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**Datasheet for the decision
of 18 November 2014**

Case Number: T 1857/11 - 3.3.03

Application Number: 02785328.2

Publication Number: 1448610

IPC: C08F2/34, C08F10/00, C08F2/42

Language of the proceedings: EN

Title of invention:
CONTINUOUS GAS-PHASE POLYMERIZATION PROCESS

Patent Proprietor:
Basell Polyolefine GmbH

Relevant legal provisions:
EPC Art. 83, 54, 56

Keyword:
Sufficiency of disclosure - (yes)
Novelty - (yes)
Inventive step - (yes)



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Case Number: T 1857/11 - 3.3.03

**D E C I S I O N
of Technical Board of Appeal 3.3.03
of 18 November 2014**

Appellant: TOTAL PETROCHEMICALS RESEARCH FELUY S.A.
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 22 June 2011
rejecting the opposition filed against European
patent No. 1448610 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chairman M. C. Gordon
Members: D. Marquis
R. Cramer

Summary of Facts and Submissions

- I. The appeal by the opponent lies against the decision of the opposition division announced the 26 May 2011 posted 22 June 2011 to reject the opposition against European patent number EP-B1-1 448 610 (Application number 02 785 328.2).

Claim 1 of the patent read as follows:

"A continuous gas-phase polymerization process for preparing ethylene and propene homopolymers and copolymers, in which ethylene, propene or mixtures comprising ethylene and propene and C₃-C₈- α -monoolefins are polymerized in the polymerization zone of a gas-phase polymerization reactor at from 30 to 125°C and pressures of from 1 to 100 bar in the gas phase in a bed comprising finely divided polymer in the presence of a catalyst, with the reactor gas being circulated to remove the heat of polymerization and the circulated reactor gas being firstly passed through a cyclone after leaving the reactor, wherein a catalyst poison having a boiling point above the maximum temperature within the circulating gas system is fed into this circulating gas system at a position between the reactor and the cyclone to prevent polymer deposits in the circulating gas system."

- II. A notice of opposition against the patent was filed on 21 December 2006 in which revocation of the patent on the grounds of Article 100(a) EPC (Lack of novelty and lack of inventive step) and Article 100(b) EPC was requested.

The opposition was inter alia supported by the following documents:

D1 : EP-A1-0 359 444
D2 : EP-A1-0 301 872
D3 : EP-A1-0 927 724
D4 : FR 2 137 441

During the course of the opposition proceedings the opponent further submitted D5 (FR 2 538 397) and D6 (EP-A1-0 376 559).

III. The decision under appeal was based on the claims of the patent as granted (main request). It was held in the decision of the opposition division that the patent in suit would provide sufficient guidance concerning the selection of the catalyst poison, its amount as well as the exact position of the nozzle for metering the poison into the circulating gas line. Also, the opponent did not provide evidence showing that the definition of the point of injection of the catalyst poison as well as the amount of catalyst poison to be injected were insufficiently disclosed. It was also found that claim 1 was novel over D1. Example 3 of D1 did not disclose the presence of a cyclone in the process or the position of the injection point of the catalyst poison into the system. The passages of D1 disclosing the optional use of a cyclone and the choice of the location of the injection of the poison were two different parts of the general teaching of D1 that were not representative of the invention of D1 as a whole. Consequently these passages could not be combined with the disclosure of example 3. According to the decision, the closest prior art was represented by the teaching of D3 which related to the same three main aspects of the patent in suit, namely to avoid deposits in the recycling gas line, increase the reactor running time and provide a product of improved quality. The examples 1 to 4 of the patent in suit showed by comparison with

comparative example 2 (which was representative of D3) that the use of a cyclone in the process reduced the number of deposits, improved the running time as well as the product quality. The examples of the patent in suit also revealed the presence of a synergy between the use of the cyclone and the catalyst poison on the running time of the polymerisation process.

The technical problem to be solved in respect of D3 was to improve the amount of deposits, the running time and the product quality in a polymerisation reactor preparing polyolefins in the gas phase process with a gas recycling line. The solution to that problem was the combination of the injection of the catalyst poison with high boiling point and a subsequent cyclone.

Neither of the cited documents D2 and D5 suggested the features defined according to the patent in suit as a solution to said problem. The claimed subject matter was therefore inventive.

Accordingly the opposition was rejected.

- IV. On 19 August 2011 the opponent lodged an appeal against that decision, the prescribed fee paid on the same day. The statement of grounds of appeal was received on 31 October 2011.

The following documents were further filed:

D7: Extract of Ullman's Encyclopedia of Industrial Chemistry, published in 1988

D8: EP-A1-0 560 035

- V. The patent proprietor, now the respondent, replied to the appeal on 12 March 2012. A set of claims forming an auxiliary request was submitted, the wording of which is not relevant to the present decision.

- VI. Or 9 April 2014 the Board issued a summons to attend oral proceedings, scheduled for 18 November 2014. A communication indicating the preliminary opinion of the Board was issued on 15 July 2014.
- VII. Oral proceedings were held before the Board on 18 November 2014.
- VIII. The arguments of the appellant can be summarised as follows:

- Sufficiency of disclosure

Extensive experiments would have to be conducted in order to determine the correct location for the injection of the poison. The indication of the injection of the catalyst poison "immediately after entry of the reactor gas into the circulating gas line and before entry into the cyclone" did not provide the necessary information. This aspect was very important, as it determined whether the poison had sufficient time to effect inactivation of the catalyst before entering the cyclone. Also, the contested patent lacked important information about the reactor set-up employed in the examples, in particular regarding the configuration of the circulating gas line. This was a crucial feature of the invention. The skilled person would thus have to undertake significant experimentation in order to be able to carry out the claimed invention. Finally, the patent in suit provided a single example disclosing the amount of a single catalyst poison (Atmer 163). Claim 1 encompassed a very broad scope of catalyst poisons. As a consequence, the skilled person would not be able to perform the invention over the whole area claimed without undue burden and without needing inventive skill.

- Novelty

Example 3 of D1 was representative of the general technical teaching disclosed in the document as a whole. That example disclosed the use of DMF as a catalyst poison in a reactor set-up similar to that claimed in the patent in suit. The disclosure of Example 3 had to be read in the light of the description of D1 which indicated that a cyclone could be included in the recycle line. Therefore, D1 unambiguously disclosed a polymerization process with, in combination, a catalyst poison injected into the recycle line and a cyclone in the recycle line for separating gas and fine particles. D1 disclosed further that the catalyst poison could be injected at any point "into the line for recycling the gaseous mixture". This statement allowed only two possibilities: before the cyclone or after the cyclone. Such a selection between two alternatives could not confer novelty. Also, even if D1 did not explicitly disclose that the cyclone was located directly after the reactor on the circulating gas line, it would nonetheless be part of the possible set-up described in column 8 of D1. D1 therefore directly and unambiguously disclosed the subject-matter of claim 1.

- Inventive step

The subject-matter of claim 1 lacked inventive step in view of D1, D2, D3 or D5.

D1 and in particular example 3 thereof could be seen as the closest prior art because it dealt with a similar technical problem to that of the patent in suit. Example 3 of D1 disclosed all the features of operative

claim 1, except the use of a cyclone in the recycle line. The technical effect of the cyclone was to remove the fine dust from the circulating gas, which thus constituted the objective technical problem. D1 would lead the skilled person to the solution by indicating that the cyclone could be employed to separate the fine solid particles entrained with the gas. Moreover, because D1 indicated that only a small amount of poison should end up in the reactor, the skilled person would have placed the cyclone after the injection point of the poison in order to limit the amount of poison reaching the reactor. The teaching of D1 would have led the skilled person, in a straightforward manner, to place a cyclone in the gas recycle line downstream of the injection point of the poison, thus arriving at the subject-matter of claim 1. Accordingly, the subject-matter of claim 1 lacked inventive step over D1.

D2 could also be seen as closest prior art. The only additional feature of claim 1 of the contested patent over D2 was the injection of a "poison catalyst" [sic] with a boiling point above the highest temperature within the circulating gas system, into the recycle line at a point located before the cyclone. The technical effect was inactivation of the catalyst entering the cyclone with the fine polymer particles, thus preventing fine dust containing active catalyst entering the circulating gas system and polymerizing. Accordingly, the objective technical problem solved by the process of claim 1 was to avoid polymerization of fine particles in the circulating gas system. That problem was solved in D3, which suggested to inject a catalyst poison into the circulating gas system, whereby the poison had a boiling point above the highest temperature within the circulating gas system. Moreover D3 also suggested, in Example 1, that the

catalyst poison be injected directly after the entry of the reactor gas into the circulating gas system. Accordingly, claim 1 lacked an inventive step in view of the combination of D2 and D3.

Considering in the alternative D3 as the closest prior art, claim 1 of the contested patent differed from the teaching thereof in that the circulated reactor gas was passed through a cyclone after injection of the catalyst poison. The technical effect of this difference was the reduction of deposits in the recycle line, resulting in improved running time and product quality. Accordingly, the objective technical problem solved by the process of claim 1 was the reduction of fines in the recycle line. The use of a cyclone to reduce the formation of deposits in the recycle line was known from D2 and D4. D3 taught further to introduce a catalyst poison immediately after the entry of the recycling gas into the circulation line. The skilled person would therefore arrive at the subject matter of claim 1 of the contested patent by combining D3 and D2. D2 did not teach generally to avoid a catalyst poison in the carrier gas but merely recommended avoiding the addition of a gas containing a poison after the particles exit the cyclone. A skilled person adding a cyclone to the set-up of D3 knew that the poison would be mainly removed from the circulating gas in the cyclone, and as a result would not be reinjected in the reactor. In addition, D8 showed that the catalyst poison of D3 (Atmer 163) could be introduced in high amount upstream of the gas phase reactor without impairing catalyst activity. Accordingly the skilled person would know from the teaching of D8 that addition of Atmer 163 in combination with a cyclone in a line feeding the reactor could be employed with good results. D2 would

consequently not prevent the skilled person when starting from D3 from using the combination of a catalyst such as Atmer 163 and a cyclone. Claim 1 was thus not inventive over D3 combined with D2 or D4.

D5 could also be seen as the closest prior art as it belonged to the technical field of gas-phase polymerization of alpha-olefins and addressed specifically the problem of avoiding the formation of polymer deposits in the gas recycle line. Similarly to the contested patent, D5 taught that the formation of the deposits was due to polymerization in the presence of active catalyst entrained in the recycle gas. D5 furthermore disclosed a polymerization plant comprising a gas recycle line with an injection point (A) for a catalyst poison, located upstream of a cyclone. The process of D5 differed from that of the claimed subject matter by the polymerization conditions employed. The objective technical problem was to produce a different polymer product. That problem was not related to the problem, common to D5 and the contested patent, of avoiding polymer deposits in the gas recycle line. The skilled person would have solved the posed problem by adapting the polymerization conditions in view of the desired final properties of the polymer, for example by using the polymerization process of D3. Additionally, when varying the polymerization conditions, the skilled person would have retained the equipment of D5. The subject matter of claim 1 consisted only in adapting the disclosure of D5 to different conditions of pressure and temperature, which adaptations were straightforward for the skilled person.

IX. The arguments of the respondent can be summarised as follows:

- Sufficiency of disclosure

The patent in suit contained a detailed presentation of the mode of operation of the process and explained why an absolute amount of catalyst poison was not given. It was set out how the optimum amount of poison could be determined. Example 1 of the patent disclosed said parameters in detail for a specific polymerization. Accordingly, a skilled person would clearly be able to identify these parameters without any inventive effort or undue burden.

- Novelty

The presence of a cyclone in the process of D1 was only disclosed in the description as an optional measure and was not part of the disclosure of Example 3. It was also nowhere disclosed in D1 that the catalyst poison should be fed into the circulating gas system at a position between the reactor and the cyclone. In the absence of any further teaching, a person skilled in the art would rather feed the catalyst poison to the circulating gas system shortly before entering the polymerization reactor than after the reactor and before the cyclone, as disclosed in Example 1 of D6. Since the boiling point of the catalyst poison used in Example 3 of D1 was not representative of the general technical teaching of D1, a skilled person would not have combined this feature with a feature disclosed in the description such as the option of using a cyclone in the circulating gas system. Consequently, the claimed subject matter was novel over D1.

- Inventive step

None of D1, D2 or D5 could be seen as the closest prior

art because these documents did not address the same technical problem as the patent in suit.

D3 had to be seen as the closest prior art. The claimed subject matter differed from Example 1 thereof in the additional use of a cyclone. Even if a skilled person would consider including a cyclone in the recycle gas line upstream of the cooler, the preferred embodiment of D3 still encompassed two possibilities: that the catalyst poison is fed upstream of the cyclone and accordingly also upstream of the cooler. Alternatively D3 encompassed the possibility that the catalyst poison be fed downstream of the cyclone, between the cyclone and the cooler. D2 did not disclose the use of a cyclone to reduce the amount of deposits in recycle gas line. D2 taught to feed the solid particles separated from the recycle gas into the reactor at a position above the fluidized bed in order to reduce the likelihood of blockage of the particle recycle line and also taught away from the use of a cyclone in a system already using catalyst poison. Also, the combination of documents D3 and D2 provided no indication of a synergistic effect arising from the combined use of a catalyst poison and a cyclone.

- X. The appellant (opponent) requested that the decision under appeal be set aside and that the European patent Nr 1 448 610 be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed and the patent be maintained as granted (main request), or alternatively that the decision under appeal be set aside and the patent be maintained in amended form on the basis of the auxiliary request filed with the reply to the statement of grounds of appeal.

Reasons for the Decision

1. The appeal is admissible.

Main request (as granted)

2. Sufficiency of disclosure
 - 2.1 Concerning the question of sufficiency of disclosure of the location of the point of injection of the catalyst poison, the opposition division found in its contested decision that the opponent had not provided evidence that the disclosure in respect of the location of the injection points between the reactor and the cyclone was insufficient to the extent that the subject-matter claimed would not be operable at one or more of the locations encompassed by the claim. The opposition division found that the patent in suit contained a working example (paragraph [0030]) disclosing the exact position of the nozzle to meter the poison into the circulating gas line and the amount and type of poison. On that basis and with the guidance found in the description explaining why the catalyst poison was added and to what effect, the opposition division concluded that the claimed subject matter was sufficiently disclosed. Also, the opposition division found that the opponent bears the burden of proof of showing why the description of the location of the injection point of the catalyst poison "between the reactor and the cyclone" would be insufficient to carry out the claimed invention.
 - 2.2 In its statement setting out the grounds of appeal, the opponent merely maintained the objection that the contested patent lacked sufficient disclosure regarding

the location of the injection point in the circulating gas system and the amount of catalyst poison to be injected. As in the proceedings before the opposition division, the opponent alleged that the indication of the location of the injection point of the catalyst poison contained in the patent was too vague and would not explain how far from the reactor or from the cyclone the injection point had to be in order to effect inactivation of the catalyst while preventing the catalyst poison from accidentally entering the reactor. That parameter was important and could only be determined through time-consuming and expensive experiments which could not be seen as a routine test.

- 2.3 Neither before the opposition division nor during the appeal proceedings did the opponent provide support for his arguments. The opponent merely contended that the location of the injection point with respect to the reactor and the cyclone was important but did not show how and why a lack of guidance regarding the exact location of the injection point in the patent in suit, if that was so important to the claimed process, would prevent the skilled person from performing the claimed invention. Thus, as already mentioned in the decision of the opposition division, the opponent has not shown that the invention could not be carried out without the missing guidance. By not discharging his burden of proof, the opponent did not succeed in showing that the decision of the opposition division was incorrect. According to the established jurisprudence of the Boards of Appeal, each of the parties to the proceedings carries the burden of proof for the facts it alleges. If a party whose arguments rest on these alleged facts does not discharge its burden of proof, this goes to the detriment of that party (see Case Law of the Boards of Appeal of the European Patent Office,

7th edition, 2013, III.G.5).

As the appellant did not provide proof of his allegations, the board has no grounds for concluding that the decision of the opposition division in respect of sufficiency of disclosure was incorrect.

3. Novelty

3.1 Example 3 of D1 discloses a continuous gas-phase polymerization of ethylene and 1-butene in a bed comprising finely divided polyethylene in the presence of a Ziegler Natta catalyst, and an external line for gas circulation, wherein DMF as catalyst poison was continuously fed into this circulating gas system. In its lower part, the reactor is equipped with a fluidisation grid and an external line for recycling gas connected to a gas circulation compressor and with means of heat transfer. The gas reaction mixture of ethylene, 1-butene, hydrogen and nitrogen passes through the fluidised bed and the catalyst is introduced into the reactor intermittently. The catalyst poison is introduced continuously during the polymerization into the gas recycling line so as to keep the output of linear low density polyethylene at a constant value.

3.2 The process disclosed in Example 3 of D1 does not involve a cyclone and consequently does not disclose the location of the injection point of the catalyst poison into the circulating gas system with respect to the position of the cyclone, or that the reactor gas is firstly passed through a cyclone after leaving the reactor.

3.3 The optional presence of a cyclone as a gas/solid separation means in the polymerisation, as well as a means for recycling fine particles directly into the polymerisation reactor in the recycling line is mentioned in column 8, lines 2 to 28 of D1. The objection of lack of novelty of claim 1 in respect of D1 was based on the combination of that passage of the general description with the specific disclosure of Example 3.

Having regard to the passage of column 8 of D1, there is no specific disclosure to position a cyclone in the circulating gas line of Example 3 and there is no guidance in D1 on how the process parameters of Example 3 and especially the amount and flow rate of the activity retarder would have to be adapted in the case that a cyclone were to be located in the circulating gas line. A cyclone is a means for separating gas from entrained fine solid particles (column 8, line 22). The efficiency of the separation may significantly alter the amount of activity retarder present in the circulating gas which thus remains in the polymerisation system. Since the amount of the activity retarder within the system is stated to be critical to the polymerisation (D1 column 3, lines 17 to 22 and lines 50 to 56; column 5, lines 27 to 33) and the rate of introduction of the catalyst poison has to be varied with time in order to maintain a substantially constant polymerization rate despite slight fluctuations occurring in the quality of the reactants or the catalyst or in the supply of catalyst to the reactor, the introduction of a cyclone into the process of Example 3 would require some guidance on how to adapt that process to accommodate such a modification. No such guidance is provided in D1. Therefore, the Board is satisfied that the passage of D1 disclosing the

optional use of a cyclone in the polymerisation system of the broader disclosure of D1 cannot be combined with the specific process of Example 3 to generate a notional disclosure of a system according to the example 3 modified solely by the presence of a cyclone.

- 3.4 Furthermore, D1 discloses that the activity retarder can be introduced at any point within the gas/solid separation means, i.e. in the reactor or in the cyclone, if present, or on the means for recycling the fine particles. D1 therefore does not explicitly and unambiguously disclose that the activity retarder is fed into the recycling line at a position between the reactor and a cyclone - if present - as required by claim 1 of the main request.
- 3.5 D1 also does not disclose that in the case that the optional cyclone is present the circulated reactor gas inevitably would first pass through the cyclone after leaving the reactor as required by claim 1 of the main request. That such a configuration is not necessarily the case is shown by D5 (Figure) wherein the circulated gas leaving the reactor is first passed through a medium pressure separator (3) before entering the cyclone (4) or in D3 (paragraph [0014]) wherein the circulated reactor gas is fed to a circulating gas compressor and a circulating gas cooler after leaving the gas-phase fluidized-bed reactor. As a result, even the combination of the process of Example 3 of D1 with the passage of the description in column 8, does not disclose, either explicitly or implicitly, the claimed subject matter.
- 3.6 Claim 1 of the main request is therefore novel over D1.

No other documents were alleged to anticipate the

subject-matter of operative claim 1. The Board is also satisfied that none of the other documents in the proceedings anticipate said subject-matter.

3.7 The main request therefore meets the requirements of Article 54 EPC.

4. Inventive step

4.1 The closest prior art

4.1.1 The patent in suit relates to a continuous gas-phase polymerization process for preparing ethylene and propene homopolymers and copolymers, in which ethylene, propene or mixtures comprising ethylene and propene and C3-C8- α -monoolefins are polymerized in the polymerization zone of a gas-phase polymerization reactor at from 30 to 125°C and pressures of from 1 to 100 bar in the gas phase in a bed comprising finely divided polymer in the presence of a catalyst, with the reactor gas being circulated to remove the heat of polymerization and the circulated reactor gas being firstly passed through a cyclone after leaving the reactor (paragraph [0001]).

The process of the patent in suit also aims at preventing formation of polymer deposits in the circulating gas system of gas-phase polymerization plants which is simple in terms of apparatus, to increase the running time of such plants and to increase the quality of the polymerization products (paragraphs [0008], [0013] and [0029]).

4.1.2 D1 discloses a gas-phase polymerization process in which a small amount of an activity retarder is introduced continuously into the reactor at a flow rate

which is varied with time so as to keep substantially constant either the polymerisation rate or the content of transition metal in the polymer produced (Claim 1). D1 addresses the problem of the formation of agglomerates of molten polymer as a result of small variations of catalyst activity during the polymerisation that can cause hot spots in the reaction bed (column 1, lines 45 to 49). The problem addressed by D1 is different from that underlying the patent in suit, which is to avoid deposits of polymer particles in the circulating gas line outside the reactor. D1 therefore appears to be remote from the problem addressed by the patent in suit.

4.1.3 D2 discloses a process for gas polymerisation of olefin in a fluidized bed reactor. The problem addressed in D2 is to reduce the likelihood of blockage of the particle recycle line and to avoid locally high concentrations of active fine particles in the fluidized bed, which can lead to the formation of agglomerates of molten polymer (column 3, lines 11 to 26). The problem of D2 is also different from that of the patent in suit (see above). D2 therefore does not address the problem underlying the patent in suit.

4.1.4 D5 discloses an ethylene polymerization process which is carried out at a temperature of between 180°C and 300°C under a pressure of 300 to 2500 bars (page 2, lines 2 to 3). The polymerization is therefore carried out at conditions above the critical point of ethylene so that the polymerization does not occur in the gas phase but in a supercritical phase. Also, D5 does not disclose that the reactor content or a part thereof when leaving the reactor is firstly passed through a cyclone. Furthermore, D5 does not address the quality of the resulting polymerization products. Therefore, D5

discloses a polymerization process that is not a gas-phase polymerization process and is consequently significantly different from that disclosed in the patent in suit.

- 4.1.5 D3 discloses a continuous gas-phase polymerization process for preparing ethylene and propene homopolymers and copolymers, in which ethylene, propene or a mixture of ethylene or propene and C3-C8- α -monoolefins is polymerized in the polymerization zone of a gas-phase polymerization reactor at a temperature from 30 to 125° C and a pressure of from 1 to 100 bar in the gas phase in a bed of finely divided polymer in the presence of a catalyst, wherein the reactor gas is circulated to remove the heat of polymerization, wherein, to prevent polymer deposits in the circulating gas line, a catalyst poison which is an alkylamino ethoxylate having a boiling point above the maximum temperature within the circulating gas line is metered into the circulating gas line in an amount that does not significantly impair the productivity of the catalyst in the reactor (Claim 1).

Through the use of catalyst poisons for preventing deposits in the circulating gas line of gas-phase fluidized-bed polymerization plants, D3 aims at providing an increase in the running time of such plants without adversely affecting the productivity of the catalyst. The process of D3 is structurally close to that of the patent in suit and the problem addressed in D3 is also similar to that of the patent in suit. D3 is the document which is closest to the problem addressed by the patent in suit, and therefore represents the closest prior art.

4.2 The technical problem

4.2.1 As noted above, the patent seeks to provide a way of preventing formation of polymer deposits in the circulating gas system of gas-phase polymerization plants which is simple in terms of apparatus, to increase the running time of such plants and to increase the quality of the polymerization products (paragraph [0008]). The examples of the patent in suit disclose a continuous gas-phase polymerisation process for the production of an MDPE (ethylene-1-hexene copolymer) film product that was prepared using a chromium catalyst and a reactor pressure of 21 bar in a gas-phase fluidized-bed production reactor. A solution of Atmer 163 in hexane was metered into the circulating gas line via a nozzle immediately after entry of the reactor gas into the circulating gas line and before entry into the cyclone. Atmer 163 was metered at a rate of 0.6 ppm based on the reactor output. The time for which the polymerization ran until shutdown was rendered necessary because of deposits in the circulating gas system or at the bottom of the reactor was recorded in each case and the film quality grade of the resulting polymer was determined over the duration of the reactor operation. The process described in example 1 was conducted in the presence of a cyclone and is representative of the claimed subject matter. The process of comparative example 2 of the patent in suit was conducted as in example 1 with the difference that a cyclone was not part of the process set-up. That example is consequently representative of the process of D3 which also discloses in its example 1 the production of an MDPE film from a similar reactor set-up and in the presence of ATMER 163 as a catalyst poison.

4.2.2 The table provided in paragraph [0031] of the patent in suit shows a reactor running time until shutdown of more than 1100 days in the case of example 1 whereas the running time is 110 days in the case of comparative example 2. Furthermore, the film quality grade which is a qualitative parameter to indicate the quality of the film on a scale of 1 (very good without specks) to 6 (very poor with numerous specks), is reported to be 2 and constant in example 1 whereas it reached a grade of 3-4 after 45 days in comparative example 2. These results show that the process according to the patent in suit leads to an increase of the reactor running time compared to the process of D3. The technical problem which can be formulated in the light of the above evidence is therefore the provision of a continuous gas-phase polymerization process for preparing ethylene and propene homopolymers and copolymers with an improved reactor running time and which delivers products of improved film quality.

4.3 Solution

4.3.1 The solution to the above problem resides in the continuous gas-phase polymerization process defined in claim 1 and more specifically in the use of a cyclone wherein the reactor gas is circulated to remove the heat of polymerization, the circulated reactor gas being firstly passed through a cyclone after leaving the reactor. This feature also represents the distinguishing feature of present claim 1 of the main request over D3 which does not disclose a cyclone in its examples.

4.4 Obviousness

4.4.1 It remains to be decided whether the proposed solution to the technical problem as defined above is obvious in view of the prior art. Starting from the closest prior art D3, the question to be answered is whether a skilled person would have employed a cyclone and would have located the cyclone directly after the reactor on the gas circulating line.

4.4.2 D3 discloses that many fluidized-bed plants of the prior art include a cyclone downstream of the reactor outlet to remove the reactive fine dust particles that tend to precipitate in the circulating gas system. However, D3 also indicates that the use of a cyclone represents a considerable outlay in terms of apparatus and its efficiency in removing very fine dusts is often unsatisfactory (paragraph [0006]). Instead, D3 proposes to solve that problem through the use of a catalyst poison having a boiling point above the maximum temperature within the circulating gas line and which is metered into this circulating gas line in an amount such that it does not significantly impair the productivity of the catalyst in the reactor (paragraphs [0009] and [0010]). D3 therefore defines its object as preventing the formation of polymer deposits in the circulating gas line of gas-phase polymerization reactors without use of complicated apparatus in order to increase the running time of such plants and to improve the quality of the polymerization products. D3 therefore leads away from the use of a cyclone and consequently does not suggest the use of a cyclone in combination with catalyst poisons.

4.4.3 Even if the person skilled in the art would depart from the teaching of D3 regarding the desirability of avoiding complicated apparatus and would consider the teaching of D1, which mentions that a cyclone can be

used in a similar process in combination with a catalyst poison or activity retarder, D1 does not provide any motivation to use a cyclone in the process of D3 in the expectation of reducing the fine dust and deposit formation in the circulating gas system and thereby improving the reactor running time because D1 only addresses the problem of the formation of agglomerates in the reactor bed and does not mention the problem of the deposit formation in the circulating gas system.

4.4.4 The person skilled in the art therefore does not find in D3 or in D1 a hint towards the use of a cyclone in order to solve the posed technical problem of providing a continuous gas-phase polymerization process for preparing ethylene and propene homopolymers and copolymers with an improved reactor running time and which delivers products of improved film quality. The subject matter of claim 1 is therefore not obvious. The same applies to dependent claims 2 to 9 which represent particular embodiments of the subject-matter of claim 1. The main requests satisfies the requirements of Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



B. ter Heijden

M. C. Gordon

Decision electronically authenticated