

Internal distribution code:

- (A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [-] To Chairmen
(D) [X] No distribution

**Datasheet for the decision
of 19 November 2019**

Case Number: T 0379/16 - 3.3.02

Application Number: 06121391.4

Publication Number: 1752435

IPC: C07D303/08, C08G59/04

Language of the proceedings: EN

Title of invention:

Process for producing epichlorhydrin

Patent Proprietor:

Technip France

Opponents:

Akzo Nobel Chemicals International B.V.
Olin Corporation
Kanzler Verfahrenstechnik GmbH
Spolek pro chemickou a hutni výrobu,
akciová společnost
LEUNA-Harze GmbH

Headword:

EPICHLORHYDRIN PRODUCTION/TECHNIP

Relevant legal provisions:

EPC Art. 56

Keyword:

Inventive step - all requests (no)

Decisions cited:

Catchword:



Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 0379/16 - 3.3.02

D E C I S I O N
of Technical Board of Appeal 3.3.02
of 19 November 2019

Appellant 1: Akzo Nobel Chemicals International B.V.
(Opponent 1) Velperweg 76
6824 BM Arnhem (NL)

Representative: Akzo Nobel Chemicals IP Group
Velperweg 76
6824 BM Arnhem (NL)

Appellant 3: Kanzler Verfahrenstechnik GmbH
(Opponent 3) Stiftingtalstrasse 165c
8010 Graz (AT)

Representative: Fitzner, Uwe
Meissner Bolte
Patentanwälte Rechtsanwälte
Partnerschaft mbB
Hauser Ring 10
40878 Ratingen (DE)

Appellant 4: Spolek pro chemickou a hutni výrobu,
(Opponent 4) akciová společnost
Revolucni 1930/86
400 32 Ústi nad Labem (CZ)

Representative: Wibbelmann, Jobst
Wuesthoff & Wuesthoff
Patentanwälte PartG mbB
Schweigerstrasse 2
81541 München (DE)

Appellant 5: LEUNA-Harze GmbH
(Opponent 5) Am Haupttor - Bau 6619
06237 Leuna (DE)

Representative: Beyer, Wolfgang
Dinter Kreissig & Partner
Gottschedstrasse 12
04109 Leipzig (DE)

Respondent: Technip France
(Patent Proprietor) 6-8 allée de l'Arche
Faubourg de l'Arche
ZAC Danton
92400 Courbevoie (FR)

Representative: Lavoix
2, place d'Estienne d'Orves
75441 Paris Cedex 09 (FR)

Party as of right: Olin Corporation
(Opponent 2) 190 Carondelet Plaza Suite 1530
Clayton, MO 63105-3443 (US)

Representative: Greaves Brewster LLP
Copa House
Station Road
Cheddar, Somerset BS27 3AH (GB)

Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 18 December
2015 rejecting the opposition filed against
European patent No. 1752435 pursuant to Article
101(2) EPC.**

Composition of the Board:

Chairman M. O. Müller
Members: M. Maremonti
L. Bühler

Summary of Facts and Submissions

I. The appeals by opponents 1, 3, 4 and 5 (hereinafter "appellant 1, 3, 4 and 5") lie from the decision of the opposition division to reject the oppositions against European patent No. 1 752 435.

II. The granted patent contains sixteen claims, the independent claim 1 of which reads as follows:

"1. Process for producing epichlorhydrin by subjecting dichloropropanol to a dehydrochlorination reaction, wherein the dichloropropanol is obtained by reacting glycerol obtained from renewable raw materials with at least one chlorinating agent in a reactor made of or coated with materials selected from enameled steel, polyolefins, fluorinated polymers, phenolic resins, tantalum and silver."

Claims two to sixteen define particular embodiments of the process of claim 1.

III. The following documents were among those cited during the opposition proceedings:

D4: Perry's Chemical Engineers Handbook, 1997, Section 28, pages 28-1 to 28-64.

D20: Dupont Brochure describing the properties and uses of Teflon PTFE, July 1996.

D29: DE 1 075 103

D31: Apparate Technik - Bau - Anwendung, 2. Ausgabe, Vulkan Verlag Essen, 1997, pages 203 to 211.

D36: US 2 198 600

D40: Experimental data submitted by the respondent, received at the European Patent Office on 24 September 2008 during examination proceedings.

D46: GB 2 029 821 A

D47: US 2 279 509

The opposition division came to the conclusion that the grounds for opposition under Article 100(a), (b) and (c) EPC did not prejudice the maintenance of the patent as granted.

- IV. In their statement of grounds of appeal, the appellants contested the reasoning of the opposition division and raised objections under Article 100(a), (b) and (c) EPC.
- V. In its reply to the statements of grounds of appeal, the patent proprietor (hereinafter "respondent") rebutted the arguments of the appellants. It also filed claims according to auxiliary requests 1 to 10.
- VI. The parties were summoned to oral proceedings to be scheduled according to their request.
- VII. In response, appellant 1 informed that it would not participate in the oral proceedings.
- VIII. The board issued a communication in preparation for the oral proceedings. In this communication, the board expressed *inter alia* the preliminary opinion that the claimed subject-matter did not appear to involve an inventive step in view of D29, taken as the closest prior art.
- IX. In reply to the board's communication, by letter dated 31 October 2019 the respondent filed description pages

and claims according to a main request 1A and to auxiliary requests 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, 5B, 6A, 6B, 7A and 7B. These requests replaced the previously filed requests.

Claim 1 of main request 1A reads as follows (amendments to claim 1 as granted are highlighted by the board):

*"1. Process for producing epichlorhydrin by subjecting dichloropropanol to a dehydrochlorination reaction, wherein the dichloropropanol is obtained by reacting glycerol obtained from renewable raw materials with at least one chlorinating agent in a reactor made of or coated with materials selected from enameled steel, polyolefins, fluorinated polymers, ~~phenolic resins,~~ tantalum and silver **or coated with phenolic resins.**"*

X. Oral proceedings before the board were held on 19 November 2019 in the absence of appellant 1 and opponent 2 pursuant to Rule 115(2) EPC and Article 15(3) RPBA.

XI. Final requests

All appellants requested that the decision under appeal be set aside and the patent be revoked.

Appellants 3 to 5 requested that main request 1A not be admitted into the proceedings.

All appellants requested that D40 be disregarded in the assessment of inventive step.

The respondent requested that the patent be maintained on the basis of description pages and claims according to its main request 1A. Alternatively, the respondent requested that the patent be maintained on the basis of description pages and claims according to one of

auxiliary requests 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, 5B, 6A, 6B, 7A or 7B to be considered in the mentioned order. All requests had been filed by letter dated 31 October 2019.

XII. The arguments of the appellants, where relevant to the present decision, may be summarised as follows:

- Document D29 might be considered as the closest prior art.
- The subject-matter of claim 1 of main request 1A only differed from the process disclosed in D29 in the specification of the reactor materials.
- The technical problem deriving from this distinguishing feature was the provision of an appropriate corrosion-resistant reactor material for the reaction of glycerol with hydrogen chloride to dichloropropanol.
- The claimed solution, in particular the selection of Teflon as the reactor material was obvious to the skilled person in view of a number of documents, in particular D4, D20, D31 and D46. In fact, all these documents disclosed that fluorinated polymers, in particular Teflon, had excellent resistance to corrosion.
- In particular, D46, though concerning a different reaction for producing dichloropropanol, disclosed a reaction mixture, comprising *inter alia* HCl and dichloropropanol, i.e. the same highly corrosive compounds as those present in the reaction mixture according to claim 1. Iron lined with Teflon was used as the reactor material.

- The skilled person would consider D46, since the compounds of the reaction mixture responsible for corrosion were the same as in the closest prior art. The fact that the reaction temperature in D46 was relatively low did not prevent the skilled person from considering D46. In fact, the reaction temperature was the same as the temperature disclosed in the contested patent, paragraph [0052], stated to be at least 20°C for the conversion of glycerol to dichloropropanol.
- D20 disclosed that Teflon was chemically inert. The only materials reacting with it were listed, and neither HCl nor dichloropropanol were mentioned.
- D31 disclosed that fluorinated polymers were extremely resistant to both HCl and trichloroethylene, i.e. a chlorinated organic compound, like dichloropropanol.
- It thus had to be concluded that the subject-matter of claim 1 of main request 1A lacked an inventive step.
- The same applied to the subject-matter of claim 1 of all the auxiliary requests. In fact, fluorinated polymers were mentioned as a possible reactor material in claim 1 of all the requests. Claim 1 of auxiliary requests 7A and 7B specifically mentioned Teflon.
- As a consequence, the subject-matter of claim 1 of all the auxiliary requests lacked an inventive step as well.

XIII. The respondent counter-argued as follows:

- Document D29 represented the closest prior art.

- The subject-matter of claim 1 of main request 1A differed from the process disclosed in D29 in the materials of the reactor used for the conversion of glycerol to dichloropropanol.
- The technical problem deriving from the distinguishing feature was the provision of reactor materials that were particularly resistant to corrosion under the conditions of conversion of glycerol to dichloropropanol.
- The reaction mixture comprising glycerol, water, hydrogen chloride and dichloropropanol was highly corrosive. In fact, the corrosiveness of HCl was well known, and D29 disclosed (column 2, lines 38 to 40) that dichloropropanol was also strongly corrosive. This was confirmed by the results reported in D40, demonstrating that materials able to withstand HCl were not able to withstand the combination of HCl and dichloropropanol.
- Looking for a solution to the posed technical problem, the skilled person would thus consider documents disclosing materials able to withstand the whole reaction mixture. The only document disclosing such a material was D36/D47, which disclosed the reaction of glycerol and HCl to dichloropropanol in a glass reactor. However, glass was not one of the materials listed in claim 1. For this reason alone, the claimed subject-matter already involved an inventive step.
- Even assuming that the skilled person would also consult documents disclosing materials able to withstand HCl only, the claimed subject-matter was still inventive. In fact, D4 disclosed the resistance to HCl corrosion not only of the

materials listed in claim 1 but also of many other materials that were shown in D40 not to withstand the combination of HCl and dichloropropanol. There was no pointer in D4 that would prompt the skilled person to select the claimed materials. The improvement in corrosion resistance shown in D40 was not taught in the prior art.

- As regards D46, the skilled person would not consider this document since it concerned a totally different reaction, in which HCl was a product and not a reactant and in which the temperature was much lower than the one required for the claimed reaction.
- Document D20 did not teach the conditions under which Teflon was used, but merely disclosed a non-exhaustive list of compounds reacting with Teflon.
- It thus had to be concluded that the claimed subject-matter involved an inventive step.
- The same applied to the subject-matter of the auxiliary requests.

Reasons for the Decision

Main request 1A - admittance into the proceedings

1. Appellants 3 to 5 objected to the admittance of main request 1A into the proceedings.

At oral proceedings, the board decided to admit main request 1A into the appeal proceedings. However, since this main request was found not to be allowable (see *infra*), a detailed reasoning for this decision is not necessary.

Main request 1A - inventive step under Article 56 EPC

2. Closest prior art

All parties agreed to consider document D29 as the closest prior art. In view of the process disclosed therein, the board has no reason to take another stance. In fact, like the contested patent, D29 relates (columns 1 to 4) to a process for producing epichlorhydrin by subjecting dichloropropanol to a dehydrochlorination reaction, wherein the dichloropropanol is obtained by reacting glycerol with hydrogen chloride. The board thus regards D29 as a suitable starting point for the assessment of inventive step.

3. The technical problem

3.1 It was common ground between the parties that the subject-matter of claim 1 of main request 1A differs from the process taught by D29 in that the reactor in which glycerol is reacted with the chlorinating agent to produce dichloropropanol is required to be "*made of or coated with materials selected from enamelled steel, polyolefins, fluorinated polymers, tantalum and silver or coated with phenolic resins*". The material of the reactor used in D29 is not specified.

3.2 The respondent argued (XIII, *supra*) that the technical problem deriving from the above mentioned distinguishing feature was the provision of reactor materials that were particularly resistant to corrosion under the conditions of conversion of glycerol to dichloropropanol.

3.3 In the following assessment of inventive step, the board, for the sake of argument only and in the

respondent's favour, accepts this formulation of the technical problem, which thus represents the objective technical problem.

4. Obviousness of the claimed solution

4.1 What remains to be decided is whether, having regard to the state of the art and common general knowledge, it was obvious to the skilled person seeking to solve the technical problem posed (3.2, *supra*), to select one of the claimed materials for the reactor used in the closest prior art to carry out the conversion of glycerol to dichloropropanol.

4.2 The respondent put forward the view (XIII, *supra*) that the skilled person would consider documents disclosing reactor materials able to withstand the conditions of the reaction defined in claim 1, especially a reaction mixture comprising HCl and dichloropropanol, known for its highly corrosive nature. Only D36/D47 disclosed such a material, namely glass. However, glass was not one of the materials listed in claim 1.

The board disagrees. Document D46 discloses (page 1, lines 57 to 58) a process for the production of dichloropropanol by reacting allyl chloride and chlorine in an aqueous medium. HCl is also produced (page 3, lines 16 to 17). The board acknowledges that this is a different reaction from that defined in claim 1 at issue. However, the reaction *mixture* taught by D46 contains, as does the reaction mixture defined in claim 1, HCl and dichloropropanol in combination, i.e. the compounds responsible, according to the respondent's argument, for the highly corrosive nature of the mixture.

According to D46 (page 3, lines 11 to 12), «*The reactors are generally constructed from materials **resistant to corrosion**, for example **iron lined with "Teflon"** (Registered Trade Mark)*» (emphasis added by the board).

The temperature of the reaction taught by D46 (page 4, table 1) lies between 20 and 56 °C, i.e. in the range of at least 20 °C disclosed in the contested patent (paragraph [0052]) for the claimed reaction of glycerol with a chlorinating agent to produce dichloropropanol.

Contrary to the respondent's opinion (XIII, *supra*), the board is therefore convinced that the skilled person would consider the teaching of D46 and would thus regard Teflon as a material suitable for solving the posed technical problem (3.2, *supra*).

- 4.3 The skilled person would also be confirmed in the selection of Teflon as a suitable material at least by D4 and D20.

In fact, according to D4 (page 28-43 under "*THERMOPLASTICS*"), "*The most chemical-resistant plastic commercially available today is **tetrafluoroethylene** or **TFE (Teflon)***" (emphasis added by the board), said to be "*practically unaffected **by all alkalies and acids***" (emphasis added by the board) and to retain "*its properties up to 260 °C*".

According to D20 ("*Chemical Properties, Resistance to Chemical Attack*"), Teflon is "*chemically inert*" and up to 260 °C "*only few chemicals*" are known to chemically react with it, "*i.e. molten alkali metals, turbulent liquid, or gaseous fluorine; and a few fluorochemicals, such as chlorine trifluoride, ClF₃, or oxygen difluoride, OF₂*". Contrary to the respondent's view,

this list of chemicals reacting with Teflon, which includes neither HCl nor dichloropropanol, is presented in D20 as exhaustive.

- 4.4 The fact that the respondent showed, by means of the experimental results in D40, that the claimed materials perform better than other materials which may also be mentioned in some of the documents cited by the appellants does not have any bearing on the fact that Teflon is identified, at least in each of D46, D4 and D20 cited above, as having excellent resistance to corrosion and being chemically inert.

Nor does the fact that D36/D47 discloses glass as a reactor material used in the presence of a mixture comprising HCl and dichloropropanol have any bearing on this conclusion.

- 4.5 The skilled person seeking a solution to the posed technical problem would therefore have been prompted by each of D46, D4 and D20, specifically to select Teflon; and since Teflon is a fluorinated polymer, they would have arrived at the subject-matter of claim 1 at issue without exercising any inventive skill.
- 4.6 The board concludes that the subject-matter of claim 1 of main request 1A lacks an inventive step (Article 56 EPC). Main request 1A is thus not allowable.
- 4.7 Since inventive step is denied even when taking D40 into account, there is no need to discuss the appellants' request (XI, *supra*) to disregard the results reported in D40 in the assessment of inventive step.

Auxiliary requests - inventive step under Article 56 EPC

5. Claim 1 of all the auxiliary requests 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, 5B, 6A and 6B includes the same distinguishing feature as the closest prior art of a "reactor made of or coated with materials selected from **fluorinated polymers**" (emphasis added by the board). Claim 1 of auxiliary requests 7A and 7B includes the distinguishing feature from the closest prior art of a "reactor made of or coated with materials selected from **polytetrafluoroethylene and poly(perfluoropropylvinylether)**" (emphasis added by the board). Polytetrafluoroethylene is the chemical name of Teflon.

Therefore, the board concludes that the same reasons for lack of inventive step set out above in relation to main request 1A apply *mutatis mutandis* to the subject-matter of claim 1 of all the auxiliary requests (Article 56 EPC).

Conclusion

6. None of the respondent's requests is allowable under Article 56 EPC.

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:



N. Maslin

M. O. Müller

Decision electronically authenticated