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Datasheet for the decision of 10 March 2021

Case Number: T 1168/19 - 3.3.03

Application Number: 14157217.2

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Title of invention:
Continuous take off technique and pressure control of polymerization reactors

Patent Proprietor:
CHEVRON PHILLIPS CHEMICAL COMPANY LP

Opponent:
Borealis AG

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - (yes)

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Case Number: T 1168/19 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 10 March 2021

Appellant: (Patent Proprietor)	CHEVRON PHILLIPS CHEMICAL COMPANY LP 10001 Six Pines Drive The Woodlands, TX 77380 (US)
Representative:	Abel & Imray Westpoint Building James Street West Bath BA1 2DA (GB)
Respondent: (Opponent)	Borealis AG Wagramerstrasse 17-19 1220 Vienna (AT)
Representative:	Borealis AG Borealis Polyolefine GmbH IPR-Department St.-Peter-Straße 25 4021 Linz (AT)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 8 February 2019 revoking European patent No. 2738184 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	D. Semino
Members:	O. Dury
	R. Cramer

Summary of Facts and Submissions

I. The appeal by the patent proprietor lies against the decision of the opposition division posted on 8 February 2019 revoking European patent No. 2 738 184. The application on which the patent is based was filed as a divisional application of parent application No. 11 724 839.3.

II. A notice of opposition against the patent had been filed, in which the revocation of the patent in its entirety was requested.

III. The decision under appeal was based among others on the set of claims of auxiliary request 8A filed with letter of 2 November 2018, of which claim 1 (which is the sole claim relevant to the present decision) read as follows:

"1. A method of producing a polyolefin, comprising:

providing a diluent and a first monomer to a first polymerization reactor;

polymerizing the first monomer in the first polymerization reactor to form a first polyolefin in a first slurry;

discharging a transfer slurry comprising the first polyolefin polymer and the diluent continuously from the first polymerization reactor to a second polymerization reactor at a flow rate;

modulating the flow rate of the transfer slurry through

a transfer line to the second loop reactor using a first continuous take-off device located on the second polymerization reactor; and

polymerizing a second monomer in the second polymerization reactor to form a second polyolefin polymer in a second slurry; and

wherein one of the first and second polymerization reactors is operated under a set of conditions to produce a polyolefin polymer having a high molecular weight and a low density, and the other of the first and second polymerization reactors is operated under a set of conditions to produce a polyolefin polymer having a lower molecular weight and a higher density."

IV. The following documents were *inter alia* cited in the decision under appeal:

D3: WO 2009/027197
D4: WO 96/18662
D5: EP 2 186 833
D7: WO 03/074167
D8: EP 0 891 990
D11: EP 1 415 999

V. In the decision under appeal the opposition division held that none of the then valid requests fulfilled the requirements of the EPC in respect of at least one of Article 76(1), 123(2), 84 or 56 EPC, whereby inventive step was assessed starting from D4 as the closest prior art. Therefore, the patent was revoked.

In respect of inventive step, the opposition division in particular reached its conclusion considering that "the inevitable result of direct transfer between first

and second loop reactors along line 21 in combination with continually removing material from the second loop reactor via exhaust valve 27 would be the modulation of the flow rate of the slurry in line 21 as described in claim 1" (last paragraph of section 20.5.6 of the reasons, in relation with the then valid auxiliary request 2A).

VI. The patent proprietor (appellant) appealed the above decision. With the statement setting out the grounds of appeal the appellant requested that the patent be maintained in amended form according to any of the main request or auxiliary requests 1 to 11 filed therewith, whereby the claims of the main request were identical to the ones of auxiliary request 8A dealt with in the decision under appeal.

VII. In its reply to the statement of grounds of appeal the opponent (respondent) requested, among others, that the appeal be dismissed.

VIII. With letter of 10 July 2019, the parties were summoned to oral proceedings. Issues to be discussed at the oral proceedings were then specified by the Board in a communication dated 5 March 2020. In sections 7.1.1 to 7.1.7 of said communication, it was in particular explained why the Board was of the opinion that the appellant's view that D4 was not a suitable document to be taken as the closest prior art for the assessment of the inventive step did not appear convincing.

IX. With the explicit agreement of both parties, oral proceedings were held on 10 March 2021 in the form of a videoconference (the Board was in a room at the premises in Haar and both parties were connected via video link).

During these oral proceedings, the following submissions were made among others:

- At the beginning of the oral proceedings, the appellant withdrew auxiliary requests 1 to 6 filed with the statement of grounds of appeal;

- The respondent withdrew their objection of lack of novelty over D4;

- The appellant's view that D4 was not a valid document to be taken as the closest prior art was not further pursued.

X. The appellant's arguments, insofar as relevant to the decision, may be summarised as follows:

Main request - Reading of claim 1

(a) The technical features of operative claim 1 were to be read as follows:

- In line with paragraph 40 of the patent in suit, a continuous take-off ("CTO") device meant a device which was not only suitable to continuously withdraw but also to control or modulate a fluid/slurry. Therefore, a continuous take-off device had to comprise a control valve while an open nozzle or a mere conduit was not a CTO device in the sense of the patent in suit;

- According to the wording of claim 1 itself, the "transfer slurry" was the slurry which was discharged from the first polymerization reactor and transferred to the second polymerization

reactor. Also, the same slurry was referred to in the passages of operative claim 1 related to the discharge from the first polymerization reactor to the second reactor and in the modulation step;

- The expression "modulating the flow rate" implied a regulation or adjustment, i.e. an active operation in order to maintain a flow rate in a desired range, which implied some mandatory steps of measurement or check of said flow rate. The wording of operative claim 1 further imposed that the flow rate of the transfer slurry was influenced as desired by a CTO device located on the second reactor.

Main request - Inventive step

(b) Either D3 or D4 constituted a suitable document to be taken as the closest prior art. In particular the methods of producing polyolefins carried out in the examples of D3 (together with figure 1) or according to the examples of D4 (together with its figure) were good starting points for the assessment of the inventive step.

(c) The subject-matter of operative claim 1 differed from the methods of producing a polyolefin according to either D3 or D4 at least in the feature "modulating the flow rate of the transfer slurry through a transfer line to the second loop reactor using a first continuous take-off device located on the second polymerization reactor".

In that respect, when assessing the disclosure of document D3, the flow rate to be modulated according to operative claim 1 was the one of the

slurry in line 18, not in line 30/30a.

(d) It was derivable from paragraph 7 of the patent in suit that the following problems over the closest prior art documents were addressed:

- as compared to D3: to provide a simplified method which avoided clogging. In particular, the method being claimed allowed to provide a simpler transfer line between both reactors than the complicated belt line combining a long recycling line and a discharge line according to D3;

- as compared to D4: to provide a method which allowed operations at an increase solids level in the transfer line between the polymerisation reactors while avoiding clogging.

Although the patent in suit contained no examples illustrative of the subject-matter being claimed (and therefore no direct comparison with the closest prior art), it was credible, when considering the patent specification as a whole and the prior art documents, that said problems were effectively solved by a method according to operative claim 1.

(e) Since at least the distinguishing feature identified above was not disclosed in any of the documents relied upon by the respondent, the subject-matter being claimed could not be obvious over D3 or D4, either alone or in combination with any of the other mentioned documents.

(f) Therefore, the subject-matter of operative claim 1 was inventive.

XI. The respondent's arguments, insofar as relevant to the decision, may be summarised as follows:

Main request - Reading of claim 1

(a) The technical features of operative claim 1 were to be read as follows:

- The term "continuous take-off device" had no accepted definition in the art and should be interpreted in its broadest sense, i.e. as meaning anything suitable to provide a continuous discharge. In view of paragraphs 39 and 40 of the patent in suit, a mere conduit, an open nozzle or a single valve were a CTO device;

- The "transfer slurry" was not limited in any manner and the use of both the indefinite article "a" when referring to the discharge from the first reactor and the definite article "the" when referring to the modulation in operative claim 1 meant that different slurries could be considered in these passages of claim 1;

- The expression "modulating the flow rate" was to be read in its broadest sense, which meant that it encompassed any kind of change of the flow rate. In particular, that term included any change that the manipulation of a CTO device located on the second reactor caused to the transfer slurry flow rate, even if the change existed only for a short period and/or were undesired. The more limited interpretation of

that expression contemplated by the appellant relied on features mentioned in the description but which were not reflected in operative claim 1. Therefore, that interpretation was not correct. In addition, the word "modulate" had a broader meaning than the word "control", as was derivable from paragraph 55 of the patent in suit according to which a partial control was seen as a modulation.

(b) In view of the definition of a CTO device given above, any conduit or reactor on which a continuous discharge took place had to implicitly comprise a CTO device. This was in particular the case for line 28 in figure 1 of D3. Valve 27 in the figure of D4, when used for a continuous discharge, was also a CTO device.

Main request - Inventive step

(c) Either D4 or D3 was a suitable document to be taken as the closest prior art. In particular the methods of producing polyolefins carried out in the examples of D3 (together with figure 1) or according to the embodiment of page 12, lines 31-33 of D4 (with continuous transfer of the slurry in line 21 between the reactors represented in the figure of D4) were appropriate starting points for the assessment of inventive step.

(d) In view of figure 1 of D3 and of the polymerisation conditions employed, operating the - implicitly present - CTO device at the outlet of the second reactor in line 28 necessarily affected the pressure of said reactor, which in turn affected the pressure gradient between both reactors and, as

a further consequence, the flow rate in transfer line 30/30a. Even if the transfer line according to operative claim 1 were held to be line 18, which was contested, the flow rate of the slurry in line 18 would also be mandatorily affected, i.e. modulated when operating the CTO device in line 28.

The same was valid in view of the process run in the apparatus of the figure of D4 and of the polymerisation conditions employed: operating the CTO device 27 at the outlet of the second reactor necessarily affected the pressure of said reactor, which in turn affected the pressure gradient between both reactors and, as a further consequence, the flow rate in transfer line 21.

These conclusions were in line with paragraph 55 (with reference to figure 3) of the patent in suit, which indicated that the "pressure within the first reactor 102 may be at least partially controlled by fluidly connecting the first reactor 102 and the second reactor 112 in a continuous state".

Therefore, the subject-matter of operative claim 1 did not differ from the disclosure of either D3 or D4 in the feature "modulating the flow rate of the transfer slurry through a transfer line to the second loop reactor using a first continuous take-off device located on the second polymerization reactor".

(e) Independently whether or not the "modulation" feature of operative claim 1 was seen as a distinguishing feature over the disclosures of D3 and D4, considering that the patent in suit contained no examples illustrative of the subject-

matter being claimed and that no comparison with the closest prior art had been made, the problem effectively solved could only reside in the provision of an alternative method to the ones according to D3 or D4. The provision of a simplification over D3 was not acceptable since a transfer line according to D3 was not excluded from the scope of the operative claims.

(f) Considering that, as indicated above, it was known in the art that operating a CTO device in the discharge line of the second reactor affected not only the pressure in the second reactor but also the pressure drop in the transfer line between both reactors, including line 18 according to figure 1 of D3, it was obvious to use the CTO device at location 28 to "modulat(e) the flow rate of the transfer slurry" according to operative claim 1. That conclusion was further supported by D11 (paragraph 38), D7 (page 18, lines 23-27), D8 (page 4, lines 31-33) and D5 (paragraph 28), in particular since it was known from D8 that the rate of withdrawal by such a CTO device could be used to control the reactor pressure.

The same conclusion was valid for D4 in view of the CTO device 27 located at the outlet of the second reactor shown in the the figure of that document.

(g) The requirements in terms of molecular weight and density specified in operative claim 1 were further obvious in view of the disclosure provided by each of D3 and D4 in that respect.

(h) For these reasons, the subject-matter of claim 1 of the main request was not inventive over both D3 or

D4.

XII. The appellant requested that the decision under appeal be set aside and that the patent be maintained in amended form according to the claims of any of the main request or auxiliary requests 7 to 11, all filed with the statement of grounds of appeal.

The respondent requested that the appeal be dismissed.

Reasons for the Decision

Main request

1. Reading of the claims' disputed features

1.1 The issue in dispute between the parties which is decisive for the present decision concerns the reading of the expression "modulating the flow rate of the transfer slurry through a transfer line to the second loop reactor using a first continuous take-off device located on the second polymerization reactor" according to operative claim 1.

1.2 Operative claim 1 is directed to a method of producing a polyolefin, whereby two reactors are connected in series, such that the product slurry from the first reactor is transferred to the second reactor wherein both reactors operate continuously (a continuous discharge is present from both reactors). This means that both reactors operate ideally at steady state conditions whereby as for any chemical process the skilled person is aware that independently of its definition some sort of control system takes care that

in the presence of input changes or disturbances the steady state conditions are maintained as far as possible.

1.3 With this in mind, the Board is of the opinion that the skilled person would not read the feature "modulating the flow rate ... " according to operative claim 1 as encompassing any kind of change of the flow rate, even if the change existed only for a short period and/or were undesired, as put forward by the respondent, since such a reading would not be considered as a "modulation". In the context of the claim such a reading, which would be in practice not limiting, could only be the result of an interpretation of the claim without "a mind willing to understand" which is not the reading of the skilled person according to the consistent case law (Case Law of the Boards of Appeal of the EPO, 9th edition, 2019, II.A.6.1).

The Board therefore considers that it would not make sense to read that feature as the definition of a device installed on such a polymerisation unit which can provoke an uncontrolled variation of the flow rate in a specific part of said unit. Rather, the Board shares the view of the appellant that this expression would be read by the skilled person considering the context of the operative claims in a more specific manner, namely as meaning a regulation or adjustment of the flow rate in the transfer line, i.e. an active operation implying an influence in a desired manner when the system is run under certain steady state conditions in order to maintain the flow rate in said transfer line in a desired range, which implies some mandatory steps of measurement or check of said flow rate.

Therefore, it is this interpretation which is applied in the following analysis.

1.4 In that respect, although the above conclusion was reached on the basis of the wording of operative claim 1 read in its technical context, such a reading is plainly in line with the whole disclosure of the patent specification, whereby it is in particular indicated that the aim of the patent in suit was to control the flow rate of the slurry between the reactors in order to avoid deviations from a set of desired reaction conditions and problems related to clogging (paragraph 7). Also, it is derivable from figure 2 and from paragraphs 53-56 of the patent in suit that these aims were achieved by monitoring the transfer line between both reactors, whereby the maintenance of the steady state conditions desired was achieved in particular by activating a CTO device located on the second reactor (CTO device 116). However, it is not for that reason that the conclusion indicated in section 1.3 was reached, contrary to the respondent's view. In other words, said conclusion was not drawn by giving to the features of the claims a limited sense on the basis of the content of the patent specification but only in view of the mere wording of these claims while giving to the word "modulating" a meaning which, in the Board's view, would be adopted by the skilled person working in the present technical field.

1.5 Regarding the meaning of the expression "continuous take-off device" contained in operative claim 1, it was not shown that it has an accepted definition in the art. Therefore, it has to be read in its broadest, technically sensible meaning. In that respect, it was not in dispute that that expression, per se, means a

device suitable to discharge/withdraw a slurry or fluid from e.g. a reactor or a conduit, whereby the word "continuous" further requires that said withdrawal takes place in a continuous manner (as opposite to intermittent withdrawal, which is an alternative discharge mode well known in the art). While the presence of a continuous discharge from a reactor then automatically implies the presence of a CTO device read in its broadest meaning, the whole of the process feature in which the CTO device appears in claim 1 implies that this device should be suitable to "modulate" the flow rate of the transfer slurry. Therefore, that expression is read in the present decision as encompassing any device suitable to vary as desired the discharge of a slurry/fluid from e.g. a reactor or a conduit in a continuous manner. Accordingly, such a CTO device could be a control valve but not an open nozzle or a mere open conduit - as argued by the respondent -, since the latter embodiments would not allow said device to be used to modulate the flow rate of the transfer slurry.

2. Inventive step starting from D3 as closest prior art

2.1 Document D3 as closest prior art

Both parties agreed that D3 was a suitable document to be taken as the closest prior art. The Board sees no reason to deviate from that view.

2.2 Distinguishing feature(s) over D3

2.2.1 D3 discloses a process for the slurry polymerization of one or more α-olefins in a sequence of at least two loop reactors interconnected by means of a transfer line, the transfer of polymer from a first loop reactor

to a second loop reactor comprising the steps:

i) establishing a recycle of polymer slurry to the second loop reactor by means of said transfer line, whereby a fraction of polymer slurry S1 withdrawn from said second loop reactor is continuously recycled back to it;

ii) discharging a fraction of polymer slurry produced in the first loop reactor into a discharge line connected to said transfer line;

wherein the weight ratio R between the total polymer slurry S2 recycled back to said second loop reactor and the productivity of the polymerization plant ranges from 2 to 8 (claim 1).

Such a process is in particular carried out in the examples of D3 using a sequence of two loop reactors (first reactor 10, second reactor 20) as shown in figure 1, which is reproduced here:

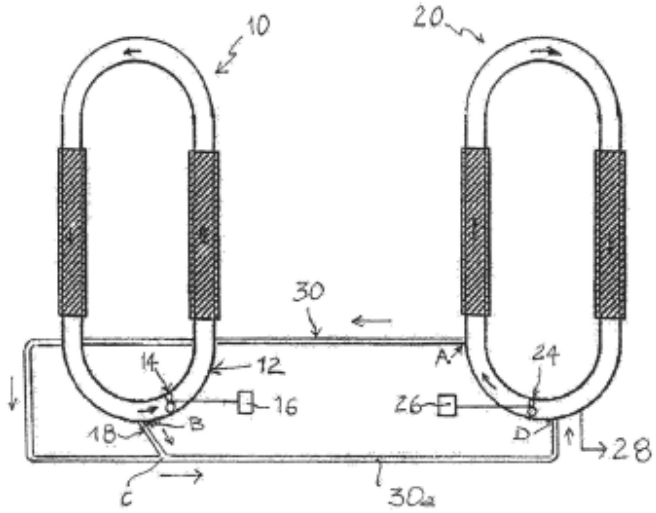


FIG. 1

2.2.2 It was in dispute between the parties which part of figure 1 of D3 corresponds to the "transfer line" according to operative claim 1 (appellant: line 18; respondent: line 30a).

In that respect, the "transfer slurry" is explicitly defined in operative claim 1 as the slurry which is discharged from the first polymerisation reactor. Said slurry, which is present as such in line 18 of figure 1 of D3 (between points B and C) is then mixed at point C with the slurry flow S1 - as defined in claim 1 of D3 -, whereby its flow rate is modified by mixing with S1 so as to obtain flow rate S2 - as defined in claim 1 of D3 - in line 30a. Therefore, the "transfer slurry" according to operative claim 1 is only present as such in line 18 of figure 1 of D3 and the "transfer line" in which the flow of the transfer slurry should be modulated according to operative claim 1 can only be line 18 of figure 1 of D3.

In the Board's view, the fact that the transfer slurry mentioned in the modulation step of operative claim 1 is preceded by the definite article "the" can only mean that it refers to the previously mentioned transfer slurry of the discharging step. Therefore, the respondent's argument that the "transfer slurry" mentioned twice in operative claim 1 could refer to different slurries is rejected.

2.2.3 The respondent argued that the discharge line 28 (from the second reactor) of figure 1 of D3 mandatorily comprised a CTO device in the sense of the patent in suit.

In that respect, in view of the reading of the term CTO device indicated in section 1.5 above and further

considering that D3 teaches that the slurry is "continuously discharged" from line 28 (page 10, four lines from the bottom), it is agreed with the respondent that line 28 of figure 1 of D3 must comprise a CTO device in the sense of the operative claims, which is mandatory in order to be able to close the whole installation and/or to control the amount of polymer produced in the last reactor. Therefore, it is agreed with the respondent that a CTO device has to be - implicitly, but directly and unambiguously - present at location 28 on the second reactor 20 of figure 1 of D3.

2.2.4 In view of the above, it remains to be assessed whether or not D3 discloses using the CTO device (implicitly) present at location 28 according to figure 1 of D3 to modulate the flow rate of the transfer slurry in transfer line 18.

a) In that respect, there is no direct and unambiguous disclosure in D3 of any need or intention to regulate or adjust the flow of the slurry in line 18. There is in particular no indication that said flow is monitored in any manner at any stage of the process. To the contrary, it is derivable from the information provided in D3 that the flow of the slurry is determined therein by setting specific pressure conditions in the reactors and a specific pressure gradient along the transfer line (page 7, second full paragraph; pressure indication in the reactors and "along the transfer line" in the examples).

b) The considerations of the respondent of what would happen in the polymerisation unit of D3 if the skilled person were to vary the discharge rate at location 28, in particular with respect to what extent this would

cause a variation in the flow rate in line 18, is also not relevant, not only because D3 does not discuss this situation and does not contain such a disclosure, but also because this would amount to the possibility of an uncontrolled variation according to the understanding of the "modulating" feature by the respondent which is not in agreement with the reading of the Board (section 1.3 above).

c) At the oral proceedings before the Board, the respondent argued that the comparison of examples 1 and 2 of D3 showed that varying the discharge rate of the second reactor at location 28 led to a variation of the discharge rate in line 18, which amounted to a modulation in the sense of operative claim 1.

However, examples 1 and 2 of D3 describe two different steady-state conditions and it is not at all surprising that with different operating conditions different steady-states are obtained characterised by different values of the discharge rate of the second reactor and of the flow rate in line 18. In any case, the existence of different steady-states has nothing to do with the modulation of the transfer slurry in line 18 using a continuous take-off device in line 28 when the feature "modulating" according to operative claim 1 is understood by the skilled person according to the reading in paragraph 1.3 above.

d) The respondent further argued that it was derivable from example 3 of D3 that if the pressure at location C of line 30/30a according to figure 1 of D3 changed, then the flow rate of slurry discharged from the loop reactor via line 18 would not be constant but be subjected to fluctuation (D3: page 11, lines 22-24). Further considering that the pressure at location C was

dependent on the pressure of the second reactor, which in turn depended on the rate of withdrawal of the CTO device at location 28, the flow rate of the slurry in line 18 was effectively modulated by the CTO device at location 28.

However, in view of the reading of the expression "modulating" adopted by the Board (section 1.3 above), an objection based on such irregular fluctuations in flow rate (as indicated in D3: page 11, penultimate sentence), i.e. uncontrolled variations, cannot succeed. In addition, as explained above, the passages of D3 relied upon by the respondent still do not amount to a direct and unambiguous disclosure of the use of the CTO device at location 28 to modulate the flow rate in line 18.

c) Although it cannot be denied that figure 3 of the patent in suit is very similar to figure 1 of D3, it is agreed with the appellant that, as argued at the oral proceedings before the Board, said figure 3 is a simplified representation, as illustrated for instance by the fact that the complete reactors are not shown but only a part thereof. Considering both figures 2 and 3 of the patent in suit, it further makes no doubt that both embodiments illustrate the teaching of the patent in suit according to which the variable to be influenced in a desired manner is the flow rate in the transfer line between both reactors, which is achieved by manipulating the CTO device located on the second reactor. The fact that the circulation of the slurry in the polymerisation unit may be determined by similar factors (pressure in the reactors and along the transfer line) both in embodiments according to the patent in suit (see in particular paragraph 55 in relation to figures 2 and 3) and in D3 (figure 1 and

examples; page 7, third paragraph) does, however, not amount to a direct and unambiguous disclosure of the "modulation" feature in the sense of operative claim 1 and as defined in above section 1.3.

d) In view of this, D3 at least does not directly and unambiguously disclose the step of "modulating the flow rate of the transfer slurry through a transfer line to the second loop reactor using a first continuous take-off device located on the second polymerization reactor" as defined in operative claim 1 (taking into account the conclusions regarding the reading of that feature reached in section 1, in particular 1.3, above).

e) Considering that an inventive step was acknowledged already in view of that "modulation" feature (see section 2.4 below), it is not necessary to analyse any further whether there are further features distinguishing the subject-matter being claimed from the disclosure of D3.

2.3 Problem effectively solved over D3

2.3.1 The appellant argued that the problem to be solved over D3 resided in the provision of a simpler process/system for producing a polyolefin while avoiding clogging in the line connecting both reactors.

2.3.2 In that respect, the aim of avoiding or at least reducing the risk of clogging in the transfer line between both reactors is derivable from paragraph 7 of the patent in suit (respectively from the corresponding passage of the application as filed).

In addition, although the patent in suit contains no

examples specifically illustrating the subject-matter being claimed in terms of a process run under specific operating conditions and an analysis of clogging phenomena, it is technically reasonable and also credible in view of the content of the whole patent specification that the problem of clogging in the transfer line can be reduced by monitoring the flow of the slurry in the transfer line between both reactors and that this may be done by activating a CTO device as defined in operative claim 1 (see in particular the information regarding the CTO device in paragraphs 40-41 and the use of a CTO device on the second reactor to control the flow velocity in the transfer line in paragraphs 55-56 and 71; see also figures 2 and 3).

Finally, considering that D3 also aims at reducing clogging in the transfer line between the reactors (paragraph bridging pages 1 and 2; third paragraph on page 3; paragraph bridging pages 4 and 5), the formulation of the problem solved in the form of an alternative method for producing a polyolefin while avoiding clogging in the line connecting both reactors is appropriate.

2.3.3 However, the arguments put forward by the appellant regarding the provision of a simpler method as compared to figure 1 of D3 are not reflected in any manner by the technical features of operative claim 1. In particular, an installation according to figure 1 of D3 is not excluded by the definition of the method according to operative claim 1. Therefore, such considerations cannot be taken up in the formulation of the problem indeed solved over D3.

2.3.4 In view of the above, the technical problem effectively solved over D3 resides in the provision of a further method for producing a polyolefin using two slurry reactors while avoiding/reducing the risk of clogging in the line connecting both reactors.

2.4 Obviousness

2.4.1 The question has to be answered whether the skilled person, desiring to solve the problem identified above, would, in view of the closest prior art, possibly in combination with other prior art documents or with common general knowledge, have modified the disclosure of the closest prior art in such a way as to arrive at the claimed subject matter.

2.4.2 In that respect, D3 itself provides no motivation to solve the above problem by monitoring and modulating the flow of the slurry in the conduit/line connecting both reactors using a CTO device located on the second reactor.

2.4.3 Although paragraph 28 of D5 teaches that the discharge line of a reactor may be made in a continuous manner, and therefore may provide a hint to use a CTO device at the discharge point of a reactor, it is silent with respect to the use of such a CTO device in order to modulate the flow rate of the slurry in the transfer line in the sense of operative claim 1 (see section 1.3 above), in particular to do so in order to solve the above problem.

2.4.4 The same is valid for any of the other documents relied upon by the respondent as combination documents with D3, in particular each of D7, D8 and D11. In particular, while these documents teach that it is

possible to control the pressure in a reactor by adjusting its discharge rate, none of these documents discloses the use of a CTO device on such a reactor to influence or adjust in a desired manner the flow rate of a slurry which is transferred between another reactor and the reactor on which the CTO is located.

2.5 In view of the above, the distinguishing feature identified above is not obvious in view of the teaching of the prior art documents cited. Therefore, the objection of the respondent concerning lack of inventive step of the the subject-matter of operative claim 1 in view of D3 alone or in combination with any of D5, D7, D8 or D11 is rejected.

3. Inventive step starting from D4 as closest prior art

3.1 Document D4 as closest prior art

Although the appellant contested in its statement of grounds of appeal that D4 was a suitable document to be takes as the closest prior art, the opinion of the Board according to which that argument was not convincing expressed in the Board's communication was not contested any further and an argumentation starting from D4 as closest prior art was in particular defended at the oral proceedings before the Board without mentioning any concern in that respect. Therefore, the Board sees no reason to deviate from the view laid down in its communication that D4 is a suitable document to be taken as the closest prior art.

3.2 Distinguishing feature(s)

3.2.1 D4 discloses a "process for producing polyethylene compositions in the presence of catalytic system of

ethylene polymerizing catalyst and cocatalyst in a multistage reaction sequence consisting of successive liquid phase and gas phase polymerizations, characterized in that the process comprises at least one continuous reaction sequence, in which

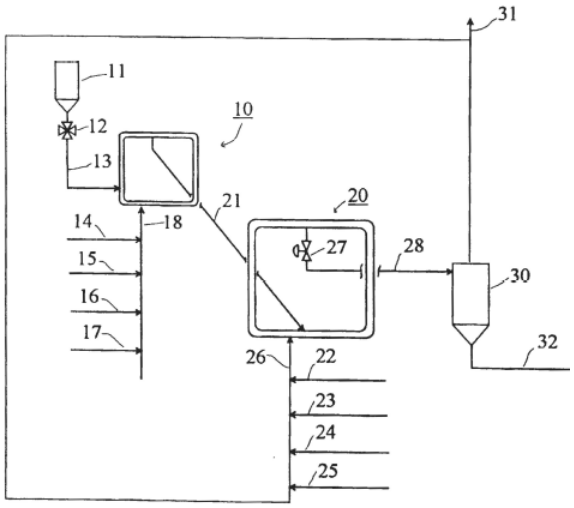
in the first step ethylene and optionally hydrogen and comonomer are polymerized in a loop reactor in a low boiling hydrocarbon medium in the presence of ethylene polymerizing catalyst and cocatalyst, the residence time and reaction temperature being such that the proportion of the ethylene polymer produced in the reactor from the end product of the process is between 1-20 w-%,

the reaction mixture removed from the step is transferred to second step where polymerization is continued in a loop reactor by adding ethylene, hydrogen and optionally inert hydrocarbon, comonomers and cocatalysts, the residence time being at least 10 minutes,

the reaction mixture is removed from the loop reactor, at least an essential part of the reaction medium is removed and

the polymer transferred to a third step where polymerizing is carried out in a gas phase reactor in the presence of added ethylene and optionally hydrogen, comonomers and cocatalysts" (claim 1).

Such a process is in particular illustrated in the figure of D4 reproduced below:



wherein first and second slurry reactors 10 and 20 are connected via transfer line 21, whereby an exhaust valve 27 is located on said second reactor (D6: page 12, line 31 to page 13, line 11). In addition, according to page 8, lines 5-6 and page 11, lines 9-10 of D6, both reactors may either be operated with a continuous or intermittent discharge. According to the embodiment of page 12, lines 31-33 of D4, that polymerisation unit is run with continuous transfer of the slurry in line 21.

3.2.2 In view of the above, the polymerisation system according to page 12, lines 31-33 of D4 comprises:

- two slurry reactors 10 and 20;

- a transfer line 21 in which the slurry from the first reactor is continuously transferred to the second reactor;

- a valve 27 located on the second reactor 20, which may be a CTO device in the sense of the patent in suit when the discharge of the second reactor takes

place in a continuous manner.

3.2.3 Independently of whether multiple selections should be made within the disclosure of D4 in order to arrive at two slurry loop reactors both operating in a continuous manner and used in a method fulfilling the conditions on the molecular weights and densities according to claim 1, D4 fails to disclose the feature of operative claim 1 "modulating the flow rate of the transfer slurry through a transfer line to the second loop reactor using a first continuous take-off device located on the second polymerisation reactor" in view of its reading in section 1, in particular 1.3, above and for reasons similar to those outlined for document D3 in section 2.2.4 above. In view of this, the subject-matter of operative claim 1 is distinguished from the disclosure of D4 at least for that reason.

3.3 Problem effectively solved over D4

For the same reasons as the ones outlined in section 2.3 above in respect of the formulation of the problem solved over D3 (paragraph 7 for defining the problem; whole patent specification to make plausible that it is plausible that the problem is solved), the Board is satisfied that the problem effectively solved over D4 resides in the provision of a method for producing a polyolefin which allows increased solids levels in the transfer line between both reactors without clogging, as argued by the appellant. It is noted that, in contrast to D3, the problem cannot be formulated in the provision of a "further" method for producing a polyolefin using two slurry reactors while avoiding/reducing the risk of clogging since - contrary to D3 - D4 was not shown to deal with said issue of

clogging.

3.4 Obviousness

3.4.1 The question has to be answered if the skilled person, desiring to solve the problem(s) to be identified as indicated above, would, in view of the closest prior art, possibly in combination with other prior art or with common general knowledge, have modified the disclosure of the closest prior art in such a way as to arrive at the claimed subject matter.

3.4.2 In that respect, D4 itself provides no motivation to solve the above problem by monitoring and modulating the flow of the slurry in the transfer line connecting both reactors using a CTO device located on the second reactor.

3.4.3 Regarding the combination of D4 with any ofD5, D7, D8 and D11, the same considerations as the ones outlined above in respect of the (non)obviousness of the solution proposed by operative claim 1 regarding inventive step over D3 are equally valid for establishing the (non)obviousness of that solution over D4, either alone or in combination with any of D5, D7, D8 or D11. In particular, none of these documents disclose the use of a CTO device on a downstream reactor to influence or adjust in a desired manner the flow rate of a slurry which is transferred between an upstream reactor and said downstream reactor on which the CTO is located.

3.4.4 In view of the above, the objection of the respondent concerning lack of inventive step of the the subject-matter of operative claim 1 starting from D4 as closest

prior art is also rejected.

4. Questioned by the Board, the respondent confirmed at the oral proceedings before the Board that he had no further objections against the main request. In view of the conclusions reached above in respect of claim 1 of the main request, the Board has no reason to deal with any further point.

5. Since none of the objections raised by the respondent against the main request is successful, the decision under appeal is to be set aside and the patent is to be maintained on the basis of the claims of the main request filed with the statement of grounds of appeal.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent on the basis of the claims of the main request filed with the statement of grounds of appeal, after any necessary amendment of the description.

The Registrar: The Chairman:

B. ter Heijden D. Semino

Decision electronically authenticated