounting to 5 seconds.

III. With its statement of grounds of appeal filed under cover of a letter dated 27 January 2003, the Applicant (hereinafter Appellant) filed

D4 H. Weiss et al., "Coking of Residue Oils by the LR-Process", in Erdöl und Kohle - Erdgas - Petrochemie vereinigt mit Brennstoff-Chemie, vol. 42, no. 6, June 1989, pages 235 to 237

in relation to the disclosure of D1,

D5 EP-B-1 009 785 and

amended claims in two auxiliary requests.

Claim 1 of the first auxiliary request reads:

"1. A two stage process for converting residua feedstock to lower boiling products wherein the first stage comprises an upgrading stage wherein the Conradson Carbon content and metals content of a residuum feedstock is lowered and the second stage comprises a catalytic cracking stage, wherein product from the first stage is catalytically cracked, wherein in the first stage, feedstock is contacted with hot

solid particles in a horizontal moving bed of fluidized hot solids in a reaction zone whereby Conradson carbon components and metal-containing components deposit on the solids and a vapor product is produced, separately recovering vapor product and solids from the reaction zone, passing some or all of the vapor product to a catalytic cracking reactor wherein it is catalytically converted to lower boiling products, heating solids in a heating zone to a temperature which is effective to maintain the operating temperature of the reaction zone, and circulating solids from the heating zone to the reaction zone for contact therein with fresh feedstock, wherein the feedstock is contacted in the reaction zone with hot solids which are at a temperature in the range of from 590 to 760 deg C, the reaction zone temperature is in the range of from 450 to 700 deg C, the solids residence time in the reaction zone is in the range of from 5 to 60 s, the vapor residence time in the reaction zone is less than 2 s, and solids pass from the reaction zone to a stripping zone where they are contacted with a stripping gas to remove volatile components therefrom, and stripped solids pass to the said heating zone."

Claim 1 of the second auxiliary request differs therefrom in that the term "wherein in the first stage," has been replaced by "and wherein, in the first stage," and in that the term "the average size of the solid particles is in the range of from 40 to 2000 micrometer," has been inserted between "700 deg C," and "the solids residence time in the reaction zone is ...".

IV. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of Claims 1 to 10 according to the main request submitted under cover of the letter dated 4 December 2001 or, alternatively on the basis of Claims 1 to 11 according to a first and second auxiliary request filed under cover of a letter dated 27 January 2003.

Further, the Appellant requested oral proceedings pursuant to Article 116 EPC, in case the Board should not be minded to grant a patent on the basis of the written proceedings.

V. The Appellant, in its statement of grounds of appeal provided arguments in support of its opinion that the contested decision was incorrect.

In particular, the Appellant filed an example to show that the claimed upgrading process provided valuable products, in particular free flowing heat carrier coke at residence times in the CMR (coking mixing reactor) of about 25 seconds for the solids and less than 2 seconds for the vapour and submitted the following arguments:

- It was apparent from D4 that the upgrading stage (LR Coking Process) of D1 was operated at extremely short coking times of less than one second to initiate coking reactions, and to continue and complete the coking process in the surge bin (SB).
- The claimed first process stage differed from the upgrading stage disclosed in D1 in



the solids residence time in the CMR of 5 to 60 seconds which was sufficient to complete all the reactions which occur in D1 in the CMR and SB; and

a stripping stage where strippable volatile materials were stripped from the solids to result in solids passing to the heating zone which were substantially free of strippable hydrocarbon material.

- These differences resulted in the following advantages:
  - (a) fully pyrolysed and non-tarry coke deposits on the carrier;
  - (b) solids passing from the CMR to the stripping zone and residing therein were free-flowing and not agglomerating; and
  - (c) the amount of upgraded hydrocarbon material could be increased by recovery of the stripped materials.
  
- In contrast, the LR-coker of D1 did not contain a stripping zone and even if the SB would be employed for stripping, this would be inefficient since the solids discharged from the CMR agglomerated due to incomplete coking.
  
- Since a patent has been granted for D5 having a priority date almost two years later than that of the application in suit, and relating to a process

which is substantially the same as the first stage of the claimed process, a patent should also be granted for the present application.

VI. In a communication dated 26 January 2006 and annexed to the summons for oral proceedings held on 12 April 2006, the Board drew attention to problems under Articles 123(2), 84 and 56 EPC.

Concerning Article 56 EPC, the Board gave the following reasons leading to its preliminary and non-binding opinion that the subject-matter claimed in the main request and auxiliary requests was not based on an inventive step:

"5.3 For the assessment of inventive step, the Boards usually apply the so-called problem-solution approach which consists in

- a) identifying the most appropriate starting point in the prior art (closest prior art) which is normally a document conceived for the same or a similar purpose as the application in suit;
- b) defining the technical problem to be solved in relation to the said starting point taking into account the technical results or effects actually achieved by the claimed invention when compared with this starting point; and
- c) examining whether or not a skilled person, having regard to the state of the art, would have suggested the claimed features for

obtaining the results achieved (see Case Law of the Boards of Appeal of the European Patent Office I.D.2).

- 5.3.1 The Appellant apparently acknowledges that D2 and D3 are conceived for the same purpose as the application in suit, namely conversion of residual feedstock into valuable lower boiling products, in particular transportation fuels. According to D2 and D3, this object is obtained by a two step process wherein the first step is a fluidized bed coking step wherein the crude is decarbonised and demetallised (upgraded) and the second step is a catalytic cracking step, especially in an FCC unit (see in D2 and D3, figure and corresponding description). In addition, it appears that the application in suit (paragraph bridging pages 3 and 4) also starts from such a prior art.

Therefore, the state of the art disclosed in D2 or D3 seems to qualify better as a starting point for the assessment of inventive step than D1 or D4 which do not consider a cracking step.

- 5.3.2 It is stated in the application in suit (page 4, first full paragraph) that in relation to the prior art, there was still need for a more efficient and cost effective upgrading step and for increased amounts of liquid products and decreased amounts of gas and/or coke during upgrading.

However, it appears that no evidence is on file showing that those objectives are actually

achieved by the claimed process versus that of D2 and D3.

The Board, therefore, agrees with the Examining Division that the technical problem solved in view of D2 or D3 boils down to the provision of an alternative process.

- 5.3.3 Further, it appears that the Appellant also acknowledges that the difference between the claimed subject-matter and the processes of D2 and D3 consists in the replacement of the fluidized bed coking by another upgrading step.

Hence, the solution of the above technical problem consists in said replacement.

- 5.3.4 Another method of upgrading is, however, known from D1 (or D4). Therefore, a skilled person would have considered combining the upgrading of D1 with the two step process of D2 or D3 in order to provide an alternative method.

On the other hand, the Appellant's submission appear to consist essentially in the argument that a combination of the disclosure of D1 or D4 with that of D2 or D3 would not result in the claimed process since the upgrading of D1 and D4 differed from the claimed one in a different solids residence time and in the stripping stage which was missing in D1 and D4 and that these differences would provide hitherto non-achieved advantages.

5.3.5 Concerning the residence time, however, the Board notes that the reference in D4 to "extremely short coking time of less than a second" (page 236, right-hand column, lines 5 to 6), if interpreted in the sense of solids residence time, is at best a contradiction to the previous statement in D4 (page 235, right-hand column, line 12) and to the disclosure of D1 (page 3, last paragraph) that this residence time should be in the order of a "few seconds". Interpreting on this basis the term "few" as "less than one" as suggested by the Appellant appears inappropriate to the Board.

In the Board's opinion, the term "a few seconds" indicates a period of time lasting several seconds.

Concerning the stripping stage, the Board, at present shares the Examining Division's opinion that a stripping of strippable material in the solids should occur in the lift pipe of D1 (Figure 2) due to the introduction of hot air from the bottom of the pipe.

Therefore, it appears that the Examining Division was correct in finding that upgrading in accordance with the claimed subject-matter differs from that of D1 (or D4) only in the missing disclosure that a few seconds should be at least five seconds.

5.3.6 However, the Appellant has not shown that this lower limit of the residence time of the solids

in the CMR is of any criticality to the performance of the process. On the contrary, it appears that required residence time is dependent on the particular circumstances, as is shown in the only example given by the Appellant (statement of grounds of appeal, page 4), where the solids residence time is about 25 seconds when a CMC is loaded with particular amounts of specific vacuum resid and carrier coke at particular temperatures.

Therefore, the specification of the residence time is considered as one of those options which a skilled person would adapt in accordance with the particular circumstances of the process.

For sake of completeness, the Board wishes to note that it seems to be usual in the art to use a stripping step in combination with the upgrading for further recovery of volatiles absorbed on the solids, if the yield of the volatiles is to be increased (D2, column 6, lines 31 to 57; D3, column 5, line 47 to column 6, line 5).

5.3.7 For these reasons, the subject-matter claimed in accordance with the main request does not, at present, appear to be based on an inventive step (Article 56 EPC).

5.3.8 Concerning the auxiliary requests and provided that the amendments made therein are admissible (see 3 above), it is not apparent why the above objections should be overcome by the introduction

of the particular temperature conditions and solids particle size. It rather appears that those features also belong to those variables which a skilled person adapts in accordance with circumstances.

6. The Appellant's submissions in respect of the examining and granting procedure leading to issuance of European patent D5 appear prima facie irrelevant to the assessment of inventive step in the present case."

The Appellant was finally advised that any reply of the Appellant to the Board's communication should be filed within two months of its deemed date of receipt.

- VII. In reply, the Appellant informed the Board by letter dated 17 March 2006 that it would not attend the oral proceedings.

- VIII. At the end of the oral proceedings held in the absence of the Appellant, the Board gave its decision.

### **Reasons for the Decision**

1. The Board interprets the Appellant's reply of 17 March 2006 as a request for a decision "according to the state of the file".
2. In the communication dated 26 January 2006, the Board raised doubts as to whether the claims on file met the requirements of Articles 123(2) and 84 EPC and, in

particular, objections under Article 56 EPC by explaining, under application of the so-called problem solution-approach, the reasons why in its non-binding and provisional opinion the subject-matter claimed in all requests was not based on an inventive step as required by Article 56 EPC.

3. The Appellant did not reply in substance to these objections or attend the requested oral proceedings which were scheduled for and held on 12 March 2006. Since there was no attempt by the Appellant to refute or overcome the objections raised in the above communication, the Board has no reasons to depart from its preliminary opinion expressed in said communication.
  
4. Having regard to the above, the Board concludes that - for the reasons set out in the communication (point IV above) - the subject-matter of Claim 1 according to any of the Appellant's requests is not based on an inventive step as required by Article 52(1) EPC in combination with Article 56 EPC.



**Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:

G. Rauh

P. Krasa