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Datasheet for the decision
of 28 August 2008

Case Number: T 0354/06 - 3.3.10

Application Number: 97951774.5

Publication Number: 0950042

IPC: C07C 4/04

Language of the proceedings: EN

Title of invention:
Two-stage process for obtaining significant olefin yields from residual feedstocks

Patentee:
ExxonMobil Research and Engineering Company

Opponent:
mg technologies ag

Headword:
Olefin production from residual feedstock/EXXONMOBIL

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step: all requests (no) - purported improvement not shown - reformulation of problem - obvious alternative"

Decisions cited:
T 0020/81

Catchword:
-

Case Number: T 0354/06 - 3.3.10

DECISION
of the Technical Board of Appeal 3.3.10
of 28 August 2008

Appellant:
(Opponent)

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Decision under appeal:

Decision of the Opposition Division of the European Patent Office posted 23 January 2006 rejecting the opposition filed against European patent No. 0950042 pursuant to Article 102(2) EPC.

Composition of the Board:

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

Summary of Facts and Submissions

I. The Appellant (Opponent) lodged an appeal on 2 March 2006 against the decision of the Opposition Division dated 23 January 2006 rejecting the opposition against European patent No. 950 042 which was granted on the basis of ten claims, and on 21 April 2006 filed a written statement setting out the grounds of appeal. Claim 1 of the granted patent read as follows:

"A two stage process for producing olefins from a residual feedstock, which process comprises converting the feedstock in two stages, wherein:

(A) a first stage is comprised of:
(i) a first stage heating zone wherein solids containing carbonaceous deposits are received from a stripping zone and heated in the presence of an oxidizing gas;
(ii) a first stage reaction zone containing a horizontal moving bed of fluidized hot solids, which reaction zone is operated at a temperature in a range of from 500°C to 600°C and under conditions such that the solids residence time and the vapor residence time are independently controlled, which vapor residence time is less than 2 seconds, and which solids residence time is in a range from 5 to 60 seconds; and
(iii) a stripping zone through which solids having carbonaceous deposits thereon are received from the reaction zone and wherein lower boiling hydrocarbons and volatiles are recovered with a stripping gas; and
(B) a second stage is comprised of:

(i) a second stage heating zone wherein solids containing carbonaceous deposits are received from a second stage reaction zone;
(ii) the said second stage reaction zone operated at a temperature in the range of from 700°C to 1100°C and at vapor residence times of less than 1 second;
which process comprises:
(a) passing said residual feedstock to said first stage reaction zone where it is contacted with fluidized hot solids thereby resulting in the production of a vaporized fraction and a solids fraction having (high) Conradson Carbon components and metal-containing components deposited thereon;
(b) separating vaporized fraction from solids fraction;
(c) passing the solids fraction to the said stripping zone wherein low boiling hydrocarbons and volatile material are stripped therefrom by contacting them with a stripping gas;
(d) passing stripped solids to said first stage heating zone where they are heated in an oxidizing environment to an effective temperature that will maintain the operating temperature of said first stage reaction zone when the solids are passed to the said first stage reaction zone;
(e) separating flue gas from the solids of said first stage heating zone;
(f) circulating hot solids from said first stage heating zone to said first stage reaction zone where they are contacted with more residual feedstock;
(g) passing vaporized fraction of said first stage reaction zone to said second stage reaction zone where it is contacted with hot solids at a temperature in a range of from 700°C to 1100°C and at vapor residence times of less than l second;

(h) separating a vapor fraction from a solids fraction;
(i) passing said solids fraction to a second stage heating zone, where the fraction is heated to an effective temperature that will combust carbonaceous deposits thereon and maintain the operating temperature of said second stage reaction zone when said solids are passed to said second stage reaction zone; and
(j) circulating hot solids from said second stage heating zone to said second stage reaction zone where they are contacted with the vapor product from said first stage reaction zone."

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

(1) Coking of oil sands, asphaltenes and residual oils in the LR-process, H. Weiss, J. Schmalfeld and R.B. Solari, the 5th Unitar Conference, 9 August 1988, pages 1 to 12,
(5) How Lurgi Improved Sand Crackers, P. Schmalfeld, Reprint from Hydrocarbon Processing & Petroleum Refiner, July 1963, Vol. 42, No. 7, pages 145 to 148 and
(6) US-A-4 297 202.

III. The Opposition Division held that the process of the claims of the granted patent involved an inventive step, document (6) or document (1) being considered to represent the closest prior art. There was, however, no suggestion to combine the teaching of document (6) with specific features of the coking process of document (1) and of the cracking process of document (5).

IV. The Respondent (Proprietor of the patent) defended the maintenance of the patent in the form as granted as the main request. With letter dated 28 July 2008, it filed auxiliary requests 1 to 5 and with letter dated 26 August 2008, it filed auxiliary requests 4 and 5, the latter two requests being identical to auxiliary requests 5 and 4, respectively, filed on 28 July 2008, merely the ranking of the requests being reversed. At the oral proceedings before the Board, held on 28 August 2008, the Respondent withdrew auxiliary requests 1 and 3.

Claim 1 of auxiliary request 2 differed from claim 1 of the main request exclusively in that in step (B)ii) it is indicated that the vapour residence time in the second stage reaction zone was shorter than the vapour residence time of the first stage reaction zone.

Claim 1 of auxiliary request 4 differed from claim 1 of the main request exclusively in the addition at the end of the claim of the feature "wherein the vapour product from the second stage reaction zone was quenched to a temperature below that at which cracking would substantially occur, and a vapour phase product containing substantial amounts of olefins was recovered".

Claim 1 of auxiliary request 5 differed from claim 1 of the main request exclusively in the addition at the end of the claim of a step k) wherein the reaction products in the second stage reaction zone were quenched to decrease the temperature of vapour phase products by 100°C to 200°C.

V. The Appellant argued that document (6) disclosed a process for the production of olefins from carbonaceous materials such as heavy hydrocarbon residues, comprising a coking and a cracking step. The problem to be solved by the patent in suit was merely to provide a further process for producing olefins from a residual feedstock. The crucial difference between the claimed process and that of document (6) was the specific residence times. However, since document (1) already described a coking reaction, wherein solid residence times were of the order of a few seconds and vapour residence times merely of a fraction of a second, and specifically taught that said coking process could be integrated "with little imagination" with other processes and could be used for the cracking of oils into mainly olefins, no inventive ingenuity could be seen in the selection of these particular residence times. With regard to auxiliary request 2, it was the common general knowledge of the skilled person that vapour residence times for cracking processes were shorter than for coking processes. With regard to auxiliary requests 4 and 5, document (5) already taught the quenching of cracker gases in order to suppress undesired secondary reactions. Thus the process defined in claim 1 of any of the requests did not involve an inventive step.

The Appellant objected in writing to the late-filing of the auxiliary requests filed on 26 August 2008. However, having realised at the oral proceedings that these requests essentially corresponded to requests filed on 28 July 2008, it did not maintain this objection.

VI. The Respondent submitted that the claimed process differed from that of document (6), which represented the closest prior art, with respect to the following features:

1) the first stage reaction zone contained a horizontal moving bed of fluidized hot solids;

2) in the first stage reaction zone the solids residence time and the vapour residence time were independently controlled; and

3) the vapour residence time was less than 2 seconds; and

4) the solids residence time was in a range from 5 to 60 seconds;

5) in the second stage reaction zone the vapour residence time was less than 1 second; and

6) a vapour fraction was separated from a solids fraction; and

7) carbonaceous deposits on the solids fraction were combusted in the second stage heating zone; and

8) hot solids from the second stage heating zone were circulated to the second stage reaction zone where they were contacted with the vapour product from the first stage reaction zone.

Starting from document (6), the problem to be solved comprised the provision of olefinic products in improved yield, namely without excessive cracking of product vapours. The above listed distinguishing features, most particularly the solid and residence times in the first stage and the vapour residence time in the second stage, and the use of a horizontal moving bed in the first stage which allowed independent control of the solids residence time and the vapour residence time, resulted in increased olefin yields, typically of from 20 to 50 wt.%, from residual feedstocks. Since none of the cited documents addressed the problem underlying the patent in suit, the skilled person would not have arrived at the proposed solution without exercising inventive ingenuity. More particularly, neither document (1) nor (5) referred to the upgrading of residual feedstock into olefins, such that the skilled person would not have combined their teachings with that of document (6). The additional features defined in claim 1 of each of the auxiliary requests resulted in processes with even less secondary cracking and thus even greater olefin yields. For these reasons, the claimed process involved an inventive step.

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

The Respondent requested that the appeal be dismissed and that the patent be maintained as granted (main request), or alternatively, that the patent be maintained on the basis of auxiliary request 2, submitted with the letter dated 28 July 2008, or of auxiliary requests 4 or 5, submitted with the letter dated 26 August 2008.

VIII. At the end of the oral proceedings, the decision of the Board was announced.

Reasons for the Decision

1. The appeal is admissible.

Main request

Lack of inventive step was the sole ground of opposition raised against the patent in suit. Thus, the sole issue to be decided in this appeal having regard to the Respondent's main request is whether or not the claimed subject-matter involves an inventive step.

2. *Inventive step*

2.1 According to the established jurisprudence of the Boards of Appeal it is necessary, in order to assess inventive step, to establish the closest state of the art, to determine in the light thereof the technical problem which the invention addresses and successfully solves, and to examine the obviousness of the claimed solution to this problem in view of the state of the art. This "problem-solution approach" ensures assessing inventive step on an objective basis and avoids an *ex post fact*o analysis.

2.2 The patent in suit is directed to a two stage process for producing olefins from a residual feedstock, which process comprises a coking and a cracking step.

2.2.1 A similar two stage process already belongs to the state of the art, namely to the disclosure of document (6). More particularly, this document discloses a process for producing unsaturated hydrocarbons from a carbonaceous material, which process comprises converting the feedstock in two stages, namely a coking and a cracking stage (col. 1, lines 46 to 50), wherein:
(A) a first stage is comprised of:

(i) a first stage heating zone 2 wherein a stream of coke from the stripping zone is heated (col. 2, lines 60 to 62);

(ii) a first stage reaction zone (12) containing a fluidized bed of solids (col. 2, lines 29 to 30), which reaction zone is more preferably operated at 950 to 1050°F (col. 2, lines 54 to 55), which corresponds to 510 to 565°C, and under conditions such that the solids residence time and the vapour residence time are independently controlled (col. 2, lines 24 to 29, col. 3, lines 28 to 29, col. 2, lines 46 to 50 and 60 to 61);

(iii) a stripping zone wherein hydrocarbons are removed from the coke received from the reaction zone (12) with a stripping gas, namely steam via line 16 (col. 2, lines 58 to 60); and

(B) a second stage is comprised of:

(i) a second stage heating zone, namely the gasifier 3, which is maintained at a temperature of 1500 to 2000°F (col. 3, lines 52 to 53), which corresponds to 815 to 1093°C, wherein solids are received from the second stage reaction zone 20 via dipleg 22, lines 18 and 44 (col. 2, lines 60 to 65 and col. 3, lines 46 to 48);

(ii) a second stage reaction zone, namely the cyclones 20, operated preferably at a temperature of 1300 to 1500°F (col. 3, lines 1 to 2), which corresponds to 704 to 815°C;

which process comprises

(a) passing said residual feedstock via line 10 to said first stage reaction zone (col. 2, lines 25 to 29) where it is contacted with fluidized hot solids (col. 2, line 30) thereby resulting in a vaporous fraction (col. 2, lines 62 to 63) and a solids fraction (col. 2, line 64);

(b) separating vaporized fraction from solids fraction (col. 2, lines 62 to 64);
(c) passing the solids fraction to the stripping zone where hydrocarbons are removed therefrom by contacting them with a stripping gas, namely steam via line 16 (col. 2, lines 58 to 60);
(d) passing stripped solids via line 18 to said first heating zone (2) where they are heated *in air* to an effective temperature that will maintain the operating temperature of said first reaction zone when the solids are passed thereto (col. 2, lines 46 to 55 and 60 to 62, col. 3, lines 30 to 36);
(e) separating flue gas via line 40 from the solids of said first stage heating zone (col. 3, lines 36 to 39);
(f) circulating hot solids via line 42 from said first stage heating zone to said first stage reaction zone where they are contacted with more residual feedstock (col. 3, lines 44 to 46);
(g) passing vaporized fraction of said first reaction zone to said second reaction zone where it is contacted with hot solids at a temperature of 1300 to 1500°F (col. 2, line 62 to col. 3, line 12), which corresponds to 704 to 815°C;
(h) separating a vapour fraction from a solids fraction (col. 2, lines 62 to 64);
(i) passing said solids fraction to a second stage heating zone, namely the gasifier 3 via dipleg 22, lines 18 and 44, where the fraction is heated to a temperature of 1500 to 2000°F, which corresponds to 815 to 1093°C, that will combust carbonaceous deposits thereon and maintain the operating temperature of said second stage reaction zone (col. 3, lines 7 to 12 and 52 to 53);

(j) hot solids from said gasifier (3) are circulated via lines 58 and 60 to said second stage reaction zone 20 where they are contacted with the vapour product from said first stage reaction zone (col. 1, lines 52 to 54 and col. 3, lines 7 to 16).

2.2.2 Thus, the Board considers that the disclosure of document (6) specified above represents the closest state of the art, and, hence, the starting point in the assessment of inventive step.

2.2.3 The Appellant addressed additionally document (1) as representing the closest prior art, said document being directed to a process for the coking of residual oils. However, document (1) does not address a two stage coking-cracking process and is thus further away from the claimed invention than document (6).

2.2.4 The Respondent, who considered document (6) as representing the closest prior art, contended, however, that the above features A(ii), (h), (i) and (j), at least in part, were not disclosed in document (6). However, with regard to feature (A)(ii), since in document (6) coke enters the first stage reaction zone via line 42 and exits via line 18, whereas the feedstock enters via line 10 and the product vapours exit via line 28, said first stage reaction zone is effectively operated under conditions whereby the solids residence time and the vapour residence time are independently controlled, since there are two completely separate circulation systems for the solids and the vapours. With regard to feature (h), it is clearly stated in document (6) that entrained solids are removed in a gas-solids separation zone such as cyclones 20 and returned to the coker zone (col. 2, lines 62 to 65). With regard to the combustion of carbonaceous deposits on the solids fraction in feature (i), although this is not explicitly described in document (6), since the gasifier therein is operated at a temperature of 815 to 1093°C, said temperature being sufficient to maintain the operating temperature of said second stage reaction zone of above 700°C, then combustion of carbonaceous deposits also necessarily occurs at this temperature. This is because in the specification of the patent in suit (col. 7, lines 2 to 10), some carbonaceous residue is already burned from the solids in the first stage heating zone, said first stage heating zone being required to maintain the first stage reaction zone at a temperature of only 500 to 600°C. Thus in a (second stage) heating zone required to maintain a (second stage) reaction zone at an even higher temperature (namely at above 700°C), then combustion of carbonaceous deposits must also necessarily occur. Finally, with regard to feature (j), the Respondent argued that the solids circulated from the gasifier in document (6) were not necessarily returned to the cyclones, but might also be injected into the first stage reaction zone. However, document (6) clearly states (col. 1, lines 52 to 54) that the heat in the gas-solids separation zone, which corresponds to the second stage reaction zone of the patent in suit, is provided by passing a portion of hot solids from a gasification zone, which corresponds to the second stage heating zone of the patent in suit, thereto. The passage in document (6) (col. 3, lines 7 to 16) specifically referred to by the Respondent discloses that a stream of hot solids withdrawn from the gasifier by line 58 is injected by line 60 above the dense fluid bed in the region adjacent to the inlets of the cyclones. Thus the hot solids are injected above and not into the first stage reaction zone. This passage further discloses that the heated gasifier solids may be discharged into the vaporous coker product passing into the cyclones via the inlets of the cyclones or may be introduced directly into the cyclone separators. Thus there is a choice of how the hot gasifier solids are circulated to the cyclones (i.e. via cyclone inlet or directly) but not as to whether they are circulated thereto. The Board thus considers that document (6) does indeed disclose features A(ii), (h), (i) and (j) as defined above.

2.3 The technical problem underlying the patent in suit, as formulated by the Respondent at the oral proceedings, comprised the provision of a process for producing olefinic products in improved yield, namely without excessive cracking of product vapours.

2.4 As the solution to this problem, the patent in suit proposes the process according to claim 1, characterised in that in the first stage reaction zone the fluidised hot solids form a horizontal moving bed, the vapour residence time is less than 2 seconds and the solids residence time is from 5 to 60 seconds, and that in the second stage reaction zone, the vapour residence time is less than 1 second.

2.5 To demonstrate that the process as defined in claim 1 achieves the alleged improvement in olefin yield, the Respondent relied on paragraphs [0016] and [0017] of the specification of the patent in suit, wherein it is stated that the vaporised products contain olefins in the range of 20 to 50wt.% and that the example shows that a short contact time process mode is important for obtaining increased olefin yields from residual feedstocks. This example is, however, as acknowledged in paragraph [0017] of the specification of the patent in suit, not an example of the process according to the invention, such that improved olefin yields have not been shown. 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 improvement, namely improved olefin yields, lacks the required experimental support, the technical problem as defined in point 2.3 above needs reformulation.

2.6 Thus, in view of the teaching of document (6), the objective problem underlying the patent in suit is merely the provision of a further process for producing olefins from a residual feedstock.

2.7 Finally, it remains to decide 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.

2.7.1 When starting from the two stage coking-cracking process for producing olefins from a residual feedstock known from document (6), it is a matter of course that the person skilled in the art seeking to provide a further process would turn his attention to that prior art addressing coking and/or cracking processes. As a skilled person, he would be struck by document (1) which describes (pages 3 and 4; Fig. 2) a coking process which is carried out at a temperature of 500 to 600°C, wherein the coking heat is transferred from a fine granular solid heat carrier, said solid being circulated from a heating zone to the coking reactor and back, said reactor being a plug flow reactor. Neither party disputed the fact that said plug flow reactor of document (1) functionally corresponds to a reaction zone with a horizontal moving bed of fluidised hot solids. It is within the ambit of the skilled person, seeking to solve the less ambitious objective problem underlying the patent in suit of providing merely a further preparation process, to consider routinely any conceivable modification of the closest prior art process, including the use of a reaction zone with a horizontal moving bed of fluidised solids. Thus, the person skilled in the art, following the avenue indicated in the state of the art, would incorporate such a horizontal moving bed known from document (1) into the process of document (6) without exercising any inventive ingenuity.

2.7.2 The specific residence times of less than 2 seconds for the vapours and from 5 to 60 seconds for the solids in the first stage reaction zone, and of less than 1 second for the vapours in the second stage reaction zone, are neither critical nor purposive choices for solving the objective problem underlying the patent in suit, since no unexpected effect has been shown to be associated with these particular residence times. The act of picking out at random particular residence times for the solids and vapours is within the routine activity of the skilled person faced with the mere problem of providing a further process for producing olefins from residual feedstock. In the present case, the skilled person is all the more guided to pick out residence times within the ranges claimed, since in the coking process of document (1) (page 3, last paragraph), solid residence times of the order of a few seconds and vapour residence times of merely a fraction of a second, and in the cracking process of document (5) (page 145, last full paragraph in right hand column), a vapour residence time of 0.3 to 0.5 seconds, are taught. Therefore, the arbitrary choice of residence times already taught in the state of the art for coking and cracking processes cannot provide the claimed process with any inventive ingenuity.

2.7.3 The Respondent argued that the skilled person would not have considered documents (1) or (5) when seeking to solve the problem underlying the patent in suit, since neither document related to the production of olefins from residual feedstocks. However, since the closest prior art, document (6), discloses a two stage process for producing olefins from a residual feedstock, namely by coking of a residual feedstock followed by cracking of the vaporous products, under these circumstances the skilled person, seeking to modify said process in order to provide merely a further process, would not only take into consideration documents relating to integrated coking and cracking processes, but also any document which is concerned with either of these process steps alone. Since document (1) (page 1, third paragraph) is concerned with the upgrading of residual oils by coking, and document (5) with the production of olefins by cracking (page 145, last full paragraph in right hand column), these documents would have been taken into consideration by the skilled person seeking merely to provide a further process for preparing olefins, when starting from a process which already teaches their production from a residual feedstock via a coking and a cracking step.

The Respondent provided no arguments from which the Board could reasonably conclude that the skilled person would have been deterred from using a horizontal moving bed of fluidised hot solids, nor from selecting the particular solids and vapour residence times claimed.

All of the Respondent's arguments in support of inventive step which were based on the premise that the olefin yield was improved *vis-à-vis* document (6) are redundant, since such an improved yield has not been shown (see point 2.5 above).

2.8 For these reasons, the subject-matter of claim 1 is obvious.

3. As a result the Respondent's main request is not allowable for lack of inventive step pursuant to Article 56 EPC.

Auxiliary request 2

4. *Amendments*

The amendment to claim 1 finds a basis on page 6, lines 21 to 22 of the application as filed and restricts the scope of the granted claims, such that the requirements of Article 123(2) and (3) EPC are satisfied.

5. *Inventive step*

5.1 Claim 1 according to the auxiliary request 2 differs from claim 1 of the main request exclusively in that the vapour residence time in the second stage reaction zone is shorter than the vapour residence time of the first stage reaction zone.

5.2 The Respondent submitted that by using a shorter vapour residence time in the second stage reaction zone than in the first stage reaction zone secondary cracking was reduced, resulting in improved olefin yields. However, it again provided no evidence in support of this allegation, such that the objective problem *vis-à-vis* document (6) remains the provision of a further process for producing olefins. Using a shorter vapour residence time in the second stage than in the first stage reaction zone is merely an arbitrary choice from within the general teaching of document (6), which covers any residence times, and, thus, cannot contribute to inventive ingenuity.

5.3 In these circumstances, the auxiliary request 2 shares the fate of the main request in that it too is not allowable for lack of inventive step pursuant to Article 56 EPC.

Auxiliary request 4

6. *Amendments*

The amendment to claim 1 finds a basis in claim 2 as filed and restricts the scope of the granted claims, such that the requirements of Article 123(2) and (3) EPC are satisfied.

7. *Inventive step*

7.1 Claim 1 according to the auxiliary request 4 differs from claim 1 of the main request exclusively in that the vapour product from the second stage reaction zone is quenched to a temperature below that at which cracking will substantially occur, and a vapour phase product containing substantial amounts of olefins is recovered.

7.2 However, quenching of the vapour product from the second stage reaction zone is already disclosed in document (6), wherein said vapours are passed into a scrubber (col. 3, lines 21 to 22). According to the specification of the patent in suit (col. 7, lines 55 to 57), passing reaction products into a scrubber results in quenching. The closest prior art document (6) thus already discloses the newly introduced feature of quenching the vapour product from the second stage reaction zone. Moreover, that such quenching results in less secondary cracking and thus improved olefin yields is taught by document (5) (pages 145 to 147; Fig. 1), which describes a cracking process which is carried out at a temperature of 700 to 850°C for a reaction time of 0.3 to 0.5 seconds, wherein sand is used as the heat transfer medium, said sand being circulated from a heating zone to the cracking reactor and back. Document (5) explicitly states that the cracker gases are quenched immediately after reaction to suppress undesired secondary reactions and that increased olefin yields are thereby obtained (page 147, paragraph bridging the left and right hand columns and page 148, first full paragraph in left hand column). Document (5) thus provides the skilled person with a clear incentive to incorporate such a quenching step into the process of claim 1 of the patent in suit in order to suppress secondary cracking.

7.3 As a consequence, the subject-matter of claim 1 of this request is obvious and does not involve an inventive step.

7.4 In these circumstances, the auxiliary request 4 shares the fate of the main request in that it too is not allowable for lack of inventive step pursuant to Article 56 EPC.

Auxiliary request 5

8. *Amendments*

In view of the negative conclusions in respect of the subject-matter of this request for lack of inventive step as set out in point 9 below, a decision of the Board on the issue of added subject-matter is unnecessary.

9. *Inventive step*

9.1 The subject-matter of claim 1 of this request differs from that of claim 1 of auxiliary request 4 merely in that instead of specifying that the vapours are quenched to a temperature below that at which cracking will substantially occur, a particular quenching temperature reduction, namely of 100°C to 200°C, is specified.

9.2 However, document (5) (page 147, first full paragraph in right hand column) describes the quenching of cracker gases to 50 to 100°C below reactor temperature and teaches that this is sufficient to largely suppress secondary reactions. Said document thus already teaches a quenching temperature reduction of 100°C as covered by claim 1 in suit. Since this particular temperature reduction is not associated with any effect *vis-à-vis* the quenching step of auxiliary request 4, the considerations and conclusion drawn concerning inventive step in point 7 above with respect to auxiliary request 4 still apply to auxiliary request 5, i.e. the subject-matter of claim 1 of this request is obvious and does not involve an inventive step.

9.3 In these circumstances, the auxiliary request 5 shares the fate of auxiliary request 4 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