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# Datasheet for the decision of 14 February 2012

**Case Number:** T 2224/09 - 3.3.06

**Application Number:** 05716677.9

**Publication Number:** 1660231

**IPC:** B01J 19/00, B01J 97/18, B01J 19/24, C08F 10/00

**Language of the proceedings:** EN

**Title of invention:**
Method and appartaus for preparing and supplying catalyst slurry to a polymerisation reactor

**Patent Proprietor:**
TOTAL PETROCHEMICALS RESERACH FELUY

**Opponent:**
Ineos Commercial Services UK Limited

**Headword:**
Membrane pump/TOTAL PETROCHEMICALS

**Relevant legal provisions:**
RPBA Art. 12(1)(2), 13(1)

**Relevant legal provisions (EPC 1973):**
EPC Art. 56, 83

**Keyword:**
"Admissibility of documents already filed during opposition proceedings (yes) - response to comments in the communication by the Opposition Division attached to the summons"
"Sufficiency of disclosure (yes)"
"Inventive step (main request): no - obvious combination of known technical means"
"Admissibility of late filed auxiliary requests 1 and 2 (no)"

**Decisions cited:**

-

**Catchword:**

-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

**Case Number:** T 2224/09 - 3.3.06

# D E C I S I O N
**of the Technical Board of Appeal 3.3.06**
**of 14 February 2012**

| | |
|---|---|
| **Appellant**: (Opponent) | Ineos Commerical Services UK Limited<br>Hawkslease<br>Chapel Lane<br>Lyndhurst<br>Hampshire SO43 7FG (GB) |
| **Representative**: | King, Alex<br>Mathisen & Macara LLP<br>120 Bridge Road<br>Chertsey<br>Surrey KT16 8LA (GB) |
| **Respondent**: (Patent Proprietor) | TOTAL PETROCHEMICALS RESEARCH FELUY<br>Zone Industrielle C<br>BE-7181 Seneffe (Feluy) (BE) |
| **Representative**: | Beckmann, Claus<br>Kraus & Weisert<br>Patent- und Rechtsanwälte<br>Thomas-Wimmer-Ring 15<br>D-80539 München (DE) |
| **Decision under appeal:** | **Interlocutory decision of the Opposition Division of the European Patent Office posted 22 September 2009 concerning maintenance of European patent No. 1660231 in amended form.** |

**Composition of the Board:**

**Chairman:** P. Ammendola
**Members:** L. Li Voti
J. Geschwind

## Summary of Facts and Submissions

I. The present appeal is from the decision of the Opposition Division to maintain the European patent no. 1 660 231, concerning a method for optimising the supply of a catalyst slurry to a polymerisation reactor, in amended form.

II. In its notice of opposition the Opponent sought revocation of the patent on the grounds of Article 100(a), because of lack of inventive step of the claimed subject-matter, and of Article 100(b) EPC.

During opposition the Opponent referred *inter alia* to the following documents:

(1): US-A-5098667;
(3): Chemical Engineering, vol. 1, fourth edition, Coulson and Richardson, pages 266 and 267 (1980);
(4): Kirk-Othmer Encyclopaedia of Chemical Technology, 2001, section 3.2.9;
(6): EP-A-1059309;
(7): CA-A-2437491;
(8): EP-B-895515;
(12): GB-A-855120;
(13): US-A-3130187;
(14): US-A-3156537;
(15): WO-A-2004/26455;
(COD): Communication of the Opposition Division of 29 December 2008, attached to the summons to attend oral proceedings.

III. The Opposition Division decided that the claims according to the then pending sixth auxiliary request complied with the requirements of the EPC.

In particular, it found that

- document (12) was not *prima facie* relevant since it did not disclose all the features of independent claim 1; therefore, it had to be disregarded in accordance with Article 114(2) EPC 1973;

- the control of the catalyst feed rate to a polymerisation reactor in function of the concentration of a reactant in the reactor had been known to the skilled person in the art for many years; therefore, all the embodiments of the invention could be realised by the skilled person on the basis of the disclosure of the patent in suit; the claimed invention thus was sufficiently disclosed;

- the claims complied with the requirements of Articles 123(2) and (3) EPC;

- document (1) represented the closest prior art; the method disclosed in this document differed from the claimed subject-matter insofar as it did not include the preparation of polyethylene, the step of diluting the concentrated catalyst slurry while being transferred from the storage vessel to the mixing vessel, a concentration of catalyst solids in the diluted slurry between 0.1 and 10% by weight and the use of a membrane pump for pumping the diluted catalyst slurry at a controlled flow rate from the mixing vessel to the polymerisation reactor;

- even though the use of membrane pump for pumping a catalyst slurry and controlling its flow to a polymerization reactor was obvious (point 14.1 in combination with point 5 of the reasons for the decision), the tests contained in table 1 of the patent in suit showed that an improved control of the polymerization process was achieved when such a membrane pump was used for pumping the diluted catalyst slurry to the polymerization reactor;

- starting from the teaching of document (1), even considering the other cited prior art, the skilled person would not have had any incentive to select a membrane pump for pumping such a diluted catalyst slurry to the reactor in order to improve the control of the polymerization reaction; moreover, it would not have been obvious to dilute the concentrated catalyst slurry while transferring it from the storage vessel to the mixing vessel instead of diluting it directly in the mixing vessel as in document (1);

- therefore, the claimed subject-matter involved an inventive step over the cited prior art.

IV. An appeal was filed against this decision by the Opponent (Appellant).

The Respondent (Patent Proprietor) submitted with the letter of 9 January 2012 two sets of amended claims as auxiliary requests 1 and 2, respectively.

Oral proceedings were held before the Board on 14 February 2012.

V. Claim 1 of the set of claims found by the Opposition Division to comply with the requirements of the EPC (hereinafter referred to as Respondent's main request) reads as follows:

"1. Method for optimising the supply of a catalyst slurry to a polymerisation reactor (1) wherein polyethylene is prepared, comprising the steps of:
- providing concentrated catalyst slurry consisting of solid catalyst particles suspended in a hydrocarbon diluent or in a mineral oil in one or more storage vessels,
- diluting said concentrated catalyst slurry for obtaining a suitable concentration for use in a polymerisation reaction, whereby said catalyst slurry is diluted while being transferred from said storage vessel to a mixing vessel, wherein said diluted catalyst slurry having a concentration of catalyst solids between 0,1 and 10% by weight is maintained,
- optionally further diluting said catalyst slurry in said storage vessel, and
- pumping said diluted catalyst slurry at a controlled flow rate from said mixing vessel (3) to said polymerisation reactor (1) through one or more conduits (4), by means of a membrane pump (5), provided in each of said conduits (4)."

Claim 1 according to auxiliary request 1 differs from claim 1 according to the main request insofar as the concentrated catalyst slurry has more than 10 wt% solids, said catalyst slurry is diluted with isobutane and the flow rate of the catalyst slurry from the mixing vessel (3) to the polymerisation reactor (1) is

controlled by determining the concentration of a reactant in said reactor (1).

Claim 1 according to auxiliary request 2 differs from claim 1 according to the main request insofar as the concentrated catalyst slurry has more than 10 wt% solids, said catalyst slurry is diluted with isobutane and the diluted catalyst slurry has a concentration of catalyst solids between 0.1 and 5% by weight.

VI. The Appellant submitted orally and in writing that

- documents (12) to (15) had been already filed during opposition as a response to some comments raised in the communication of the Opposition Division attached to the summons to attend oral proceedings; moreover, document (12) was highly relevant since it differed from the claimed subject-matter in less features than document (1); therefore, these documents had to be admitted into the proceedings;

- the invention was insufficiently disclosed insofar as the description of the patent did not specify any suitable method for determining the concentration of a reactant in the polymerization reactor in order to control the flow rate of the diluted catalyst slurry from the mixing vessel to said reactor, and the method known from document (14) was considered by the Respondent to be unsuitable for the invention; moreover, the description did not show how the required concentration of the diluted catalyst slurry could be obtained simply by diluting the concentrated slurry in the conduit between the storage and the mixing vessel without the use of an intermediate vessel;

- the tests contained in table 1 of the patent in suit did not contain any information as to the type of pump used in the comparative example (hereinafter control); moreover, the control used a greater concentration of catalyst solids in the diluted slurry with a greater standard deviation and a higher catalyst and ethylene feed rates and higher ethylene concentration; therefore, it was not possible to draw from these data any conclusion on any alleged improvement of the control of the polymerization reaction due to the combined use of a membrane pump with a diluted catalyst solution; consequently, the technical problem underlying the invention could only be defined as the provision of an alternative method for optimising the supply of a catalyst slurry to a polymerisation reactor for producing polyethylene;

- in the light of the teaching of document (1) it would have been obvious for the skilled person that the method disclosed therein was applicable to the production of polyethylene; moreover, the concentration of the diluted catalyst slurry used in this document would have been one already used for a similar purpose in the state of the art, for example that of document (8) or (12); the use of a membrane pump for metering accurately a catalyst slurry to the polymerisation reactor was also obvious for the skilled person since such pumps were well known to have suitable qualities from document (4) and were currently used in the technical field of the invention as shown from documents (6), (7), (8) and document (12) in combination with document (3); finally, a dilution of the concentrated catalyst slurry while transferring it

from the storage vessel to the mixing vessel occurred also in the method of document (1), which only required a final dilution in the mixing vessel, a step which was not excluded by claim 1 according to the Respondent's main request;

- therefore, the claimed subject-matter lacked an inventive step;

- the auxiliary requests 1 and 2 had been submitted at a very late stage without any explanation as to the reasons for their late filing; moreover, the reasons for the various amendments contained in each claim 1 had also not been indicated in writing; therefore, they had not to be admitted.

VII. The Respondent submitted that

- documents (12) to (15) were late filed and not highly relevant; therefore, they had not to be admitted;

- the claimed invention was sufficiently disclosed since methods for determining the concentration of a reactant, such as ethylene, in a polymerization reactor were well known to the skilled person; moreover, it would have been clear to the skilled person that the same means used for flushing the conduits in the description of the patent in suit could be used for diluting the catalyst slurry while transferring it from the storage vessel to the mixing vessel as required by the invention of claim 1; furthermore, claim 1 required the indicated concentration of the diluted slurry to be present in the mixing vessel and not in the conduit between the storage and the mixing vessel;

- the tests contained in table 1 showed clearly that the use of a membrane pump for pumping a diluted catalyst slurry to the polymerization reactor brought about a more efficient use of the catalyst and a better control of the polymerization reaction with respect to a conventional method wherein another type of pump was used;

- the prior art did not contain any suggestion that this combination of features would bring about such a technical advantage; furthermore, it did not disclose any method wherein the dilution of a concentrated catalyst slurry occurred during its transfer from a storage to a mixing vessel;

- consequently, the claimed subject-matter involved an inventive step;

- the auxiliary requests 1 and 2 corresponded to auxiliary requests 7 and 8 submitted before the department of first instance, which had not been withdrawn; therefore, they were not late filed and should be admitted.

VIII. The Appellant requests that the decision under appeal be set aside and the patent be revoked.

IX. The Respondent requests that the appeal be dismissed or, in the alternative, that the patent be maintained in amended form on the basis of any of auxiliary requests 1 or 2, both of them submitted with letter of 9 January 2012.

## Reasons for the Decision

1. *Admissibility of documents (12) to (15)*

The Opposition Division decided not to admit document (12) because it was not highly relevant and did not express itself explicitly with regard to documents (13) to (15).

However, the Opposition Division had remarked in the communication of 29 December 2008, attached to the summons to attend oral proceedings, that document (1), cited by the Opponent with the statement of the grounds of opposition, did not show a control of the catalyst slurry flow to the reactor in function of the concentration of a reactant in said reactor (point 5.3 of said communication), that none of the documents on file disclosed a diluted catalyst slurry having a concentration as required in the patent in suit and that the Opponent had not supported its statement that the claimed diluted concentration was a standard range.

In the response to this communication the Opponent submitted with the letter of 9 February 2009 documents (13) and (14) as evidence that the above mentioned catalyst flow control was already known in the prior art (see last paragraph of page 1 of the Opponent's letter) and documents (12) and (15) as evidence that the claimed diluted slurry had a typical concentration used in the prior art for a similar use (page 2, third full paragraph and page 7, last full paragraph of said letter).

The Board thus finds that documents (12) to (15) had been submitted as a reaction to observations raised by the Opposition Division and well in advance of the oral proceedings which were held on 8 July 2009.

Therefore, these documents were not late filed and should have been admitted by the Opposition Division.

The Board thus finds that these documents are to be admitted into the proceedings in accordance with Articles 12(1) and (2) RPBA.

2. Respondent's main request

2.1 *Articles 123(2) and (3) EPC*

The Board is convinced that, as found in the decision under appeal, the claims according to the main request comply with the requirements of Articles 123(2) and (3) EPC.

Since this was not contested by the Appellant further details are not necessary.

2.2 *Sufficiency of disclosure*

2.2.1 The Respondent admitted in writing and orally that methods for determining the concentration of a reactant, such as ethylene, in a polymerization reactor were well known to the skilled person. The Board has also no doubt that this was indeed the case at the priority date of the patent in suit.
In the light of this statement, the fact that some specific methods of the prior art, such as that

disclosed in document (14), might not have been applicable to the present invention is of no relevance, since the skilled person, on the basis of his common general knowledge, would have easily found suitable methods of measuring such a concentration of a reactant applicable to the present invention.

2.2.2 As regards the dilution of the concentrated catalyst slurry whilst transferring it from the storage vessel to the mixing vessel, the Board agrees with the Respondent that the concentration of the diluted slurry indicated in claim 1 can only reasonably regard the concentration of the diluted slurry in the mixing vessel.

Therefore, the Board finds that the claimed invention requires simply that a diluent and the concentrated catalyst slurry are brought into contact in the conduit between the storage and the mixing vessel, thereby necessarily diluting the concentrated slurry. The required concentration in the mixing vessel can thus be obtained subsequently, for example, by adjusting the ratio of diluent to catalyst slurry that enter the mixing vessel, by adding further diluent or interrupting the catalyst flow, as explained in paragraph 71 and 95 of the patent in suit. The Board remarks also that claim 1 does not exclude the addition of diluent directly to the mixing vessel.

2.2.3 The Board concludes that the skilled person would be able to perform the invention by following the teaching of the patent in suit.

2.3 *Inventive step*

2.3.1 The invention of claim 1 relates to a method for optimizing the supply of a catalyst slurry to a polymerisation reactor for the preparation of polyethylene.

As explained in the description of the patent in suit, it was known that the polymerisation of olefins such as ethylene by a gas phase polymerisation process is quite sensitive to the quantity of catalyst utilized. Therefore, it is important to control the catalyst flow to a reactor in order to avoid possible runaway reactions (paragraph 4 of the patent in suit).

Since the direct feeding of a catalyst slurry from a storage vessel to a reactor has the disadvantage that the feeding rate of the catalyst to the reactor cannot be adequately controlled and may induce runaway reactions in the reactor, several catalyst supply systems of the prior art involve the preparation and the supply of diluted catalyst slurry to the polymerization reactor. In general, a mixture of dry solid particulate catalyst and diluent are apportioned in a catalyst storage vessel for thorough mixing and, thereafter, such catalyst slurry is transferred to a polymerization reaction vessel for contact with the monomer reactants (paragraphs 6 and 8).

However, although the above-described methods for preparing diluted catalyst slurry provide an improvement on the control of catalyst flow, they have the disadvantage that the catalyst flow rate cannot be

reliably adjusted in function of the reaction conditions in the polymerisation reactor (paragraph 13). Therefore, there was still a need in the art for providing an improved method for controlling catalyst feeding to a polymerization reactor (paragraph 16).

The technical problem underlying the invention thus is formulated in the patent in suit as the provision of an improved method for optimising catalyst introduction in a polymerisation reactor and therewith controlling the polymerization reaction of ethylene (paragraph 19).

2.3.2 The Board agrees with both parties that document (1), regarding a method for controlling flow of particulate solid catalyst to a polymerization reactor and thereby controlling the reaction itself (column 1, lines 8 to 10 and 40 to 45) and indicated also in the patent in suit as one of the known methods for preparing a diluted catalyst slurry and supplying it to a polymerization reactor (paragraphs 8 and 12), represents the most suitable starting point for the evaluation of inventive step.

The Respondent submitted that the test contained in table 1 of the patent in suit would show an unexpected advantage over the prior art obtained by means of the combination of a membrane pump with the specific concentration of the diluted slurry.

However, the concentration and the standard deviation of the diluted slurry used in the example of the invention and the control of table 1 is different (0.35 wt% with a deviation of 0.01 for the invention and 0.46 wt% with a deviation of 0.05 for the control);

this means undoubtedly that the two diluted slurries have been prepared in different ways. Moreover, also the catalyst slurry flow (70.6 kg/hr with a deviation of 1.9 for the invention and 91.0 kg/hr with a deviation of 2.8 for the control) and the ethylene flow to the reactor (3461 kg/hr with a deviation of 23 for the invention and 3855 kg/hr with a deviation of 16 for the control) are different and would necessarily influence differently the final results, as already suggested in document (1) (see column 1, lines 40 to 45). Furthermore, it is not known which pump was used for the control. This is also a clear deficiency of the comparative data in view of the fact that the prior art, as explained above, already suggests to use at least a positive displacement pump and not any pump for controlling accurately the flow of catalyst slurry to a polymerization reactor.

Therefore, in the Board's judgement, it cannot be deduced from table 1 any unexpected advantage resulting from the combined use of a membrane pump with the selected diluted concentration of catalyst.

The Board thus concludes that the technical problem underlying the invention can only be formulated as indicated in said paragraph 19 of the patent in suit.

The Board has no doubt that, starting from document (1), the above mentioned technical problem was solved by means of the subject-matter of claim 1.

2.3.3 Document (1) discloses a method wherein a concentrate catalyst slurry in isobutane is transferred from a mud tank, i.e. a storage vessel, to a mix tank by means of

a cyclic operation in which the concentrated slurry flows through a conduit, enters a first port of a piston motor valve (hereinafter PMV), fills a chamber within the PMV, is mixed therein with a carrier fluid such as isobutane and the mixture is flushed through the second port of such a PMV into a conduit and into a mix tank (column 4, lines 1 to 10 and 33 to 47).

Therefore, this document discloses not only the first step of claim 1 of providing a concentrated catalyst slurry consisting of solid catalyst particles suspended in a hydrocarbon diluent in one storage vessel, but also the step of diluting said concentrated catalyst slurry while being transferred from said storage vessel to a mixing vessel, since in document (1) a mixture of diluent isobutane and concentrated slurry is formed in a conduit between such two vessels. According to document (1) the final dilution occurs in the mixing vessel itself by further addition of isobutane (column 5, lines 1 to 4), a step which is not excluded from the wording of claim 1.
Finally, the diluted catalyst slurry is withdrawn from the mix tank though a conduit and pumped at a controlled flow rate through a conduit to the polymerization reactor (see column 5, lines 21 to 27 and 38 to 40; column 6, lines 58 to 62).

Therefore, the method disclosed in document (1) differs from the subject-matter of claim 1 only insofar as it does not specifically disclose the production of polyethylene, a concentration of 0.1 to 10% solids in the diluted catalyst slurry and the use of a membrane pump for pumping the slurry to the polymerization reactor.

However, the method disclosed in document (1) is generically applicable to particulate feed systems where the flow particulate rate of solids in the slurry has to be controlled (column 2, lines 27 to 32). Moreover, it involves the use of a mud pot wherefrom a concentrated catalyst slurry is diluted, such as in known catalyst systems (see also paragraph 5 of the patent in suit). It is thus clear for the skilled person that the method of document (1) is applicable to the preparation of polyethylene. This has also not been disputed by the Respondent.

The selected concentration range for the diluted catalyst slurry has not been proven to be critical for the invention. Furthermore, even though document (1) does not specify the concentration of catalyst solids in the diluted slurry used therein, it is to be remarked that diluted slurries were well known in the prior art, as indicated in the patent in suit (paragraphs 5 and 9 to 12), and a diluted slurry pumped to a polymerization reactor for preparing polyethylene and having a concentration as required in claim 1 of the main request was already known, for example, from document (12) (see page 3, lines 33 to 35). Therefore, the skilled person, in the light of the teaching of the prior art, could have adjusted arbitrarily the diluted slurry of document (1) to the selected concentration of claim 1.

Finally, the use of a membrane pump for accurately controlling the flow of catalyst slurry to a polymerization reactor had been found correctly by the Opposition Division to be obvious to the skilled person,

since such membrane pumps were known to be suitable for metering accurately slurries (see document (4)) and had been used in the prior art for pumping catalyst slurries to a polymerization reactor for the preparation of polyolefins (see documents (6) (example 2, paragraph 19), (7) (page 1, lines 19 to 21 in combination with page 12, lines 37 to 39), (8) (paragraphs 1 and 42) and (12) (page 2, lines 19 to 22), which refers to positive displacement pumps, i.e. to the general class of pumps to which membrane pumps belong (see document (3), page 266, second and third lines below figure 8.3)).

As document (1) teaches explicitly to manipulate the catalyst feed rate in order to control the polymerization process (column 1, lines 42 to 45 and column 5, lines 28 to 33), it would have been obvious for the skilled person, faced with the technical problem of providing an improved method for optimising catalyst introduction in a polymerisation reactor and therewith controlling the polymerization reaction of ethylene, to implement the disclosure of document (1) with the technical means known from the prior art mentioned above, for example the use of a membrane pump, for optimizing and controlling the delivery of the catalyst slurry to the polymerization reactor and improving therewith the reaction control itself.

The Board thus concludes that the subject-matter of claim 1 lacks an inventive step.

3. *Admissibility of Respondent's first and second auxiliary requests*

The Board remarks that the Respondent did not submit any reply to the Appellant's grounds of appeal within four months from the notification of the grounds; it requested on 2 August 2011 a postponement of the oral proceedings originally scheduled for 6 December 2011 and it was only on 9 January 2012, i.e. about one month before the newly scheduled oral proceedings, that the Respondent submitted a reply to the grounds of appeal and the auxiliary requests 1 and 2.

Therefore, the submission of these requests at such a late stage of the appeal proceedings amounts to an amendment of the party's case within the meaning of Article 13(1) RPBA and may be admitted only at the Board's discretion.

The Respondent submitted that the auxiliary requests should not be considered late filed since they correspond to the auxiliary requests 7 and 8 filed before the Opposition Division.

However, the fact that such requests were submitted before the Opposition Division does not mean automatically that they are part of the Respondent's appeal case. In fact, according to Article 12(1) and (2) RPBA, the basis of the Respondent's case in appeal consists of its reply to be filed within four months of notification of the grounds of appeal (in the present case there was no reply) and any reply to a possible Board's communication (in the present case none).

Therefore, it could only be deduced from the Respondent's behaviour till its letter of 9 January 2012 that it requested only the dismissal of the appeal and that it did not intend to submit any subsidiary requests.

The submission of two auxiliary requests at such a late stage of the proceedings without any explanation about the reason for submitting them so late and without any explanation as to the importance of the various amendments carried out to claim 1 of the main request, thus amounts to a substantial modification of the party's case which disadvantages clearly the other party which could only speculate on the reasons for the submissions of such requests.

The Board thus concludes that such late filed requests are not to be admitted.

## Order

## For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

D. Magliano P. Ammendola