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**Datasheet for the decision  
of 6 June 2023**

**Case Number:** T 1277/20 - 3.3.03

**Application Number:** 05716678.7

**Publication Number:** 1720914

**IPC:** C08F2/14, B01J19/18, C08F10/02,  
B01J8/00

**Language of the proceedings:** EN

**Title of invention:**  
MULTIPLE LOOP REACTOR FOR OLEFIN POLYMERIZATION

**Patent Proprietor:**  
TotalEnergies OneTech Belgium

**Opponent:**  
Chevron Phillips Chemical Company LP

**Relevant legal provisions:**  
EPC Art. 56

**Keyword:**  
Inventive step - (no)

**Decisions cited:**  
T 0578/06, T 0716/08



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**Case Number: T 1277/20 - 3.3.03**

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.03**  
**of 6 June 2023**

**Appellant:** Chevron Phillips Chemical Company LP  
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**Decision under appeal:** **Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
16 March 2020 concerning maintenance of the  
European Patent No. 1720914 in amended form.**

**Composition of the Board:**

**Chairman** D. Semino  
**Members:** D. Marquis  
R. Cramer

## Summary of Facts and Submissions

I. The appeal lies against the decision of the opposition division concerning maintenance of European patent No. 1 720 914 in amended form based on auxiliary request 2 submitted at the oral proceedings on 21 January 2020.

II. Claim 1 of auxiliary request 2 read as follows:

"1. Multiple loop reactor (1) suitable for olefin polymerization comprising

- at least two interconnected loop reactors (2,3), each consisting of a plurality of interconnected pipes (4) defining a flow path (8) for a polymer slurry,
- one or more settling legs (12) connected to the pipes (4) of one reactor (2), each of said settling legs being provided with a transfer line (16) for transferring polymer slurry to another reactor (3), and
- one or more settling legs (12) connected to the pipes (4) of the other reactor (3) for discharging polymer slurry from the reactor (3) into a product recovery zone, and
- at least one pump (6) suitable for maintaining the polymer slurry in circulation in said multiple loop reactor,

whereby a three-way valve (15) is provided at the exit of the settling leg (12) of said one reactor (2), and whereby the entry in the other reactor (3) is provided with a piston valve (18),

and whereby said connection of said reactors (2, 3) consists of one or more transfer lines (16) and whereby said transfer lines are positioned with respect to a horizontal axis X-X' under an angle of inclination  $\alpha$

with respect to said horizontal axis X-X' which is lower than 25°, and extend from the exit of the settling leg (12) of the reactor (2) to the entry in the other reactor (3), and whereby said transfer lines (16) connect the three-way valve (15) provided at the exit of the settling leg (12) of reactor (2) with the entry of the other reactor (3) where the piston valve (18) is provided".

III. The decision of the opposition division was based, *inter alia*, on the following documents:

D1: WO 02/28922 A1  
D3: US 6,355,741 B1.

IV. In the impugned decision the opposition division concluded that claim 1 as granted lacked a basis in the application as filed and that the same conclusion applied to claim 12 of auxiliary request 1. Claims 1 and 12 of auxiliary request 2 found a basis in the application as filed. They were sufficiently disclosed and novel over D1. D3 and not D1 was the closest prior art. The subject-matter of the claims of auxiliary request 2 was inventive over D3.

V. The opponent (appellant) lodged an appeal against that decision.

VI. The patent proprietor (respondent) submitted document D13 (US 3,345,431) with their rejoinder.

VII. The parties were summoned to oral proceedings and a communication pursuant to Article 15(1) RPBA 2020 indicating specific issues to be discussed at the oral proceedings was sent to the parties.

- VIII. Oral proceedings were held on 6 June 2023 by videoconference.
- IX. The final requests of the parties were as follows:
- The appellant requested that the decision of the opposition division be set aside and that the patent be revoked.
  - The respondent requested that the appeal be dismissed.
- X. The appellant's arguments, in so far as they are pertinent to the present decision, may be derived from the reasons for the decision below. They are essentially as follows:
- Claim 1 of auxiliary request 2 did not involve an inventive step over D3 taken as the closest prior art.
- XI. The respondent's arguments, in so far as they are pertinent to the present decision, may be derived from the reasons for the decision below. They are essentially as follows:
- Claim 1 of auxiliary request 2 involved an inventive step over D3 taken as the closest prior art.

### **Reasons for the Decision**

1. Inventive step - Auxiliary request 2
- 1.1 The impugned decision addressed inventive step of claim 1 of auxiliary request 2 in view of D3 as the closest

prior art, and in particular it was apparent from section 4.6.1 of the impugned decision that the multiple loop reactor assembly disclosed in Figure 1 of D3 and described in its columns 5-9 constituted the most relevant starting point to assess inventive step within D3. It was also not in dispute between the parties in appeal that D3 could be seen as a document representing the closest prior art.

1.2 The opposition division concluded that claim 1 of auxiliary request 2 differed from the closest prior art D3 in the presence of (i) a three-way valve provided at the exit of the settling leg, (ii) a piston valve at the entry of the other reactor and (iii) a transfer line connecting the three-way valve and the piston valve being positioned at an angle with respect to the horizontal axis X-X' under an angle of inclination  $\alpha$  which is lower than  $25^\circ$  (section 4.6.3). These differences were not in dispute between the parties in appeal.

1.3 The respondent argued (rejoinder, section 7.17) that the problem solved in the patent in suit was to provide optimized polymer slurry transfer between two serially connected reactors, i.e. efficient and controlled transfer of polymer slurry from the first to the second reactor, while avoiding plugging problems. The formulation of that problem corresponds to the effects disclosed in paragraphs 14 and 15 of the patent in suit, in particular the optimized transfer and the avoidance of increased plugging alleged to result from the "substantially horizontal transfer of the polymer product from one to another reactor by means of the transfer lines" (paragraph 15).

- 1.4 The Board however does not find evidence of an effect resulting from the distinguishing features (i)-(iii) over the apparatus disclosed in the closest prior art D3.
- 1.4.1 The three-way valve (i) provided at the exit of the settling leg allows the removal of polymer slurry from the settling leg to channel that polymer slurry to another reactor or to a product recovery zone (paragraphs 29 and 33). The three-way valve defined in operative claim 1 provides by definition a control over the transfer of the polymer slurry, in the sense of allowing the operator to decide whether and where the polymer slurry would flow, but was not shown to have an effect beyond its normal operational function.
- 1.4.2 The piston valve (ii) located at the entry of the other reactor is capable of sealing the orifice by which the transfer line is connected to the other loop reactor (paragraph 34). The piston valve defined in operative claim 1 also provides a control over the transfer of the polymer slurry but, similarly to the three-way valve, it was not shown to have an effect beyond its normal operational function.
- 1.4.3 As to the transfer line (iii) positioned at an angle of less than  $25^{\circ}$  with respect to the horizontal axis X-X', the respondent alleged that this line surprisingly did not increase the frequency of plugging (paragraphs 15 and 36 of the patent in suit) and would result in a more cost effective process (paragraph 35). The respondent, however, exclusively relied on the effects stated in the patent in suit for which no evidence was provided that they existed over the apparatus of the closest prior art D3. The respondent's argument was that the EPC did not require experimental proof for

patentability and that it was sufficient that the effect had been rendered plausible to consider that the problem posed had been solved. Decisions T 578/06 and T 716/08 were cited in this respect (rejoinder, section 7.4).

- 1.4.4 The established case law about alleged technical advantages of the claimed subject matter over the closest prior art is, however, unambiguous (Case Law of the Boards of Appeal, 10th Edition 2022, I.D.4.3.1). Alleged advantages to which the patent proprietor merely refers, without offering sufficient evidence to support the comparison with the closest prior art, cannot be taken into consideration in determining the problem underlying the invention and therefore in assessing inventive step.
- 1.4.5 Other Boards have said in decisions T 578/06 and T 716/08 that the EPC did not require experimental data in the application as filed and that post-published evidence was not always required to establish that the claimed subject-matter solved the objective technical problem. This case law, however, considers that it must be shown that the technical problem underlying the invention was at least plausibly solved (Case Law of the Boards of Appeal, 10th Edition 2022, III.G. 4.2.3.b).
- 1.4.6 In the present case, the patent in suit discloses as a surprising effect that the use of substantially horizontal transfer of polymer product from one to another reactor does not increase the frequency of plugging in the polymer transfer lines and provides optimal product transfer in a cost-effective way (paragraphs 15 and 36). That alleged effect, as confirmed by the respondent at the oral proceedings



before the Board, was neither self-evident, nor predictable. The Board does not see how in such a case and in the absence of a credible technical explanation, the respondent could be dispensed from providing actual experimental evidence that the positioning of the transfer line at an angle of less than 25° with respect to the horizontal resulted in the alleged effect. Since it was not shown that the positioning of the transfer line at an angle of less than 25° with respect to the horizontal provided the alleged improvement, that effect cannot be taken into account in the formulation of the technical problem.

1.4.7 None of the distinguishing features (i), (ii) and (iii) was, therefore, shown to result in an unexpected effect alone or in combination with the others. The problem can, however, be formulated as the provision of a multiple loop reactor with controllable polymer slurry transfer between two reactors connected in series in view of the fact that the claim defines specific valves to control the transfer and a formulation in such a generality does not include any improvement over D3.

1.5 Starting from D3, the question of obviousness was whether using a (i) three-way valve at the exit of the settling leg, (ii) a piston valve at the end of the transfer line and (iii) a horizontal transfer line between the two reactors can be seen as being inventive.

1.6 It was acknowledged by the decision of the opposition division and also not contested by the respondent that the use of three-way valves and piston valves was known in the art and the Board had no reason to doubt that this was the case. The three-way valve (i) and the piston valve (ii) operate to fulfil a commonly known

purpose in the patent in suit, namely to allow the removal of polymer slurry from the settling leg and/or carry the polymer slurry to the transfer line or to an output line (for the three way valve (i)) and to open or close the transfer line before entering the second reactor (for the piston valve (ii)). The use of common types of valves in an apparatus involving a flow of product through conduits is the most obvious way in the art of exerting control on that product flow. The use of a three-way valve (i) and a piston valve (ii) in the process of D3 can therefore not be seen as involving an inventive step.

1.7 D3 further mentions in the first full paragraph in column 13 that horizontal pipes may be used as transfer conduit between the reactors. While that teaching regarding the transfer line of D3 is given in the context of producing polypropylene in a supercritical diluent, it is apparent from that passage that the use of horizontal pipes as transfer lines was more generally known in the art and that its use is not restricted to particular applications in D3. Moreover, the use of a diluent under supercritical conditions is not excluded for the polymerisation of olefins in the process and apparatus of the patent in suit. The apparatus disclosed in the closest prior art involving a diluent under supercritical conditions is therefore relevant to the apparatus according to the patent in suit.

1.8 The respondent considered that the passage in column 13 of D3 actually led the skilled person away from using a horizontal line. That passage, however, addresses an option of the process of D3 and indicates that without concentrating devices, which are both present in D3 and in the apparatus according to operative claim 1

(settling leg), the two reactors cannot be run independently from one another when, for example, a horizontal pipe is used. That passage therefore does not lead away from the general use of horizontal lines in an apparatus having concentrating devices, such as settling legs, as the apparatus disclosed in column 5 of D3. The use of a horizontal pipe as a transfer line between the two reactors of D3, therefore, does not involve an inventive step. This conclusion cannot be changed by the possible existence of reacting systems with a vertical arrangement, as alleged by the respondent based on document D13.

1.9 The Board concludes that the features (i), (ii) and (iii) alone or in combination do not involve an inventive step over the closest prior art D3. In view of that, the Board finds that claim 1 of auxiliary request 2 does not involve an inventive step.

2. Admittance of D13

2.1 With regard to D13, while its admittance was not contested by the appellant, consideration of this document filed by the respondent does not change the conclusion on inventive step (see point 1.8, above), so that there is no need to provide a detailed reasoning as to its admittance.

## 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. Hampe

D. Semino

Decision electronically authenticated