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Datasheet for the decision of 13 October 2011

Case Number: T 1993/07 - 3.3.05

Application Number: 99924333.0

Publication Number: 1080116

IPC: C08F 2/00

Language of the proceedings: EN

Title of invention:
Continuous volatile removal in slurry polymerization

Patentee:
CHEVRON PHILLIPS CHEMICAL COMPANY LP

Opponents:
INEOS EUROPE LIMITED
TOTAL PETROCHEMICALS RESEARCH FELUY S.A.
Basell Poliolefine Italia S.r.l.

Headword:
Continuous polymerisation/CHEVRON

Relevant legal provisions:
EPC Art. 52(1), 54(1)(2)(3), 56, 83, 84, 123(2)(3)
RPBA Art. 13(1)(3)

Keyword:
"Sufficiency of disclosure (yes): main and 3rd auxiliary requests"
"Novelty (yes): main and 3rd auxiliary requests"
"Inventive step (no): main request - obvious solution"
"First and second auxiliary requests: admissible (no), late filed, new issues, divergent claims versions"
"Inventive step (yes): third auxiliary request"

Decisions cited:
T 1126/97, T 1685/07, T 0183/09

Catchword:
-

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Case Number: T 1993/07 - 3.3.05

D E C I S I O N
of the Technical Board of Appeal 3.3.05
of 13 October 2011

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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 28 November 2007 concerning maintenance of European patent No. 1080116 in amended form.**

Composition of the Board:

Chairman: B. Czech
Members: J.-M. Schwaller
C. Vallet

Summary of Facts and Submissions

I. These appeals lie from the decision of the opposition division concerning maintenance of European patent No. 1 080 116 on the basis of the set of amended claims filed as second auxiliary request on 7 November 2007 during the oral proceedings before the first instance.

II. During the opposition procedure, the parties relied inter alia on the following documents:

D2: WO 99/47251

D5: EP 0 891 990 A2

D6: US 5 575 979

D7: US 4 424 341

D18: Chemical Engineer's Handbook, R.H. Perry and C.H. Chilton, 1973, Chapter 7, pages 23 to 26.

III. Claim 1 as granted - also claim 1 of the main request then on file - reads as follows:

"*1. A process for producing polymer from a polymerization slurry in a loop reactor operating at a space time yield greater than 2.6 lbs/hr-gal (8.65 x* 10^{-5} *kg* s^{-1} dm^{-3}*) which comprises the steps of :*

forming the polymer in the polymerization slurry, wherein the polymerization slurry comprises a liquid medium and solids;

continuously discharging the polymerization slurry through a discharge valve into a first transfer conduit,

the polymerization slurry after discharge referred to as a polymerization effluent;

heating the polymerization effluent in said first transfer conduit to a temperature below the fusion temperature of the polymer;

communicating said polymerization effluent through said first transfer conduit to a first flash tank wherein the pressure in said first flash tank and the temperature of said heated polymerization effluent are such as to produce a vapor from about 50% to about 100% of the liquid medium;

condensing the vapor obtained in the first flash step by heat exchange;

discharging from said first flash tank polymer solids to a second flash tank through a seal chamber of sufficient dimension such as to maintain a volume of polymer solids in the said seal chamber sufficient to maintain a pressure seal;

communicating the polymer solids to a second flash tank;

exposing the polymer solids to a pressure reduction from a higher pressure in the first flash tank to a lower pressure in said second flash; and

discharging the polymer solids from said second flash tank."

Claim 1 as held allowable by the opposition division (claim 1 of the second auxiliary request then on file) reads as follows (differences compared with claim 1 as granted highlighted by the board):

"*1. A process for producing polymer from a polymerization slurry […] ;*

discharging from said first flash tank polymer solids to a second flash tank through a seal chamber of sufficient dimension such as to maintain ***in the said seal chamber a volume of polymer solids being a continuous plug flow having an l/d ratio of from 1.5 to 8 and being*** *sufficient to maintain a pressure seal; […] discharging the polymer solids from said second flash tank."*

IV. The contested decision can be summarised as follows:

The claims on file met the requirements of Articles 83 and 123(2) EPC.

The priority claims of the contested patent were not valid. Documents D2 and D5 thus belonged to the state of the art under Article 54(3) and Article 54(2) EPC, respectively.

D2 did not disclose the space time yield claimed.

D5 did not disclose a seal chamber of sufficient dimension such as to maintain a volume of polymer solids in the seal chamber sufficient to maintain a pressure seal. The space time yields that could be calculated from D5 were about 20% lower than the one claimed.

The combination of D5 - which represented the closest state of the art - with D6 led to a process with all the features of claim 1 as granted, except the specified space time yield. As the latter was of no inventive merit per se, the subject-matter of claim 1

as granted was obvious in the light of the method of D5, modified as taught in document D6.

An integration of the flash vessel design of D6 into the method according to D5 would not lead to a process according to claim 1 of the second auxiliary request, because such a combination would lead to a discontinuous flow of polymer solids, not to a continuous plug flow as claimed.

V. With its statement of grounds of appeal dated 7 March 2008, the patent proprietor (hereinafter "appellant I") filed a set of amended claims as first auxiliary request.

VI. With its statement of grounds of appeal, opponent 02 (Total; hereinafter "appellant II") submitted two new documents:

A1: US 4 078 675

A2: WO 94/07596

and objected to the contested patent, as maintained by the opposition division, on the grounds of Article 100(a), (b) and (c) EPC.

VII. With its statement of grounds of appeal, opponent 01 (Ineos; hereinafter "appellant III") also relied on document A1 and objected to the claims allowed by the opposition division, on the grounds of Article 100(a) and (b) EPC.

VIII. Appellant I requested the non-admittance of documents A1 and A2 into the proceedings and rebutted the objections of the adverse parties.

IX. In reply to the statement of grounds of appellant I, appellants II and III each filed further arguments in writing.

X. In response to the summons to oral proceedings, appellant III filed further observations concerning the alleged lack of novelty over document D2.

XI. On 22 September 2011, appellant I submitted four sets of amended claims as 1st, 2nd, 4th and 5th auxiliary requests, respectively. The third auxiliary request was to maintain the patent in the form upheld by the opposition division.

XII. At the oral proceedings, which took place on 13 October 2011, the issues discussed concerned essentially the admissibility of late filed documents A1 and A2 and of the late filed requests of 22 September 2011, sufficiency of disclosure and the patentability of the claimed subject-matter. Regarding the latter issue, novelty over document D2 and inventive step over document D5 in combination with document A1 were specifically discussed.

XIII. The parties' requests were as follows:

Appellant I requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or, alternatively, that the patent be maintained on the basis of the claims according to one

of the auxiliary requests 1 or 2 filed with letter dated 22 September 2011 or, alternatively, that the appeals of opponents II and III be dismissed (third auxiliary request) or, alternatively, that the patent be maintained on the basis of the claims according to one of the auxiliary requests 4 or 5 filed with letter dated 22 September 2011.

Appellants II and III requested that the decision under appeal be set aside and that the patent be revoked.

Reasons for the Decision

Main request

1. Sufficiency of disclosure

1.1 Appellants II and III argued that the patent specification did not provide enough information and guidance, so that the skilled person could not know how to achieve a space time yield (STY) as required by claim 1 at issue, i.e. of at least 2.6 lbs/hr-gal (8.65 x 10^{-5} kg s^{-1} dm^{-3}). In the following, for easier reading, STY values are indicated without the unit "lbs/hr-gal" and without conversion into SI units.

1.2 Appellant I (patent proprietor) stated that STY was influenced by many factors, such as catalyst type, catalyst input rate, monomer concentration and/or temperature, and that the skilled person, based on common general knowledge, knew how these factors could be adjusted for controlling the STY of a slurry polymerisation in a loop reactor. It gave in particular

the example of a higher catalyst addition rate or the use of a more productive catalyst when an increase of STY was sought.

1.3 The board observes that the contested patent discloses one embodiment (Example 4) wherein ethylene is polymerised according to a process falling under the terms of claim 1 and in which the STY is between 3.3 and 3.7. Table 1 at page 10 of the contested patent indicates a multitude of process conditions which undisputedly permit the polymerisation process according to Example 4 to be run in said STY range. It is to be noted that the process conditions indicated in Table 1 for (comparative) Example 3, which is run at a lower STY (between 2.4 and 2.7), differs in several ways from the process conditions according to Example 4, inter alia in terms of the monomer concentration used. For the board, the comparative data provided in Table 1 constitute an additional source of information providing guidance for the skilled person on how to achieve an STY value in the claimed range in a polymerisation loop reactor.

1.4 According to the case law of the boards of appeal, in order to establish insufficiency of disclosure, the burden of proof rests upon the opponent(s) to show that the skilled reader of the disputed patent, using his common general knowledge, would be unable to carry out the invention claimed.

In the present case, as the information given in the patent is sufficient for enabling the operation of the polymerisation loop reactor in the claimed STY range, and as the appellants II and III (opponents) have not

provided evidence to the contrary, the board concludes that the invention is disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

1.5 The invention as claimed according to the main request therefore cannot be objected to under Article 100(b) EPC.

2. Novelty

2.1 The only novelty objection raised against the process claimed was based on document D2, the disclosure of which is undisputedly part of the state of the art pursuant to Article 54(3) EPC in view of the invalid priority claims of the patent in suit.

2.2 The board observes that it is uncontested that D2 explicitly discloses, in combination, all the features of present claim 1, with the exception of the "space time yield" parameter that document D2 does not address at all.

2.3 According to a first line of argument, appellants II and III held an STY greater than 2.6 - as defined in claim 1 at issue - to be the inevitable result of a process with all the other features of claim 1, such as those processes disclosed in Examples 1 and 2 of D2.

They both pointed out in this respect that Examples 1 and 2 of the contested patent were neither labelled "comparative" nor described as being outside the scope of the invention, so they were supposed to illustrate the invention according to the contested patent. Since

the content of Examples 1 and 2 of the patent was strictly identical with the content of Examples 1 and 2 in D2, the subject-matter of claim 1 at issue lacked novelty over D2.

The board notes in this respect that Example 3 of the patent in suit, which is clearly outside the scope of claim 1 since the polymerisation method described makes use of only one flash tank, is also not labelled "comparative" or said not to belong to the invention. Furthermore, the application as originally filed (see WO 99/60028 as published) - which led to the grant of the contested patent - comprised a multitude of independent claims which did not all relate to the use of a separation process as presently defined in claim 1, i.e. including two flash tanks and being run at an STY greater than 2.6.

For the board, the simple fact that Examples 1 and 2 are not labelled "comparative" in the patent in suit is thus not sufficient for concluding that the processes according to Examples 1 and 2 of document D2 had inevitably been put into practice at a space time yield greater than 2.6.

2.4 According to a second line of argumentation, appellant II argued that since document D2 (page 6, lines 1 to 9 and 16 to 17) aimed at an increased reactor throughput, like the contested patent, it implicitly and inevitably also aimed at an increased STY. Concerning the meaning of an increased STY in the sense of D2, the skilled person knew from documents D5 and D17 what the values of "normal" space time yields were supposed to be (from D5, STY values of about 2.2

could be calculated from the examples; D17 mentioned an STY maximum value of about 3.3).

The skilled person reading D2 was furthermore able to estimate a lower limit for the STY in the "typical ethylene polymerisation process" used in Examples 1 and 2 based on the knowledge of the reactor size used in such a "typical" process. For example, the skilled person knew the volume of commercial scale loop reactors such as those referred to in D5 (page 4, line 55), which were described as having a volume of 15 000 to 18 000 gallons. Taking this range as the volume for a "typical ethylene polymerisation process" as in Example 1 of D2 gave a potential STY of between 2.5 and 3. For a smaller reactor (such as the one actually used in Examples 3 and 4 of the contested patent), the STY would be still higher. Thus, the range of STY that the person skilled in the art would determine for the example of D2 would be "at least 2.5" and this would be entirely consistent with the statement in D2 that an advantage of the claimed process was an increase in reactor throughput. Even if a value in the range greater than 2.6 was not inherently disclosed in D2, the range in claim 1 at issue was not sufficiently far removed from the range which could be determined from D2, and did not represent a purposive selection over the more general disclosure of D2.

The board observes that the above arguments are based to a large extent on estimations of what the volume of a reactor in the "typical ethylene polymerisation process" disclosed in the Examples of D2 could be, and estimations of what a "normal" STY could be according

to D2. The board cannot follow such speculative considerations, because the boards' established criteria for lack of novelty are that the disclosure must be "direct and unambiguous". This is not the case in a situation where the arguments are based on estimations allegedly corroborated by additional information gathered from documents other than the one alleged to be novelty-destroying. No specific STY values can be directly and unambiguously derived by deduction or calculation from the data indicated in the examples of D2. Hence D2 does not even implicitly disclose any specific STY values.

Moreover, D2 does not expressly disclose any range of STY values whatsoever. For the board, considerations applicable to cases where an invention is defined in terms of a range of values which is narrower or overlaps with a broader range disclosed in a prior-art document, and where a so-called selection invention may have been made, are thus not applicable to the present case.

2.5 For the above reasons, the board concludes that the subject-matter of claim 1 at issue is not directly and unambiguously disclosed in D2.

2.6 The board is also satisfied – and nor was it in dispute – that none of the other documents cited in the appeal and opposition proceedings discloses in combination all the features of present claim 1.

2.7 Claim 1 according to the main request and, by the same token, claims 2 to 15 dependent thereon thus meet the requirements of Articles 52(1) and 54(1)(2)(3) EPC.

3. Inventive step

3.1 The contested patent (paragraphs [0001] and [0007]) relates to a process for producing polymer from a polymerisation slurry in a loop reactor wherein the polymerisation slurry is continuously discharged from the loop reactor, polymer solids are separated from the liquid medium and dried by subjecting the slurry to a two-stage flashing operation, and liquid medium is recovered and may be reused in the polymerisation process.

3.2 In agreement with the parties, document D5 is taken as the starting point for assessing inventive step. In view of the invalid priority claims of the patent in suit, document D5 is part of the prior art pursuant to Article 54(2) EPC. This was not disputed.

3.2.1 In its claim 1, D5 discloses in particular a polymerisation process comprising:

- polymerising, in a loop reaction zone, at least one olefin monomer in a liquid diluent to produce a fluid slurry comprising liquid diluent and solid olefin polymer particles;
- maintaining a concentration of said solid olefin polymer particles in said slurry in said zone of greater than 40 weight percent based on the weight of said polymer particles and the weight of said liquid diluent; and
- continuously withdrawing a slurry having an increase in solids concentration as compared with said slurry in said zone, the thus withdrawn slurry comprising

liquid diluent and solid polymer particles as an intermediate product of said process.

3.2.2 In the embodiment illustrated in Figure 1 (see also page 3, line 50 to page 4, line 27), the continuously withdrawn intermediate product slurry is passed from the continuous take off mechanism (34) via conduit (36) into a separation system including a high pressure flash chamber (38), allowing the majority of the withdrawn diluent to be flashed off and recycled with no compression. The polymer particles withdrawn from said high pressure flash chamber (38) are passed via line (44) to a low pressure flash chamber (46) from where they are recovered as polymer product via line 48, whereas separated residual diluent is withdrawn for recompression.

3.2.3 Figure 1 of D5 merely shows a valve symbol arranged in the transfer line (44) between the two flash tanks, but no details concerning this valve are given in the description of D5. However, regarding the design of the high pressure flash system, D5 (page 4, lines 19 to 20) incorporates by reference the disclosure of document D7, which includes a figure showing such a flash system wherein the transfer line (28) comprises an arrangement with two valves.

There is thus no disclosure in D5 of a separation system in which the polymer solids are discharged from the first to the second flash tank "*through a seal chamber of sufficient dimension such as to maintain a volume of polymer solids in the said seal chamber sufficient to maintain a pressure seal*" as required by present claim 1.

3.2.4 There is also no explicit disclosure in D5 of any space time yield value. It was however common ground between the parties that from the data indicated in the table on pages 5 to 6 of D5, it could be calculated that the methods according to the examples of D5 were run at space time yields of about 2.1 to 2.2, i.e. at values which are significantly below the levels of space time yield required by claim 1.

3.3 As regards the technical problem to be solved in the light of document D5, appellant I submitted that it consisted in the provision of a polymerisation process including a slurry loop reactor and a two-stage flash separation system, wherein the reactor could be operated at a higher space time yield owing to a reduced risk of plugging in the downstream equipment.

3.4 As a solution to this problem, the patent in suit proposes the process according to claim 1, which is characterised in particular in that:

(a) the loop reactor is "*operating at a space time yield greater than 2.6 lbs/hr-gal*"; and

(b) the polymer solids are discharged "*from the first flash tank to the second flash tank through a seal chamber of sufficient dimension such as to maintain a volume of polymer solids in the said seal chamber sufficient to maintain a pressure seal*".

3.5 Appellant I argued that the stated technical problem was indeed solved by the claimed process. The reduced

risk of plugging in downstream equipment was the consequence, on the one hand, of the continuous take-off of polymer slurry from the slurry loop reactor and, on the other hand, of the uninterrupted discharging of the polymer solids from the first to the second flash stage. Said reduced risk of plugging permitted the loop reactor to be operated at relatively high STY values.

3.5.1 According to appellant I, a continuous discharging from the first flash stage - although not explicitly mentioned in present claim 1 - was implicit from the expression "*such as to maintain a volume of polymer solids … sufficient to maintain a pressure seal*". The skilled person reading the patent understood that claim 1 was restricted to a process with a separation system wherein the polymer solids in the seal chamber provided a pressure seal which lasted over the entire duration of the polymerisation process, without interruption.

3.5.2 The board does not accept this understanding of claim 1, because the wording of claim 1 does not imply that an uninterrupted or, in other words, continuous discharging of polymer solids from the first to the second flash stage over the whole duration of the polymerisation process is mandatory. Such a more specific requirement cannot be read into claim 1 at issue, which only requires that "*a volume of polymer solids*" be maintained in the seal chamber to maintain a pressure seal, not that the volume of polymer **alone** assures a permanent pressure seal throughout the polymerisation process, as submitted by appellant I.

Moreover, the presence of a valve system which only opens intermittently and hence also contributes to maintaining the pressure seal between the first and the second flash tank is not excluded by the wording of claim 1, and the claimed method does not expressly require the continuous flow of polymer solids in the discharging of the polymer solids from the first flash tank.

3.5.3 Claim 1 thus embraces processes for which the advantage allegedly linked to a continuous transfer of material from the high-pressure flash tank to the low-pressure flash tank, namely the reduced plugging in the downstream equipment despite the increased STY, cannot be acknowledged.

3.6 Consequently, the technical problem has to be reformulated in less ambiguous terms. Taking document D5 as the closest prior art, it can merely be seen as providing a polymerisation process carried out in a slurry loop reactor with continuous removal of the polymerisation effluent and a two-stage flash separation system, which is operated at an increased STY value.

3.7 It remains to be decided whether or not the above solution is obvious in view of the cited prior art, in particular document D6, on which appellants II and III relied.

3.7.1 Appellant I argued that the skilled person would not take document D6 into consideration because it was not concerned with the problem of reducing the risk of plugging at increased space time yield. This argument

is not convincing since the objective technical problem merely consists in the provision of a polymerisation process operated at an increased STY value (see point 3.6 above), i.e. no attention is to be paid to the increased risk of plugging.

3.7.2 The board is, however, convinced that the skilled person faced with said less ambitious problem would consider document D6, because it is also concerned with polymerisation in a loop reactor associated with a two-stage flash separation stage. In particular, D6 (column 2, lines 1 to 19; claim 1; Figure 1) discloses a method for recovering the polymer solids from such a loop reactor, wherein the polymerisation effluent, i.e. a slurry of polymer solids, is fed to a first flash vessel (28) in the form of a cyclone with an extended solids reservoir (32), wherein the diluent is partially vaporised while the polymer solids pass into the extended solids reservoir (32). The polymer solids are held in the reservoir until it is at least partially full. At this point, the polymer solids are passed from said reservoir to a second flash vessel maintained at a lower pressure than the first flash vessel, where the residual diluent is vaporised.

As indicated at column 3, lines 9 to 17, when the extended solids reservoir (32) of the first flash vessel is typically more than 80 percent filled, the content thereof flows into the second lower-pressure flash vessel (50) via conduit (48). The transfer is controlled by a valve (46) which is fully open when the polymer solids are flowing to the second lower-pressure flash vessel and fully closed at other times, i.e. in

particular during the settling step of the polymer solids in the reservoir (32).

3.7.3 The board accepts the argument of appellants II and III that for proper operation of a two-stage flash separation process, such as the one of D6, it is necessary to substantially maintain the pressure difference between the high-pressure stage and the low-pressure stage at any time. In the process according to D6, during the settling step it is the closed valve (46) which provides for the pressure seal between the flash tanks. During the transfer of the collected polymer solids to the second low-pressure flash vessel, it is the "plug" formed by the settled, concentrated polymer solids slurry leaving the extended solids reservoir and flowing to the lower-pressure flash vessel which works as a pressure seal maintaining the pressure difference between the two vessels for the period of time during which the valve between the two vessels is maintained open. Otherwise, the high pressure in the first flash vessel would inevitably fall after the valve was opened, and the two-stage separation process would be interrupted.

3.7.4 So, the skilled person faced with the problem defined under item 3.6 would immediately realise that the two-stage separation process described in D6 constitutes an alternative to the one described in D5. By replacing, in the process according to D5, the two-stage flash system described therein by the system according to D6, he would arrive at a process with all the features of claim 1 at issue - except for the space time yield values.

3.7.5 Concerning the increased STY value at which the process of claim 1 operates, the board notes that values of more than 2.6 are disclosed neither in D5 nor in D6. However, appellant I accepted that such values were not unusual in the art and that the technical features necessary for achieving such values were known to the skilled person. Considering that a high STY is generally desirable in performing industrial polymerisation processes, nothing inventive can be seen in operating the process of D5 modified by the adoption of the two-stage flash system (see item 3.7.4) at STY values increased in comparison to the ones described in the examples of D5.

3.7.6 The board concludes that the subject-matter of claim 1 at issue was obvious for the skilled person in the light of common general knowledge and the combined disclosures of documents D5 and D6. Hence, claim 1 does not meet the requirements of Articles 52(1) and 56 EPC, and the main request is thus not allowable.

First auxiliary request - Admissibility

4. The amendments to claim 1 of this request read as follows:

*"1. […], **continuously** discharging from said first flash tank polymer solids to a second flash tank through a seal chamber of sufficient dimension such as to maintain a volume of polymer solids in the said seal chamber sufficient to maintain a pressure seal **wherein the said chamber is of sufficient length to allow measurement and control of the solids level; maintaining a polymer solids level in the said chamber***

to form the pressure seal, *[…].*" (differences compared with claim 1 of the main request highlighted by the board).

4.1 This request was received on 22 September 2011, i.e. more than five months after the issuance of the summons to oral proceedings and less than one month before the oral proceedings. Relevant criteria for assessing the admissibility of requests filed at such a late stage of the proceedings are indicated in Article 13(1)(3) RPBA.

4.2 The request was filed without justification as to its lateness, and with the sole argumentation as to the patentability of the claimed subject-matter that there was "no disclosure or suggestion of any such process in the cited documents". At the oral proceedings, appellant I stated that the new requests had been filed in reaction to new arguments regarding lack of novelty in the light of document D2 raised by appellant II in its letter of 13 September 2011.

4.3 The board observes that the novelty attack based on D2 had already been raised in the opposition phase. So, a request consisting of claims amended in this manner could have been filed much earlier, in particular during the opposition proceedings, or under cover of the statement of the grounds of appeal.

4.4 Moreover, the board observes that the present request raises new issues of a certain complexity which have not been addressed in the written submissions of the parties.

4.4.1 According to appellant I, the amendments to claim 1 were based on the description of the application as filed, and more particularly on the passage at page 14, line 29 to page 15, line 7.

The board observes that said passage belongs to the description of a specific embodiment, namely the one illustrated in Figures 1 and 2 and described at page 12, line 26 to page 18, line 4 of the application as filed. Hence, the question arises whether the amendment consisting in the incorporation of these features, which were isolated from the other features of said specific embodiment, into present claim 1, satisfies the requirements of Article 123(2) EPC.

4.4.2 Furthermore, the added features "*the said chamber is of sufficient length to allow measurement and control of the solids level*" comprise a functional definition of the chamber length, and so the further question arises whether these features are sufficiently clear (Article 84 EPC) for the skilled person.

4.4.3 In view of these new issues arising from the amendments to claim 1, the board decided not to admit the present request into the proceedings, because - as established e.g. in T 183/09, point 4.1 of the Reasons; T 1126/97, point 3.1.2 of the Reasons - amended claims filed at such a late stage should be clearly allowable in the sense that it can be quickly ascertained that they overcome all outstanding issues without raising new ones. This is clearly not the case here, since the amended claims raise new issues under Articles 84 and 123(2) EPC.

4.4.4 Considering these particular circumstances, the board decided, in the exercise of the discretion conferred on it by Article 13(1) and (3) RPBA, not to admit the first auxiliary request into the proceedings.

Second auxiliary request - Admissibility

5. Amended claim 1 according to this request reads as follows (differences compared with claim 1 as granted highlighted by the board):

"*1. A process for producing polymer from a polymerization slurry in a loop reactor operating at a space time yield greater than **2.8** lbs/hr-gal (**9.3** x 10^{-5} kg s^{-1} dm^{-3}) […].*".

6. The second auxiliary request was filed together with the first auxiliary request, and so its very late filing raises the question of its admissibility.

6.1 The request was filed without justification as to its lateness, and with no further argumentation as to the purpose of the amendment. At the oral proceedings, appellant I stated that the new requests had been filed in reaction to new arguments regarding lack of novelty in the light of document D2 raised by appellant II in its letter of 13 September 2011.

6.1.1 The board observes that the claims according to this request were not only filed late but - compared to the claims as granted (main request) - also go in a completely different direction to the claims of the first auxiliary request referred to above and those held allowable by the opposition division. More

particularly, none of the features additionally incorporated into the respective claims 1 of the latter requests concerning the dimensioning of the seal chamber have been taken over into claim 1 at issue, which only differs from claim 1 of the main request by a different lower limit of the prescribed range of STY values (**2.8** in the second auxiliary request vs. 2.6 in the main request).

6.2 So although the amendments consist in the incorporation of features from a dependent claim into claim 1 as granted, the claims submitted as second auxiliary request "diverge" in the sense that they pursue different lines of amendment - by incorporating different features in each version - instead of increasingly limiting the subject-matter of independent claim 1 of the main request in one direction. For the board, the very late filing of the "diverging" second auxiliary request is not admissible, for the reasons set out in decision T 1685/07 of 4 August 2010, points 6.5 and 6.6 of the reasons, which the present board decided to follow.

6.3 The board thus decided, in the exercise of the discretion conferred on it by Article 13(1) and (3) RPBA, not to admit into the proceedings the first auxiliary request.

Admissibility of late-filed prior art documents

6.4 Document A1 was filed by appellants II and III, and document A2 by appellant II only, under cover of their respective statements of grounds of appeal. Since they were relied upon in questioning inventive step having

regard to the third auxiliary request, the board had to decide whether or not they could be admitted into the proceedings.

6.5 Appellant I held that these documents should not be admitted to the proceedings in view of their late filing and lack of relevance.

6.6 However, as emphasised by appellants II and III, these documents were filed in response to and directly address the amendments made by appellant I during the oral proceedings before the opposition division. Said amendments comprised the incorporation of features taken from the description, and were thus not foreseeable at first glance.

6.7 The board thus accepts that an earlier filing of these documents had not been necessary from the opponents' point of view. Documents A1 and A2 are supposed to disclose the features introduced into claim 1 by the amendments in question and are thus potentially of relevance. They are of a limited size and permit a relatively quick evaluation of their potential relevance. The board notes that appellant I had sufficient time to evaluate the potential relevance of these documents, and did so in its reply to the statements of grounds of appeal of appellants II and III.

6.8 Consequently, the board decided to admit documents A1 and A2 into the proceedings (Rule 12(4) RPBA).

Third auxiliary request

6.9 The third auxiliary request of appellant I is a request for the dismissal of the appeals of appellants II and III. Hence, it has to be decided whether the patent in the amended form held allowable by the opposition division meets the requirements of the EPC.

6.10 Amendments

6.10.1 The claims of this request differ from those according to the main request only in that the feature "*such as to maintain a volume of polymer solids in the said seal chamber sufficient to maintain a pressure seal*" in claim 1 was amended to read "*such as to maintain* ***in the said seal chamber*** *a volume of polymer solids* ~~*in the said seal chamber*~~ ***being a continuous plug flow having an l/d ratio of from 1.5 to 8 and being*** *sufficient to maintain a pressure seal*" (amendments highlighted by the board).

6.10.2 The amendment finds a basis in the passage reading "*The continuous plug flow of concentrated polymer solids/slurry forms a pressure seal wherein the concentrated polymer solids/slurry have an l/d ratio inside the seal chamber 17 which is typically 1.5 to 8, preferable l/d is 2 to 6 and most preferable l/d is 2.2 to 3*" (page 15, lines 21 to 24 of the application as filed).

6.10.3 The argument of appellant II that present claim 1 infringed the requirements of Article 123(2) EPC because the above passage referred to "*a continuous plug flow of polymer solids/slurry*" and not to "*polymer*

solids" alone, is not accepted by the board because claim 1 of the present request is in its essence based on claim 21 of the application as filed, which already referred to "*polymer solids*" not to "*polymer solids/slurry*". Moreover, appellant II has not set out why the finding of the opposition division, which considered that both expressions were essentially synonymous in the context of the claimed process, was wrong. Nor did it indicate what specific subject-matter not disclosed in the application as filed had been added by virtue of this amendment.

6.10.4 The board is satisfied – and nor was it in dispute – that the dependent claims, as well as the amendments to the description as allowed by the opposition division, find a basis in the application as filed, and that the amendment to the sole independent claim 1 is of a restricting nature.

6.10.5 The patent as amended according to the third auxiliary request thus meets the requirements of Article 123(2) and (3) EPC.

7. Sufficiency of disclosure

7.1 The amendments to the wording of claim 1, compared to the wording of claim 1 according to the main request, have no bearing on the previous considerations regarding sufficiency of disclosure.

7.2 The considerations under points 1.1 to 1.4 thus apply *mutatis mutandis* to the claims according to the third auxiliary request. The board is satisfied, and it was not in dispute, that that the amendments in question do

not lead to a further problem of sufficiency of the disclosure.

7.3 The amended patent according to the third auxiliary request therefore cannot be objected to under Article 100(b) EPC.

8. Novelty

8.1 Claim 1 at issue comprises all the features of claim 1 according to the main request, but is undisputedly narrower in scope than claim 1 according to the main request by virtue of the amendment made.

8.2 The changes in wording compared to claim 1 according to the main request have no bearing on the considerations under points 2.2 to 2.4 regarding novelty, which thus apply *mutatis mutandis* to the claims according to the present request.

8.3 The subject-matter of claims 1 to 15 of the third auxiliary request is thus novel (Articles 52(1) and 54(1)(2)(3) EPC).

8.4 Inventive step

8.4.1 It was common ground that document D5 still remains the closest prior art for the assessment of inventive step of the claims at issue.

8.4.2 For the board, the technical problem to be solved in the light of document D5 can be seen in the provision of a polymerisation process including a slurry loop reactor and a two-stage flash separation system which

can be operated at a high space time yield with a reduced risk of plugging in downstream equipment (see also paragraphs [0009] and [0012] of the contested patent).

8.4.3 As a solution to this technical problem, the patent proposes the process according to claim 1 at issue, which is characterised in particular in that:

(a) the loop reactor operates at a space time yield greater than 2.6; and

(b) the polymer solids are discharged from the first to the second flash tank via a seal chamber so as to maintain in said seal chamber a volume of polymer solids being a continuous plug flow having an l/d ratio of from 1.5 to 8 and being sufficient to maintain a pressure seal.

8.4.4 The board is satisfied that the technical problem as defined under point 8.4.2 is effectively solved, because a process working in the continuous operating mode according to claim 1 at issue is manifestly less sensitive to plugging in comparison to a process - such as in D5 - wherein the polymer solids are transferred from the first to the second flash vessel using a valve system as shown in more detail in D7.

Appellants II and III argued that said technical problem was not solved by the claimed process. More particularly, they held that there was no evidence of reduced plugging for the process as presently claimed. Furthermore, plugging and STY were two different issues which were not interrelated.

The board does not accept these arguments. For the board, it is technically plausible that the specific arrangement defined in claim 1 for continuously transferring material from the first to the second flash zone whilst maintaining a pressure seal is less prone to plugging than the more conventional valve system used according to D5 and illustrated in more detail in document D7. The board also considers it plausible that a reduction of the plugging risk enables the polymerisation reactor to be run at a higher space time yield and that the two issues, i.e. plugging and space time yield, are thus interrelated. Higher monomer and solids concentrations can be used in the reactor, and so a higher STY is achievable. Moreover, there is no evidence on file showing that, by using the specific way of transferring the material between the two flash zones according to the claimed process, reduced plugging could not be achieved at increased STY values in comparison to the ones disclosed in D5.

8.5 It remains to be decided whether or not the solution as proposed by the subject-matter claimed is obvious in view of the cited prior art.

8.5.1 Document D6, considered relevant in the assessment of inventive step of claim 1 of the main request, does not disclose a continuous transfer of the polymer solids from the first to the second flash tank. On the contrary, it expressly teaches a system providing an intermittent transfer of material (column 3, lines 13 to 17). So, it cannot render obvious the subject-matter of claim 1 at issue.

8.5.2 Appellants II and III considered that the claimed process was obvious in view of document A1.

8.5.3 A1 relates to the transfer of particulate solids, such as char or coke, through a conduit from one pressure zone to another pressure zone by means of a "seal leg" of substantial length, which may be affected by plugging problems and which may also breach local building regulations because the structure is too high (A1, column 1, lines 7 to 45).

8.5.4 A1 focuses on overcoming the plugging problems in the seal leg and proposes (see column 1, "summary") to this end a plurality of gas conduits tapped in spaced relationship into and across the length of the seal leg and being in communication with either or both of the high-pressure and low-pressure zones. The gas conduits are provided with pressure control means for introducing gas into or out of the seal leg to achieve a relatively uniform pressure gradient along the length of the seal leg.

8.5.5 The board is not convinced that the skilled person faced with the problem in point 8.4.2, and seeking in particular to increase the space time yield of the slurry polymerisation process known from D5, would consider document A1 at all. Document A1 tackles the problem of plugging occurring in seal legs without dealing at all with the problems occurring in slurry polymerisation processes, let alone with the specific problem of improving the space time yield in such processes.

Moreover, the technical solution taught by document A1 (gas conduits tapped into the seal leg) is not foreseen for a seal leg used for the transfer of a slurry, i.e. of a material comprising a solid and a liquid phase, from a high-pressure flash zone to a low-pressure flash zone. Therefore, even assuming in favour of appellants II and III that the skilled person would consider the content of A1, he would not find therein any hint inducing him to foresee a conventional seal leg and provide the specified l/d ratio inside the seal chamber, as a replacement for the transfer system according to D5. Without relying on *ex post facto* considerations, the skilled person would thus not arrive at the subject-matter of claim 1 at issue.

8.5.6 In writing, appellant II also referred to document D18 in this context. However, D18 only illustrates common general knowledge in the field of withdrawal of solid bulk materials from storage bins, silos and hoppers and sets out criteria for designing the corresponding equipment. That common general knowledge has no bearing on the considerations under point 8.5.5 above.

8.5.7 Document A2 (see page 1, lines 6 to 10) relates to the discharge of a material from a container under pressure to a container at lower pressure, more particularly to the discharge of residual materials such as ash and slag from a combustor. A2 (see page 3, "summary") foresees special means for stabilising the discharge with respect to variations in the gas flow through the column.

Like document A1, document A2 does not address the transfer of a slurry from one flash zone to another and

is concerned with a different technical problem than the one posed. Considerations analogous to those under point 8.5.5 thus apply to document A2.

8.5.8 The remaining documents cited during the opposition and appeal proceedings do not contain further information pointing towards the claimed solution of the technical problem stated under point 8.4.2.

8.6 For the reasons indicated above, the board concludes that the subject-matter of claim 1 at issue, and by the same token that of dependent claims 2 to 15, which includes all the features of claim 1, is not obvious to the skilled person from the cited prior art.

Therefore, the subject-matter of claims 1 to 15 according to the third auxiliary request involves an inventive step within the meaning of Articles 52(1) and 56 EPC.

9. In summary, the patent in its amended form held allowable by the opposition division is found to meet the requirements of the EPC.

Order

For these reasons it is decided that:

The appeals are dismissed.

The Registrar: The Chairman:

C. Vodz B. Czech