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Datasheet for the decision of 8 March 2024

Case Number: T 1501/21 - 3.3.03

Application Number: 15736743.4

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Language of the proceedings: EN

Title of invention:
PROCESS FOR MANUFACTURING ETHYLENE POLYMERS AND USING MODIFIERS

Patent Proprietor:
ExxonMobil Chemical Patents Inc.

Opponent:
The Dow Chemical Company

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
Novelty - (yes)
Inventive step - obvious modification (yes)

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Case Number: T 1501/21 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 8 March 2024

Appellant: (Opponent)	The Dow Chemical Company 2030 Dow Center Midland, MI 48674 (US)
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Respondent: (Patent Proprietor)	ExxonMobil Chemical Patents Inc. 5200 Bayway Drive Baytown TX 77520-2101 (US)
Representative:	Uexküll & Stolberg Partnerschaft von Patent- und Rechtsanwälten mbB Beselerstraße 4 22607 Hamburg (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 1 July 2021 rejecting the opposition filed against European patent No. 3177653 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	D. Semino
Members:	M. Barrère
	R. Cramer

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 No. 3 177 653.

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

D4: US 2005/0192414 A1
D5: EP 2 636 691 A1
D8: WO 2013/064586 A1

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

- The subject-matter of granted claim 1 was novel in view of the disclosure of documents D4 and D5.

- The subject-matter of granted claim 1 involved an inventive step over D5 as the closest prior art.

IV. The opponent (appellant) filed an appeal against said decision.

V. With the rejoinder to the statement of grounds of appeal, the patent proprietor (respondent) filed two sets of claims as auxiliary requests B' and C'.

VI. Oral proceedings were held before the Board on 8 March 2024.

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, or alternatively that the decision under appeal be set aside and the patent be maintained in amended form on the basis of one of the sets of claims according to auxiliary requests A, B', B, C or C', whereby:

- sets A, B and C were filed with the reply to the notice of opposition and

- sets B' and C' were filed with the rejoinder to the statement of grounds of appeal.

VIII. Claim 1 as granted (main request of the respondent) read as follows:

"1. A process for producing an ethylene polymer comprising:

compressing ethylene monomer in a first and a second compressor to a pressure from 1000 to 3000 bar;

introducing the compressed ethylene monomer into one or more reactors;

introducing a modifier into one or more locations; and

separating the ethylene polymer from the reaction mixture;

wherein the first and the second compressor has two or more stages and the second stage of the second compressor comprises a suction section and discharge, and

wherein the modifier is introduced at the suction section of the second stage of the second compressor and/or the discharge of the second compressor."

Claim 1 of auxiliary request A corresponded to claim 1 as granted wherein:

"the modifier is introduced at the suction section of the second stage of the second compressor and~~/or~~, **optionally**, the discharge of the second compressor" (deletion in ~~strikethrough~~ and addition in **bold**).

The remaining claims of these requests and the claims of auxiliary requests B', B, C and C' are not relevant for 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) Main request

(i) Novelty

The subject-matter of claim 1 was not novel in view of the disclosure of document D5.

(ii) Inventive step

The subject-matter of claim 1 lacked an inventive step over D5 as the closest prior art.

(b) Auxiliary request A

(i) Novelty

The subject-matter of claim 1 was not novel in view of the disclosure of document D4.

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) Main request

(i) Novelty

The subject-matter of claim 1 was novel in view of the disclosure of document D5.

(ii) Inventive step

The subject-matter of claim 1 involved an inventive step over D5 as the closest prior art.

(b) Auxiliary request A

(i) Novelty

The subject-matter of claim 1 was novel in view of the disclosure of document D4.

Reasons for the Decision

Main request (patent as granted)

1. Novelty over document D5

1.1 Granted claim 1 is directed to a process for producing an ethylene polymer wherein, *inter alia*, a modifier is introduced:

D-1) at the suction section of the second stage of a second compressor and/or

D-2) at the discharge of a second compressor.

These two alternatives will be referred to as features D-1 and D-2 in the following.

A central point of dispute between the parties was whether document D5 disclosed the addition of a modifier at the discharge of the second compressor (emphasis here and below added by the Board).

In this respect, the parties disagreed on the interpretation of the expression "at the discharge". Given that the reading of this expression is central to the assessment of novelty and inventive step, the Board addresses this issue first.

1.2 Reading of the expression "at the discharge" (feature D-2)

1.2.1 The appellant contested the interpretation of the expression "at the discharge of the second compressor"

in the decision under appeal, in which the opposition division took the view that "at the discharge" should be interpreted as meaning "a location directly at the discharge unit" (decision, page 9, last paragraph and statement of grounds of appeal, pages 3 to 6, point IV. 1). They contended that the opposed patent did not explicitly define this expression, leaving room for interpretation. In particular, there was no explicit or implicit teaching as to where "*at the discharge of the second compressor*" would end. The appellant further noted that the terms "at the discharge," "in the discharge," and "into the discharge" were used interchangeably in the patent, further supporting their argument for a broader interpretation.

In their opinion, in the absence of a clear teaching, the skilled person should interpret the claim language using his/her technical knowledge in order to arrive at an interpretation that is technically sensible. To the person skilled in the art, the discharge stream was the same when exiting the second compressor and further downstream the line prior to the preheater. Accordingly, when applying his/her technical sense to the claim language, the skilled person would interpret the expression "*at the discharge of the second compressor*" as referring to any location between the compressor and the preheater.

1.2.2 With regard to the interpretation of feature D-2 the Board agrees with the opposition division and the respondent for the following reasons:

(a) According to established case law, the skilled person should try, with synthetical propensity, i.e. building up rather than tearing down, to arrive at an interpretation of the claim which is

technically sensible and takes into account the whole disclosure of the patent (Case Law of the Boards of Appeal, 10th edition 2022, in the following "Case Law", II.A.6.1).

(b) While it is true that the opposed patent does not further define feature D-2, the Board takes the view that the local preposition "at" in the expression "at the discharge of the second processor" has a clear meaning, which applies also for the skilled person working in an ethylene polymerisation plant, in the sense that it designates a location in the direct vicinity of the said discharge. In any event, the Board has no reason to believe that the skilled person would understand feature D-2 to represent a location further downstream from the discharge such as locations that would be close to the preheater or even the reactor. In other words, the Board considers that the skilled person (working with a polyethylene manufacturing unit) can make a distinction between the discharge of a compressor, a transfer line between the compressor and the next unit, and the suction section in the next unit (preheater or reactor).

(c) The appellant's line of argument is based on the alleged fact that the skilled person would understand that the ethylene stream is "*the same when exiting the second compressor and further downstream the line prior to the preheater.*" However, the Board considers that the fact that the stream may be the same is irrelevant for the reading of feature D-2. Even if the skilled person would understand that it makes no difference whether the modifier is added at the discharge of

the compressor or at the inlet of the preheater, claim 1 still specifies that the modifier is to be added "at the discharge of the compressor". Therefore, even if it made no difference (for the purpose of the claimed invention) to add the modifier at a different location, this interpretation is not covered by granted claim 1.

1.2.3 Therefore, the Board considers that feature D-2 designates a location near the compressor discharge, and not any location between the compressor and the next downstream unit.

1.3 Merit of the novelty objection

1.3.1 The appellant's novelty objection was based on a broad interpretation of feature D-2 (point 1.2.1 above). Specifically, it was argued that D5 disclosed ethylene polymerisation processes wherein a modifier was added between a secondary compressor and a preheater, thereby anticipating feature D-2 of claim 1 (D5, paragraph [0023]).

1.3.2 However, as noted previously, the Board does not agree with the appellant's broad interpretation of feature D-2 and does not consider that any location between the second compressor and a downstream unit can be equivalent to said feature.

1.3.3 As D5 does not to disclose the introduction of a modifier "at the suction section of the second stage of a second compressor and/or at the discharge of a second compressor", the subject-matter of granted claim 1 is novel over this document.

2. Inventive step

According to the appellant, the subject-matter of granted claim 1 lacks an inventive step over document D5 as the closest prior art.

2.1 Closest prior art

2.1.1 The respondent argued that D8 was the closest prior art for the subject-matter of granted claim 1. Contrary to the appellant's view, they considered that D5 was not a suitable starting point for the assessment of inventive step because it related to technical problems different from those of the opposed patent. In particular D5 was not concerned with compressor fouling but with preheater fouling (D5, paragraph [0009]). A relevant additional point for the respondent was that D5 pertained to polymerisation processes directed at making ethylene-diene copolymers and to specific problems linked to the presence of a diene comonomer.

2.1.2 Irrespective of whether or not D5 is closer to the subject-matter of granted claim 1 than D8, the relevant question for the Board is whether D5 represents a realistic starting point (Case Law, I.D.3.4.1). In that respect, a central consideration in selecting the closest prior art is that it should be directed to the same purpose or effect as the invention (Case Law, I.D. 3.2).

2.1.3 The opposed patent relates to a process of manufacturing ethylene polymers and copolymers at high pressure using one or more modifiers (paragraph [0001]). D5 also pertains to high pressure polymerisation processes comprising the polymerisation of ethylene in the presence of a chain transfer agent

corresponding to a modifier (D5, claims 1, 6 and 13). While D5 specifically concerns a copolymer of ethylene and a diene comonomer, it should be noted that this type of copolymer is covered by claim 1 of the opposed patent.

Moreover, D5 mentions that the addition of reactive substances prior to sensitive process steps such as compression and pre-heating might result in unwanted reactions (D5, paragraph [0104]). Although D5 does not explicitly mention the problem of compressor fouling, this document is nevertheless closely related to the technical field and the purpose of the opposed patent and is therefore considered to be a reasonable starting point for assessing inventive step of the subject-matter of claim 1.

2.2 Distinguishing feature

According to the respondent (rejoinder to the statement of grounds of appeal, page 51, penultimate paragraph), granted claim 1 differed from D5 in that the modifier was introduced:

D-1) at the suction section of the second stage of the second compressor and/or

D-2) at the discharge of the second compressor.

The appellant contested these distinguishing features on the basis of a broad interpretation of feature D-2.

However, in the context of novelty (point 1.3 above), the Board did not follow the appellant's interpretation

of feature D-2 and agreed with the distinguishing features identified by the respondent.

2.3 Objective problem to be solved

2.3.1 The appellant contended that there was no evidence in the opposed patent that any problem was solved by introducing the modifier at the suction section of the second stage of the second compressor or at the discharge of the second compressor (statement of grounds of appeal, page 24, first full paragraph to page 25, second paragraph).

2.3.2 During the oral proceedings before the Board, the respondent referred to the subjective technical problem identified in paragraph [0026] of the opposed patent and argued that it was at least credible that the said problem was solved by a process comprising distinguishing features D-1 and D-2.

2.3.3 The opposed patent indeed teaches that introducing a modifier before the secondary compressor leads to fouling in the said compressor (paragraph [0005]). Moreover, it was allegedly found that injecting a modifier into the suction section of the second stage of the secondary compressor (feature D-1) and/or at the discharge of the second stage of the secondary compressor (feature D-2) significantly reduced fouling in the secondary compressor (paragraph [0026]).

However, following the teaching of the opposed patent, it can be concluded that, if the addition of the modifier at the discharge of the compressor reduces fouling in the compressor, it can be assumed that fouling is also reduced if the modifier is injected

further downstream of the compressor, as in D5 (paragraph [0023]).

2.3.4 It follows that the subjective problem to be solved in the patent is expected to be already solved by the processes of D5.

2.3.5 It is therefore concluded that the objective problem to be solved over D5 should be formulated as the provision of an alternative process for producing an ethylene polymer.

2.4 Obviousness of the solution

2.4.1 It remains to be assessed whether it was obvious for a person skilled in the art wishing to provide an alternative process to the processes disclosed in D5 to introduce the modifier:

D-1) at the suction section of the second stage of the second compressor and/or

D-2) at the discharge of the second compressor.

2.4.2 According to the respondent, D5 taught away from the solution proposed in the opposed patent because it suggested to introduce the modifier downstream of the compressor, and preferably downstream of the preheater (paragraph [0097] and figure 3 of D5).

2.4.3 The appellant argued that, in view of the disclosure of D5, it was obvious to introduce the modifier at the discharge of the second compressor (statement of grounds of appeal, page 25, second paragraph to page 27, first paragraph).

2.4.4 In that respect the Board agrees with the appellant for the following reasons:

As noted above, the problem to be solved is merely the provision of an alternative process. Hence any embodiment within the general teaching of D5 is considered to be obvious for the skilled person. D5 teaches that it is beneficial to add reactive compounds such as a chain transfer agent downstream from the compressor, and in particular between the compressor and the preheater (D5, paragraph [0023]). Therefore the choice of a specific location between the compressor and the preheater such as the discharge of the compressor is arbitrary and an obvious option for the skilled person. Although the Board agrees that this embodiment is not the preferred one of D5 (due to the risk of fouling in the preheater as stated in paragraph [0105]), it is nevertheless covered by its teaching and therefore obvious for a skilled person looking only for an alternative.

2.4.5 In any event, an inventive step cannot be acknowledged solely because claim 1 relies on a less preferred embodiment of the prior art. Put another way, if a process from the prior art is known to have potential drawbacks, in the absence of contradictory evidence, a process derived from this embodiment such as the one of granted claim 1 is likely to inherit the same drawbacks and cannot be considered inventive in view of the expected disadvantages.

2.4.6 For these reasons, the subject-matter of granted claim 1 does not involve an inventive step over D5 alone.

Auxiliary request A

3. Claim 1 of auxiliary request A differs from granted claim 1 essentially in that the modifier must be introduced at the suction section of the second stage of the second compressor (feature D-1). In other words, feature D-1 is no longer optional. With respect to inventive step, the appellant only argued that feature D-2 was obvious to a person skilled in the art, but did not contest the obviousness of feature D-1. It follows that none of the objections of lack of inventive step raised against granted claim 1 applies to claim 1 of auxiliary request A.

The appellant confirmed that the sole objection against auxiliary request A was an objection of lack of novelty in view of the disclosure of document D4 (minutes of the oral proceedings, page 2, sixth paragraph).

4. Novelty over document D4

4.1 The appellant argued that all features of present claim 1 of the patent were already disclosed in D4 (statement of grounds of appeal, pages 12 to 16, point IV.3). Specifically, they asserted that D4 disclosed the addition of a transfer agent "at the suction section of the second stage of the second compressor" based on paragraphs [0046] to [0049] and figure 3 of D4. In paragraph [0046], it was mentioned that the transfer agent was introduced into a segregated section of the second compressor. This segregated section was where the transfer agent-poor monomer stream was initially compressed, and then the transfer agent was added. Subsequently, in a second stage of this compressor, the transfer agent was compressed together with the

ethylene monomer to a pressure suitable for supplying them to the reactor.

This process, according to the appellant, effectively introduced the transfer agent at the suction section of the second stage of the second compressor, as it was blended with the monomer stream at this point.

Furthermore, even if it were considered that the transfer agent and ethylene monomer would pass through segregated conduits in a section of the second compression stage, the appellant argued that there was

> "*no requirement [in claim 1 of the opposed patent] that the modifier is mixed with ethylene monomer in the same conduit.*" (letter of 20 October 2022, page 12, second full paragraph)

4.2 The Board agrees with the respondent that D4 does not directly and unambiguously disclose a step of introducing the modifier "at the suction section of the second stage of the second compressor" for the following reasons:

(a) Firstly, it is derivable from figure 3 of D4 in combination with paragraphs [0046] and [0049] that the ethylene and the chain transfer agent are compressed in segregated lines and that the actual introduction of the said agent in the monomer takes place only in the vicinity of the reactor. Moreover, the Board does not agree with the interpretation of claim 1 put forward by the appellant that this claim does not require that the ethylene and the modifier are blended at the suction of the second stage of the second compressor. The expression "wherein the modifier is

introduced at the suction section of the second stage of the second compressor" makes it clear for the skilled person that the modifier must be contacted and therefore blended with the ethylene feed because the said compressor is used to compress the ethylene monomer. This, however, does not correspond to the teaching of D4 requiring segregated pressurisation lines for the monomer and the chain transfer agent.

(b) Secondly, independently of whether present claim 1 covers a process wherein the monomer and the modifier are pressurised in segregated lines, the Board does not consider that D4 directly and unambiguously discloses the introduction of a modifier "at the suction section of the second stage of the second compressor". This specific location is neither explicitly disclosed nor can it be inferred from the disclosure of document D4 as a whole.

4.3 For these reasons, the subject-matter of claim 1 of auxiliary request A is novel over the disclosure of D4.

5. As the only objection to auxiliary request A is unsuccessful, the patent is to be maintained on the basis of this request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division with the order to maintain the patent on the basis of the claims of auxiliary request A filed with the reply to the notice of opposition, after any necessary consequential amendment of the description.

The Registrar: The Chairman:

D. Hampe D. Semino

Decision electronically authenticated