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**Datasheet for the decision  
of 3 June 2022**

**Case Number:** T 1815/19 - 3.3.03

**Application Number:** 04740445.4

**Publication Number:** 1648946

**IPC:** C08F10/00

**Language of the proceedings:** EN

**Title of invention:**  
OLEFIN POLYMERIZATION PROCESS

**Patent Proprietor:**  
Basell Polyolefine GmbH

**Opponent:**  
Borealis AG

**Relevant legal provisions:**  
EPC Art. 56, 100(b), 100(c)  
RPBA Art. 12(4)

**Keyword:**

Late-filed facts - submitted with the statement of grounds of appeal - admitted (no)

Amendments - extension beyond the content of the application as filed (no)

Sufficiency of disclosure - (yes)

Inventive step - could-would approach - reasonable expectation of success (no)



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Case Number: T 1815/19 - 3.3.03

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.03**  
**of 3 June 2022**

**Appellant:**

(Opponent)

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**Respondent:**

(Patent Proprietor)

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**Representative:**

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**Decision under appeal:**

**Decision of the Opposition Division of the  
European Patent Office posted on 10 April 2019  
rejecting the opposition filed against European  
patent No. 1648946 pursuant to Article 101(2)  
EPC.**

**Composition of the Board:**

**Chairman**

D. Semino

**Members:**

M. Barrère

W. Ungler

## Summary of Facts and Submissions

I. The appeal of the opponent lies against the decision of the opposition division rejecting the opposition against European Patent number 1 648 946.

II. The following documents were *inter alia* cited in the opposition division's decision:

D1: WO 97/33920 A1

D2a: WO 02/50134 A1

D2b: English translation of D2a

D16: RÖMPP Lexikon Chemie (10<sup>th</sup> Edition), page 2612

D17: Kai Fichtel, PhD thesis, Hamburg University, Metalloccen-Verbindungen des Bariums, 2004

D18a: John Scheirs, Walter Kaminsky, Metallocene-Based Polyolefins, Volume Two, Chapter 14, Application of Metallocene Catalysts to Large-scale Slurry Loop Reactors, pages 321-332, 2000

D22: Polyolefins Planning Service, Report 2: Global Commercial Analysis and Technology Reviews, Part B: Technology Review, 2002

D24: Severn et al., "Bound but Not Gagged" - Immobilizing Single-Site  $\alpha$ -Olefin Polymerization Catalysts, 2005, Chemical Reviews, 105, 11, 4073-4147

III. In that decision the opposition division held, among others, that:

- The opposed patent fulfilled the requirements of Article 123(2) EPC. In particular, the deletion of of the phrase "For the purpose of the present invention with the term metallocene it is intended

a transition metal compound containing at least one pi-bond" from the description did not extend the content of the patent beyond what was originally disclosed.

- The claimed invention was sufficiently disclosed for it to be carried out by a person skilled in the art. With regard to the examples of the opposed patent, albeit experimental conditions such as the temperature or the catalyst concentration were not mentioned, the skilled person could use standard polymerisation conditions which would not amount to undue burden.
  
- D1 was the closest prior art for the subject-matter of claim 1. The distinguishing features between the process of claim 1 and the disclosure of D1 were
  - i) the polymerization temperature range (30 to 65°C),
  - ii) the polymerization degree (PD) between 60 and 500 g per gram of catalyst system and
  - iii) the use of a loop reactor as pre-polymerisation reactor.

The problem to be solved was the provision of an alternative pre-polymerisation process suitable to reduce reactor fouling during polymerisation. The claimed solution to that problem was neither disclosed nor hinted at in the cited prior art. Therefore claim 1 involved an inventive step over D1 as the closest prior art.

IV. The opponent (appellant) lodged an appeal against said decision. With the statement of grounds of appeal the following document was filed:

D26: WO 03/037941 A1

V. With the rejoinder to the statement of grounds of appeal, the patent proprietor (respondent) filed four sets of claims as first to fourth auxiliary requests as well as the following document:

D27: Hawley's Condensed Chemical Dictionary, Eleventh Edition, 1987, pages 1170-1171, definition of "transition element (transition metal)"

VI. Oral proceedings were held before the Board on 3 June 2022.

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

The respondent requested that the appeal be dismissed (main request), in the alternative that the patent be maintained on the basis of one of the first to fourth auxiliary requests filed with the rejoinder to the statement of grounds of appeal.

VIII. Claims 1, 6 and 9 as granted (main request of the respondent) read as follows:

"1. A process for polymerizing one or more alpha-olefins comprising the following steps:

a) contacting in a continuous way one or more of said alpha-olefins with a metallocene-based catalyst system in a loop reactor, wherein:

- (i) the reaction is carried out in a liquid medium;
- (ii) the average residence time of the metallocene-based catalyst system is not more than 30 minutes;
- (iii) the temperature ranges from 30° to 65°C;

in order to obtain a polymerization degree ranging from 60 to 500 g per gram of catalyst system;

- b) feeding in continuous the prepolymerized metallocene-based catalyst system obtained in step a) into a polymerization reactor;
- c) polymerizing one or more alpha-olefins, the same or different from the alpha-olefins used in step a), in the presence of said prepolymerized metallocene-based catalyst system."

"6. The process according to anyone of claims 1-5 wherein the metallocene-based catalyst system is obtainable by contacting:

- a) at least a metallocene compound;
- b) at least an alumoxane or a compound able to form an alkylmetallocene cation; and
- c) optionally an organo aluminum compound."

"9. The process according to anyone of claims 1 to 7 wherein step a) of the process is carried out in the loop reactor (1), then the catalyst-prepolymer

product is transferred via line (C), to the gas-phase reactor (2) and the polymer is withdrawn through line (D)."

The remaining granted claims as well as the claims of the auxiliary requests are not relevant to this decision.

IX. The appellant's submissions, in so far as they are pertinent to the present decision, may be derived from the reasons for the decision below. They were essentially as follows:

(a) Admittance of D26

D26 was *prima facie* relevant since it anticipated the subject-matter of granted claim 1. This document was found only after the decision was issued and filed at the earlier possible stage of the appeal proceedings. It should therefore be admitted.

(b) Main request

(i) Article 100(c) EPC

The deletion of the following sentence of the original description led to an unallowable broadening of the application as filed:

"For the purpose of the present invention with the term metallocene it is intended a transition metal compound containing at least one pi-bond" (hereinafter the metallocene definition).

The same objection applied to granted claim 6 in which the feature



"transition metal compound containing at least one  $\pi$  bond"

was replaced by

"metallocene compound".

(ii) Sufficiency of disclosure

Only one way of carrying out the invention was indicated in the opposed patent. The skilled person was therefore not able to obtain substantially all embodiments falling within the ambit of the claims.

The reaction temperature and catalyst concentration were not disclosed in the examples. Therefore the skilled person had to carry out a research programme in order to determine how reactor fouling could be avoided.

Moreover, granted claim 9 was inconsistent with the rest of the opposed patent because there was no line (D) for polymer removal in either the description or the drawings.

All these reasons led to lack of sufficiency.

(iii) Inventive step

The subject-matter of claim 1 as granted did not involve an inventive step over D1 alone or in combination with D2a, D18a, D22, D24 or D26.

X. The respondent's submissions, in so far as they are pertinent to the present decision, may be derived from

the reasons for the decision below. They were essentially as follows:

(a) Admittance of D26

D26, if relevant, should have been filed during opposition proceedings. It should therefore not be admitted.

(b) Main request

(i) Article 100(c) EPC

The metallocene definition in textbooks was limited to transition metal compounds. Hence, the deletion of the metallocene definition in the description could not broaden the scope of protection. The same applied to the amendment of granted claim 6.

(ii) Sufficiency of disclosure

The description of the opposed patent provided sufficient guidance to obtain all embodiments falling within the scope of the claims.

The problem to be solved (reduction of the reactor fouling) was not a limiting feature of the claims. Therefore, whether said problem was solved over the entire scope of the claims was not relevant to the issue of sufficiency of disclosure.

Moreover, the alleged inconsistency of granted claim 9 was a typing mistake which was easily overcome by reading the relevant part of the description.

The patent was therefore sufficiently disclosed.

(iii) Inventive step

The subject-matter of claim 1 as granted involved an inventive step over D1 alone or in combination with D2a, D18a, D22, D24 or D26.

### **Reasons for the Decision**

1. Admittance of D26

1.1 D26 was filed with the statement of grounds of appeal. Its admission to the proceedings, which is contested by the respondent, is subject to the discretionary power of the Board in accordance with Article 12(4) RPBA 2007 which applies in view of the transitional provisions in Article 25(2) RPBA 2020.

1.2 According to the appellant, D26 only came to their attention after the decision was issued. Furthermore, D26 was *prima facie* relevant since it anticipated the subject-matter of claim 1.

1.3 The admittance of D26 is contested by the respondent for the following reasons:

D26 should have been filed during opposition proceedings,

D26 is a patent application of the appellant (which means that D26 was known to the appellant before filing the opposition) and

D26 is not *prima facie* relevant.

1.4 D26 was cited for the first time in appeal as a further novelty-destroying document against claim 1 as granted. The Board notes that the appellant contested the novelty of claim 1 since the beginning of the opposition proceedings. Already for that reason, D26 should have been filed with the notice of opposition. This is all the more true since D26 came from the appellant's sphere (being a patent application filed by them).

Under these circumstances, the Board finds it appropriate to exercise its discretion under Article 12(4) RPBA 2007 by not admitting document D26 into the proceedings.

Main request (patent as granted)

2. Article 100(c) EPC

2.1 Deletion of a passage of the description

During examination proceedings, the following sentence was deleted from the description:

*"For the purpose of the present invention with the term metallocene it is intended a transition metal compound containing at least one pi-bond"* (see description as filed, page 4, last paragraph).

(a) According to the appellant the deletion of the above sentence leads to an unallowable broadening of the subject-matter disclosed in the application as filed. In particular, the appellant considers that all kinds of metals (including lanthanides and

actinides) are now covered in the opposed patent, which was not the case in the application as filed.

- (b) The respondent is of the opinion that the IUPAC definition of metallocenes limits the metal to transition metals. Furthermore according to D27 it would be clear that transition metals include lanthanides and actinides.

The Board agrees with the respondent for the following reasons:

D16 is a chemical dictionary. On page 2612, information about metallocenes is provided. Specifically, D16 refers to the IUPAC definition of metallocenes. According to said definition (see rejoinder to the statement of grounds of appeal, page 3, first paragraph), metallocenes are organometallic coordination compounds based on a transition metal.

Thus the Board considers that the deletion of the above sentence has no effect on the scope of the opposed patent since the general definition of metallocenes is anyway limited to transition metals.

While it is acknowledged that barium metallocenes are mentioned in D17 (although barium is not a transition metal), this document is a PhD thesis and is not considered part of common general knowledge. Therefore, D17 does not affect the general definition of metallocenes. As to the question whether actinides and lanthanides are included or not in the group of transition metals, it is pointed out that this question is not impacted by the deletion of the above sentence and has therefore no effect on the scope of the opposed patent. Nonetheless, it is pointed out that the patent

itself includes actinides and lanthanides in this group (see opposed patent, paragraph [0024]).

Thus the deletion of the above sentence does not extend the subject-matter of the patent beyond the content of the application as filed.

## 2.2 Amendment of granted claim 6

Claim 6 corresponds to claim 7 as filed wherein the feature:

"at least a transition metal compound containing at least one  $\pi$  bond"

was replaced by:

"at least a metallocene compound"

The appellant is of the opinion that the amendment of claim 6 extends beyond the content of the application as filed because the metallocene compound is no longer limited to compounds derived from a transition metal.

As explained previously (see paragraph 2.1), the Board takes the view that metallocene compounds are compounds derived from transition metals (according to the IUPAC definition). Thus no broadening can be identified in the amendment of granted claim 6.

## 2.3 Consequently, the Board has no reason to depart from the opposition division's findings (see section 14 of the contested decision) that the ground for opposition under Article 100(c) EPC does not prejudice maintenance of the patent as granted.

3. Sufficiency of disclosure

3.1 The appellant is of the opinion that the requirement of sufficiency of disclosure is not fulfilled for the following reasons:

- (a) Claim 1 encompasses a large number of possible embodiments. It includes the use of any alpha-olefin and any metallocene catalyst. However, only one way of carrying out the invention is indicated in the opposed patent. In the examples of the opposed patent a single alpha-olefin (propylene) and a single metallocene catalyst (rac-dimethylsilylbis(2-methyl-4,5-benzo-indenyl)-zirconium dichloride) are used. The skilled person is therefore not able to obtain substantially all embodiments falling within the ambit of claim 1.
- (b) The opposed patent does not teach how to select the catalyst and olefins to achieve the objective of the claimed invention. In particular, the exact concentration of catalyst in the examples is not provided although it is known that said amount has a significant influence on the reactor fouling. The same applies to the reaction temperature. Therefore, the skilled person trying to carry out the invention has to test different amounts of catalyst and different reaction conditions in order to determine how the reactor fouling may be avoided.
- (c) Granted claim 9 states that the polymer is withdrawn through line (D). However, the opposed patent does not disclose any line (D) for withdrawing the polymer.

3.2 The Board cannot follow the appellant's objections for the following reasons:

With regard to objection (a), it is pointed out that a successful objection of lack of sufficiency of disclosure presupposes that there are serious doubts, substantiated by verifiable facts (see Case Law of the Boards of Appeal, 9th edition 2019, II.C.9). A mere allegation that the invention cannot be carried out over the whole scope of the claims is not sufficient. Furthermore, contrary to the appellant's view, the description provides sufficient guidance to select the monomers, catalyst and the reactions conditions (see opposed patent, paragraphs [0012]-[0043]).

Objection (b) is based on the criticism that the skilled person, wishing to provide a process leading to a low reactor fouling, would have to carry out a large number of experiments in order to identify all embodiments solving that problem (undue burden). It is however well-established case law that an objection of insufficient disclosure cannot legitimately be based on the argument that the patent does not enable a skilled person to achieve a technical effect which is not defined in the claim (see Case Law of the Boards of Appeal, 9th edition 2019, II.C.3.2). Since the complete absence of reactor fouling or a measure of it is not a limiting feature of the claims, the present objection is not relevant for the question of sufficiency of disclosure.

Finally, the Board is of the opinion that the inconsistency in claim 9 (objection (c)) is easily clarified by the description of the opposed patent (see paragraph [0041] with reference to figure 2) and is, if



at all, an issue of clarity, which may not be dealt with in opposition proceedings.

3.3 Therefore, the Board has no reason on the basis of the arguments of the appellant to depart from the opposition division's findings (see section 15 of the contested decision) that the ground for opposition under Article 100(b) EPC does not prejudice maintenance of the patent as granted.

4. Inventive step

4.1 Closest prior art

The parties agree that D1 and in particular its example 21 is the closest prior for the subject-matter of claim 1. The Board sees no reason to depart from that view.

4.2 Technical differences

According to the appellant, claim 1 differs from example 21 of D1 in that:

- (a) the pre-polymerization temperature ranges from 30°C to 65°C (instead of 25°C in example 21),
- (b) the pre-polymerization is carried out in a loop reactor (instead of a compartmented continuously stirred tank reactor (compartmented CSTR or CCSTR)), and
- (c) a polymerisation degree (PD) ranging from 60 to 500 g per gram of catalyst system is achieved (the PD in example 21 being unknown).

The respondent is of the opinion that the catalyst used in example 21 (with back reference to example 17) is

not a catalyst system according to claim 1 because no co-catalyst is present.

The Board cannot follow the respondent's interpretation of granted claim 1 which only mentions the presence of a catalyst system without specifying whether it includes a co-catalyst or not. Consequently the Board does not consider that the catalyst is an additional distinguishing feature between claim 1 and D1 and agrees with the distinguishing features (a), (b) and (c) identified by the appellant.

#### 4.3 Problem to be solved

According to the appellant, no problem was solved in comparison to the process of example 21. Furthermore, as already argued under sufficiency of the disclosure, the problem of reducing or avoiding fouling was not solved over the entire scope of claim 1.

The subjective problem to be solved in the opposed patent is to reduce fouling in the polymerisation reactor (see opposed patent, paragraphs [0002], [0003] and [0009]). The Board notes that said problem is already solved by the process of example 21 of D1 (see page 22, table IV, no fines being present). Likewise the examples of the opposed patent show that pre-polymerisation processes falling within the scope of claim 1 successfully avoid fouling in the subsequent polymerisation reactor (see opposed patent, table 2). Although the Board cannot identify any advantage of the process of claim 1 over the process of example 21, it remains to assess whether it is credible that the claimed process provides an alternative way of obtaining low fouling over the whole ambit of claim 1.

In the present case, the respondent provided examples showing that the process of claim 1 can be put into practice and that the reactor fouling can be avoided (see opposed patent, examples). In the board's view, it is credible that the experimental evidence provided in the opposed patent can be generalised over the whole scope of claim 1. The burden of proof was therefore shifted to the appellant to provide evidence that certain embodiments falling within claim 1 did not provide an alternative way of obtaining low fouling. No such evidence has been provided.

On that basis and in the absence of any contrary evidence, the Board concludes that the objective technical problem is the provision of an alternative polymerisation process leading to low reactor fouling during polymerisation.

#### 4.4 Obviousness of the solution

4.4.1 The appellant held that it was obvious in view of the prior art to use a loop pre-polymerisation reactor instead of a CCSTR. Specifically, D1 or D22 taught that conventional (loop) reactors may be used as pre-polymerisation reactors (see D1, page 8, lines 8-12; D22, pages VI-131 and VI-132). In example 82 of D2a the pre-polymerisation was carried out in a loop reactor (see the translation D2b, pages 68-69, bridging paragraph, reference is made in what follows to D2b). It was also common general knowledge that loop reactors provided an efficient cooling of the polymerisation mixture thereby reducing the risk of reactor fouling (see D18a, page 322, first paragraph; D24, chapter 2.2.1).

4.4.2 The Board cannot follow this line of arguments for the following reasons:

As explained previously, the problem to be solved is the provision of an alternative polymerisation process leading to low reactor fouling during polymerisation. The skilled person wishing to provide an alternative to the pre-polymerisation process of D1 while keeping the reactor fouling at a low level, should therefore have a reasonable expectation that any modification made to the process of D1 does not impair the reactor fouling. In other words, while it is not disputed that the skilled person could have replaced the pre-polymerisation reactor of D1 by a loop reactor, it needs to be evaluated whether the skilled person would have done it with the expectation of keeping the reactor fouling at a low level (see Case Law of the Boards of Appeal, 9th edition 2019, I.D.5).

An essential teaching of D1 is that the reduction of the fouling in the main polymerisation reactor is achieved if a CCSTR pre-polymerisation reactor is used (see D1, table IV, examples 19 and 21 vs. comparative examples 18 and 20 and independent claims 1 and 15). By contrast, in the background part of D1 (see page 2, lines 9-20 and page 3, first paragraph), it is specified that conventional pre-polymerisation reactors are disadvantageous. For this reason, the Board considers that D1 teaches away from replacing the CCSTR pre-polymerisation reactor of D1 by any other reactor.

Turning to D22, this document discloses a propylene polymerisation process involving the use of a Ziegler-Natta catalyst (see D22, page VI-131). Although a loop pre-polymerisation is shown in the figure of VI-132, D22 does not relate to metallocene catalysts and is

silent about the performance of the said process in terms of reactor fouling. Thus, the person skilled in the art finds no incentive in D22 to replace the CCSTR of D1 with a loop pre-polymerisation reactor in order to maintain low reactor fouling.

D2b relates to olefin polymerisation catalysts and to olefin polymer production processes using the said catalysts (see D2b, page 1, technical field). According to the appellant, example 82 of D2b would provide an incentive to use a loop pre-polymerisation reactor in order to reduce the reactor fouling in the main polymerisation reactor. The Board notes that example 82 is one of the few examples of D2b for which the reactor fouling is not reported (see D2b, tables 1-5). Already for that reason, the Board considers that it is hindsight to choose example 82 instead of any other inventive example of D2b for which the reactor fouling is evaluated. Furthermore, even if the process of example 82 were to be followed, it is pointed out that the pre-polymerisation step is carried out in a conventional batch reactor and not in a loop reactor (see D2b, page 68, lines 25-32). In a subsequent step, a loop reactor is used, however said step is not considered to be a pre-polymerisation step within the meaning of the opposed patent or D1, i.e. an initial step in which a protective layer is formed around the catalyst particles (see opposed patent, paragraph [0005] and D1, page 2, lines 22-27). Thus, should the skilled person follow the teaching of example 82, it would rather replace the CCSTR of D1 by a batch reactor instead of a loop reactor. For those reasons, D2b does not provide any incentive for the use of a loop pre-polymerisation reactor in order to maintain low reactor fouling.

With regard to documents D18a and D24 as proof of common general knowledge according to which loop reactors are less sensitive to reactor fouling than CCSTRs, the following is pointed out. The process of the opposed patent pertains to a pre-polymerisation process which reduces the reactor fouling in the main polymerisation reactor. Thus the reactor in which fouling is an issue is the main polymerisation reactor and not the pre-polymerisation reactor. While it might be obvious to replace the main polymerisation reactor by a loop reactor, the relevant question is whether it was obvious to replace the pre-polymerisation reactor by a loop reactor. In the present case, D18a and D24 are silent about any advantage of loop reactors as pre-polymerisation reactors.

For these reasons, documents D1, D2b, D18a, D22 or D24 provide no incentive to replace the CCSTR of example 21 by a loop reactor in order to solve the above problem.

Consequently, under consideration of distinguishing feature (b) alone, the Board has no reason to depart from the opposition division's finding that the main request meets the requirements of Article 56 EPC (see paragraph 17 of the contested decision). It is therefore not necessary to analyse in detail the obviousness of distinguishing features (a) and (c).

5. As none of the objections of the appellant is successful, the appeal is to be dismissed.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:



B. ter Heijden

D. Semino

Decision electronically authenticated