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Datasheet for the decision of 14 October 2025

Case Number: T 1453/23 - 3.3.02

Application Number: 14711027.4

Publication Number: 3089958

IPC: C07C51/43, C07C51/487

Language of the proceedings: EN

Title of invention:
HIGH-PRESSURE CONDENSATE GENERATION IN THE MANUFACTURE OF PURIFIED AROMATIC CARBOXYLIC ACIDS

Patent Proprietor:
INEOS US CHEMICALS COMPANY

Opponent:
Withers & Rogers LLP/Jones Nicholas/Wright Howard/
Wallin Nicholas

Headword:

Relevant legal provisions:
EPC Art. 56, 123(2), 83

Keyword:
Inventive step - main request (no) - auxiliary request six (yes)
Amendments - allowable (yes)
Sufficiency of disclosure - (yes)

Decisions cited:

Catchword:

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Case Number: T 1453/23 - 3.3.02

D E C I S I O N
of Technical Board of Appeal 3.3.02
of 14 October 2025

Appellant: (Patent Proprietor)	INEOS US CHEMICALS COMPANY 150 West Warrenville Road Naperville, IL 60563 (US)
Representative:	King, Alex Mathisen & Macara LLP Charta House 30-38 Church Street Staines-upon-Thames, Middlesex TW18 4EP (GB)
Respondent: (Opponent)	Withers & Rogers LLP/Jones Nicholas/Wright Howard/ Wallin Nicholas 2 London Bridge London SE1 2RA (GB)
Representative:	Stepney, Gregory John Withers & Rogers LLP 2 London Bridge London SE1 9RA (GB)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 30 May 2023 revoking European patent No. 3089958 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	M. Maremonti
Members:	M. Kollmannsberger
	T. Bokor

Summary of Facts and Submissions

I. The patent proprietor appealed the opposition division's decision to revoke European patent EP 3 089 958 pursuant to Article 101(2) and (3)(b) EPC.

II. The patent deals with the preparation of purified aromatic carboxylic acids. The claimed process involves heating a crude reaction product for purification by hydrogenation and crystallisation. The patent is based on the idea of using high-pressure steam from a boiler in a heat exchanger for this purpose, with the high-pressure condensate formed during heat exchange being recycled from the heat exchanger to the boiler.

III. The patent had been opposed under Article 100(a), (b) and (c) EPC for lack of inventive step (Article 56 EPC), insufficient disclosure (Article 83 EPC) and unallowable amendments (Article 123(2) EPC). In its decision, the opposition division concluded that the grounds for opposition under Article 100(b) and (c) EPC did not prejudice maintenance of the patent in its granted form. However, the process defined in claim 1 as granted lacked an inventive step (Articles 56 and 100(a) EPC). The same applied to the processes defined in claims 1 of auxiliary requests 1-10 filed before the opposition division and underlying the appealed decision. Thus the patent was revoked.

IV. The following documents are referred to in the present decision:

D1: CN 103304397 A

D1b: IN 970/CHE/2013: Indian family member of D1, used as English translation of D1

D2: WO 93/24441

D4: Declaration filed before the Indian patent office in the prosecution of D1b

D5: "*Why Steam Generators Are Better Than Steam Boilers*" from https://www.electrosteam.com/why-steam-generators-better-steam-boilers/

D7: Paffel, K.: "*Best Practices for Condensate System Piping*" from https://www.plantengineering.com/articles/best-practices-for-condensate-system-piping/

D8: Sarco, S.: "A quick guide to condensate recovery" from https://www.plantengineering.com/articles/a-quick-guide-to-condensate-recovery/

D9: WO 2006/102336 A2

V. Claim 1 of the patent as granted reads as follows:

"*A process for manufacturing a purified aromatic carboxylic acid comprising:*

generating high-pressure steam from boiler feed water supplied to a boiler;
oxidizing a substituted aromatic hydrocarbon in a reaction zone to form a crude aromatic carboxylic acid;
heating the crude aromatic carboxylic acid in a heating zone by indirect contact with the high-pressure steam, whereby the high pressure steam is condensed in the heating zone to form a high-pressure condensate; and
purifying the heated crude aromatic carboxylic acid to form a purified aromatic carboxylic acid, wherein purification comprises hydrogenation of the heated crude aromatic carboxylic acid;
wherein the boiler feed water comprises at least a portion of the high-pressure condensate."

VI. The independent claims 1 of auxiliary requests 4, 5 and 6 (AR4, AR5 and AR6), which are the ones relevant to the present decision, read as follows (amendments compared with granted claim 1 are highlighted using underscore and ~~strike-through~~).

AR4:

"*1. A process for manufacturing a purified aromatic carboxylic acid comprising:*

generating high-pressure steam from boiler feed water supplied to a boiler;
oxidizing a substituted aromatic hydrocarbon in a reaction zone to form a crude aromatic carboxylic acid;
heating the crude aromatic carboxylic acid in a heating zone by indirect contact with the high-pressure steam, whereby the high pressure steam is condensed in the heating zone to form a high-pressure condensate; and
purifying the heated crude aromatic carboxylic acid to form a purified aromatic carboxylic acid, wherein purification comprises hydrogenation of the heated crude aromatic carboxylic acid;
wherein the boiler feed water comprises at least a portion of the high-pressure condensate and further comprises makeup water from at least one additional source,
and
wherein the makeup boiler feed water is at a lower temperature than the high pressure condensate prior to their combination."

AR5:

"*1. A process for manufacturing a purified aromatic carboxylic acid comprising:*

generating high-pressure steam from boiler feed water supplied to a boiler;
oxidizing a substituted aromatic hydrocarbon in a reaction zone to form a crude aromatic carboxylic acid;
heating the crude aromatic carboxylic acid in a heating zone by indirect contact with the high-pressure steam, whereby the high pressure steam is condensed in the heating zone to form a high-pressure condensate; and
purifying the heated crude aromatic carboxylic acid to form a purified aromatic carboxylic acid, wherein purification comprises hydrogenation of the heated crude aromatic carboxylic acid;
wherein the boiler feed water comprises ~~at least a portion~~ between 65% and 97% of the high-pressure condensate formed in the heating zone and further comprises makeup water from at least one additional source,

wherein the makeup boiler feed water is at a lower temperature than the high pressure condensate prior to their combination."

AR6:

"*1. A process for manufacturing a purified aromatic carboxylic acid comprising:*

generating high-pressure steam from boiler feed water supplied to a boiler;
oxidizing a substituted aromatic hydrocarbon in a reaction zone to form a crude aromatic carboxylic acid;

heating the crude aromatic carboxylic acid in a heating zone by indirect contact with the high-pressure steam, whereby the high pressure steam is condensed in the heating zone to form a high-pressure condensate; and purifying the heated crude aromatic carboxylic acid to form a purified aromatic carboxylic acid, wherein purification comprises hydrogenation of the heated crude aromatic carboxylic acid;
wherein the boiler feed water comprises ~~at least a portion~~ between 65% and 97% of the high-pressure condensate formed in the heating zone and further comprises makeup water from at least one additional source,

wherein the makeup boiler feed water is at a lower temperature than the high pressure condensate prior to their combination, and
wherein a second portion of the high-pressure condensate is transferred to a crystallization zone for use as a crystallizer flush."

VII. In the appeal proceedings, the patent proprietor ("appellant") defended the patent in the granted version (main request), as well as in amended form based on the claim sets filed as auxiliary requests 1-16 together with its statement setting out the grounds of appeal. Auxiliary requests 1-10 underlie the appealed decision, while auxiliary requests 11-16 were newly filed. Throughout the appeal proceedings, the appellant submitted that the process defined in claim 1 of the patent as granted, in contrast to the opposition division's decision, involved an inventive step over D1 as the closest prior-art document(Article 56 EPC). This held even more so for the claims of the auxiliary requests, in particular for the claims of auxiliary requests 4, 5 or 6. On the other hand, the opposition

division had rightly dismissed the objections under Articles 123(2) EPC (unallowable amendments) and 83 EPC (insufficient disclosure).

VIII. The opponent ("respondent") submitted that the process defined in granted claim 1 had rightly been found to lack an inventive step over D1 as the closest prior-art document. Also, the additional features introduced into the independent claims of the auxiliary requests did not add anything inventive, as correctly decided by the opposition division. Moreover, in contrast to the opposition division's decision, the claimed process was also insufficiently disclosed (Article 83 EPC). Claim 1 was also amended in such a way that it contained subject-matter extending beyond the original application documents (Article 123(2) EPC), at least with respect to certain auxiliary requests.

IX. The parties were summoned to oral proceedings as per their requests. In preparation for the oral proceedings, the board issued a communication under Article 15(1) RPBA.

X. Oral proceedings before the board were held by videoconference on 14 October 2025 in the presence of both parties.

XI. The parties' final requests were as follows:

The appellant requested that the decision under appeal be set aside and that the patent be maintained as granted, meaning that the opposition be rejected. Alternatively, it requested that the patent be maintained in amended form on the basis of the claims of one of auxiliary requests 4 to 16 as filed with the statement setting out the grounds of appeal. Auxiliary

requests 1-3 were withdrawn during oral proceedings before the board.

The respondent requested that the appeal be dismissed.

XII. The decision was announced at the end of the oral proceedings.

XIII. As regards the parties' submissions that are relevant to the decision, reference is made to these in the reasons for the decision set out below.

Reasons for the Decision

1. The appeal is admissible.

Main request - patent as granted

2. Sufficiency of disclosure (Article 100(b) EPC)

2.1 The respondent argued that the features "*high-pressure steam*" and "*high-pressure condensate*" mentioned in claim 1 as granted were essential for the claimed process to solve the technical problem underlying the invention. According to the patent, the skilled person was required to choose a "high pressure" that on one hand enabled enough energy to be liberated for heating but, on the other hand, conserved enough energy to save fuel costs. It was unclear whether the same or different pressures should be selected for steam and condensate. The term "high-pressure" was not defined at any point in the patent and there was no universally accepted meaning of this term in the art. In this regard, the respondent especially referred to different definitions of this term as contained e.g. in the

Collins dictionary or provided by ZBG, a manufacturer of industrial boilers. In the respondent's view, a skilled person would thus not have been in a position to carry out the claimed process, since they would have had no information as to what pressures to use. In other words, the relative terms "*high-pressure steam*" and "*high-pressure condensate*" in claim 1 as granted were so ill-defined that the skilled person would not be able to identify the technical measures necessary to solve the problem underlying the patent.

2.2 The board disagrees.

Claim 1 as granted does not require any fuel saving to be achieved or any technical problem to be solved by the process defined therein. Therefore such considerations are irrelevant to the assessment of sufficiency of disclosure of the invention.

As correctly outlined by the opposition division (paragraphs 44 to 49 of the decision's reasoning), the patent provides an indication of what temperatures should be obtained in the heating step, namely 260°C to 290°C, see paragraph [0006]. This is the temperature at which the subsequent purification reaction takes place. A skilled person is well positioned to calculate the steam pressures required from the boiler to provide sufficient heat for the heat transfer, and to control the process so that the high-pressure condensate returned to the boiler is at a suitable pressure. Indications for the latter are given e.g. in claim 5 as granted. Finding suitable temperatures and pressures for a heat transfer fluid moving through a heat transfer cycle does not go beyond the skilled person's routine tasks.

The lack of a precise definition of the term "high pressure" may at most result in a lack of clarity under Article 84 EPC when it comes to assessing the exact boundaries of the claim. However, even if established, the lack of clarity would not be a ground for revocation of a granted patent under Article 100 EPC.

Therefore the ground for opposition under Article 100(b) EPC does not prejudice maintenance of the patent as granted.

3. Inventive step (Articles 100(a) and 56 EPC)

3.1 Closest prior art

It is undisputed that D1 represents the state of the art closest to the claimed process. The board refers to the Indian family member D1b as an English translation.

D1, like the patent, relates to the purification of aromatic carboxylic acids such as phthalic or terephthalic acids. D1, like the patent, aims at reducing production costs by recycling heat and aqueous media generated in the process, see page 7, lines 15-20 of D1b.

D1, like the patent, focuses on the step where a crude product is made into a slurry using a solvent (basically water) and then heated under pressure to form a solution, which is then purified by hydrogenation and crystallization. The idea underlying D1 is to use steam released in the various product crystallization steps for heating the slurry by means of a series of heat exchangers and to use the resulting condensed water as a solvent for the slurry, see

summary of the invention, page 6, line 23 to page 7, line 20 of D1b.

A process wherein the various crystallization steps provide hot steam (via lines 12) to the various heat exchangers respectively used for heating the slurry is depicted in figures 1 and 2 of D1. As is apparent from the figures, the resulting condensed water is collected (11-2) and routed to the slurry preparation step (I).

The last in the series of heat exchangers that heat the slurry, H-6 in figure 2, at the high-temperature end of the series, is provided with "*very high pressure steam*" of undefined origin, see unit 26 in figure 2 and the corresponding description on page 32, line 16 to page 33, line 26 of D1b. The high-pressure condensate from this last heat exchanger is collected in a high-pressure waste water tank (24) and, according to the description (page 33, lines 5-26), may be used for operating a power generation turbine "*or other applications taking advantage of the high pressure and temperature of the waste water*". It may also be routed to the penultimate heating step (see flush drum B-5 and heat exchanger H-5), and in this way join the water/ steam cycling between crystallizations, the other heat exchangers and slurry preparation, see page 33, lines 23-26.

The parties agreed that the "*very high pressure steam*" originating from unit 26 in figure 2 of D1 corresponds to the high-pressure steam feed line 402 in figure 2 of the patent which provides the high-pressure steam to heat exchanger (206) heating the slurry of the crude product.

3.2 Distinguishing features

The parties agreed that the claimed process differs from the process disclosed in D1 in two features, namely

(i) the high-pressure steam being provided by a boiler

(ii) the resulting high-pressure condensate being recycled to the boiler

3.3 Technical problem and its solution

3.3.1 The parties disagreed on whether these distinguishing features resulted in an overall energy reduction versus the process of D1 or not. The appellant pointed to the simulations carried out in D4, whereas in the respondent's view these data were not suitable to show that the claimed process exhibited any advantages over the process disclosed in D1.

3.3.2 D4 contains simulation data for two processes in which a boiler is used for the generation of the "very high-pressure steam" (26) in D1. In one process the resulting condensate is recycled to the boiler (example A), and in the other the condensate is used for power generation (example C). The result is that, on the assumptions made in the simulation, the overall energy efficiency is better for the recycling than for the power generation.

3.3.3 These simulations presuppose that in fact a boiler is used in D1 to generate the "very high pressure steam" (26). Thus in a way these simulations shift D1 closer to the claimed process, which speaks in favour of the appellant. However, the data of D4 cannot prove

that the claimed process is more energy efficient than the process disclosed in D1.

As emphasised by the respondent, D4 makes a series of assumptions about the pressures and temperatures of the streams, for example about the temperature and pressure of the additional makeup water fed to the boiler in example C (stream 508) and the high-pressure condensate (426) in example A. Depending on these parameters, the respondent calculated that either example C, i.e. the process allegedly representing D1, or example A, i.e. the process representing claim 1, turns out to be more energy efficient/cost effective, see respondent's submission of 22 January 2025, point 1.2. Moreover, D4 describes the streams used for the simulation only in qualitative terms such as "high pressure"/"low pressure", and the amount of makeup water used is undefined (see the expression "as necessary" in the last sentence of page 7 of D4). In summary, the board agrees with the respondent's point of view that the results obtained in D4 are inconclusive, and that the simulation conditions used in D4, and thus also the results obtained, cannot be verified. D4 does not prove that the process defined in claim 1 is more energy efficient than the one disclosed in D1.

3.3.4 Thus, starting from D1, the objective technical problem cannot be formulated as the provision of an improved, more energy-efficient process.

3.3.5 Instead, starting from D1, the objective technical problem to be solved has to be defined as the provision of an alternative energy-efficient process for the purification of aromatic carboxylic acids.

3.3.6 This problem is solved by the process defined in claim 1 of the patent as granted, which is characterized in that the "*very high pressure steam*" (26) is generated by means of a boiler and that the boiler feed water comprises at least a portion of the high-pressure condensate, i.e. a part of the condensate is recycled to the boiler.

It was undisputed that the process defined in claim 1 does indeed provide a solution to this technical problem.

3.4 Obviousness of the claimed solution

3.4.1 It was undisputed that, among other possibilities, boilers are known to be suitable for the production of high-pressure steam. It was likewise undisputed that it is generally more energy efficient to recycle the condensate, formed after the steam has transferred part of its energy, back into the boiler than to discard it and to feed the boiler with cold water instead. This is illustrated e.g. in D7 and D8, which are also referred to in the opposition division's decision.

3.4.2 The appellant submitted that the question was not whether boilers were known or not to produce high-pressure steam, but whether the skilled person would have introduced a boiler and condensate recycling into the process of D1 in order to solve the objective technical problem.

3.4.3 The board agrees. However, it holds that a skilled person would have seen the introduction of a boiler and the recycling of the condensate as an obvious measure in an implementation of the process disclosed in D1.

D1 is silent about the origin of the "very high-pressure steam" (26) used to feed the last of the heat exchangers (H-6) on the high-temperature side. Thus a skilled person, putting into practice the process illustrated in figure 2 of D1, needs to choose a source for this steam. Boilers being a well-known means for steam generation, in particular in situations where an industrial process temperature needs to be maintained (see e.g. D5, first page), a skilled person would readily have used a boiler for this purpose. Once a boiler had been chosen for generating the steam, it would have been obvious to recycle the condensate to the boiler, since this is general practice, as illustrated e.g. in D7 and D8.

Thus, starting from D1, a skilled person would have arrived at the process defined in claim 1 as granted in an obvious way.

3.4.4 The appellant submitted a number of arguments as to why a skilled person would not have implemented the claimed solution when trying to solve the objective technical problem starting from D1. These arguments are treated in the following paragraphs.

3.4.5 The appellant argued that a skilled person would not have seen any necessity at all to introduce a steam generation step for providing the high-pressure steam (26) since steam streams were available from inside the process and could have been used for this purpose. In this respect it referred to D2.

This argument is unconvincing.

According to D1, steam (26) has a temperature of about 300°C and a pressure of about 9 MPa, see page 32, lines

21-25 of D1b. No steam with such high energy is available anywhere in the purification process described in D1 itself.

The appellant has referred to D2, which discloses the synthesis of aromatic carboxylic acids, i.e. the upstream process corresponding to section (22) in figure 2 of D1. In the appellant's view, a skilled person would know from D2 that steam with sufficiently high energy was available in the synthesis part, i.e. in the part depicted as (22) in figure 2 of D1, in order to be used as steam (26). The appellant also referred to D9, claim 1, which contained a similar disclosure.

However, D2 discloses in the background section (page 1, lines 30-36) that heat for the heat exchangers in the purification section of aromatic carboxylic acid plants had previously been provided from steam generated in the synthesis part. This is said to be disadvantageous due to energy losses in the heat exchangers, so in D2 itself steam is not used in this manner. In D2 steam from the synthesis section is, rather, directly injected into the slurries of the purification part, see claim 1 of D2 or the specific example referred to by the appellant, page 13, lines 25-29. Furthermore, as pointed out by the respondent, D2 itself suggests the use of a boiler for steam generation, see page 3, lines 2-4 and page 13, lines 25-29.

Moreover, even if, for the sake of argument, the appellant's arguments were accepted, these would not render the use of a boiler for providing steam (26) non-obvious. Firstly, D1 does not contain any indication that steam (26) may be taken from the

synthesis process (22), which is depicted in the same figure 2. Secondly, even if a skilled person, after considering documents other than the starting document D1, e.g. D2 or D9, could think of other possibilities for the generation of steam (26), this would not render the choice of a boiler inventive. Choosing one out of several obvious ways to proceed is still within the skilled person's routine way of working.

3.4.6 The appellant furthermore argued that, even when choosing a boiler for generating steam (26), it was not obvious to recycle the high-pressure waste water (24) back to the boiler. D1 disclosed other uses for this water, see page 33, lines 5-26 of D1b. D1 disclosed that the condensed water was discharged out of the system, and proposed in particular to use this water for operating a power generation turbine or to transfer it to the penultimate heating step (B-5 and H-5).

This argument is likewise unconvincing.

Once a boiler has been chosen for the generation of steam (26), it is obvious to recycle (part of) the condensate (24) as a boiler feed. Recycling of condensates as boiler feed is common practice, see e.g. D7 and D8. D7 explicitly states that for energy efficiency reasons a maximum of condensate should be recycled, see page 1. Moreover, D1 on page 33, lines 5-26 states that the condensed water *may be* discharged out of the system, and does not limit the use of the condensate (24) to power generation or heating of upstream steps. On the contrary, it states that the condensate may be used for "*other applications taking advantage of the high pressure and temperature of the waste water*", see page 33, lines 14-16. Recycling the

hot condensate to the boiler clearly is one such application.

3.4.7 The appellant further argued that the distinguishing features (i) and (ii) should not be treated separately in terms of a partial problem approach, as had been done by the respondent and the opposition division, but together.

The board would agree: it is evident that the two features are related, since without a boiler distinguishing feature (ii) cannot be implemented. However, the above analysis does not treat these features separately in terms of a partial problem approach, and nevertheless leads to the conclusion that the claimed solution to the above-mentioned objective technical problem is obvious.

3.4.8 Finally, the appellant argued that the inventors of D1 had already considered ways to maximise energy efficiency. In examples 1 and 2, they had achieved an overall energy reduction compared with a previous conventional process, and had in particular achieved a reduction of the vapour required for the heat consumption of the heat exchanger H-6 of over 40%. Two energy-efficient alternatives of the use of the condensate (24) were given, and even a third completely different option, the use of a circulating heating fluid for heating the heat exchanger H-6, had been proposed, see passage on page 33/34 of D1b. The inventors of D1 must also have been aware of D2 since the Japanese equivalent of D2 was mentioned on page 6, line 10 of D1b. D2 proposed to use steam from the carboxylic acid synthesis part in the purification part of the plant. With all this knowledge in their minds, the inventors of D1 did not consider recycling of the

condensate (24) to be energetically efficient. This supported the argument that they considered the installation of a boiler to be superfluous, and the recycling of the condensate to be inferior to the other possibilities proposed in D1.

The board considers it a futile exercise to speculate about reasons why the inventors of D1 omitted the origin of the high-pressure steam (26) in their disclosure, and why the possibility of recycling the condensate (24) is likewise not mentioned in D1. The appellant drew conclusions from the absence of the disclosure of a boiler. In the same way, conclusions could be drawn from the absence in D1 of a direct proposal to use steam from the synthesis plant as steam (26), the synthesis process (22) being depicted in the same figure 2 as the purification process. However, an inventive-step analysis cannot be based on speculations about the motivation of authors in disclosing or not certain features in a document. An inventive-step analysis must be based on the disclosure of the prior art as it stands and the conclusions a skilled person would have drawn from its explicit and implicit teaching, complemented by common general knowledge.

3.5 For these reasons, the board concludes that the process defined in claim 1 of the patent as granted does not involve an inventive step. The ground for opposition under Article 100(a) EPC in combination with Article 56 EPC prejudices maintenance of the patent as granted (Article 101(2) EPC). The appellant's main request is not allowable.

Auxiliary requests (ARs) 4 and 5

4. Inventive step regarding AR4 and AR5

4.1 Claims 1 of ARs 4 and 5 impose certain requirements on the boiler feed water. In claim 1 of AR4 it is required that the boiler feed water "*further comprises makeup water from at least one additional source*" and that "*the makeup boiler feed water is at a lower temperature than the high pressure condensate prior to their combination.*" In claim 1 of AR5 it is further required that "*between 65% and 97%*" of the high-pressure condensate is recycled to the boiler.

4.2 These features cannot add anything inventive. Adding makeup water to a boiler feed in order to make up for losses is usual, and the percentage of high-pressure condensate recycled to the boiler (and not used for other purposes) would be chosen by the skilled person according to their needs. Evidently, a high proportion is usually advantageous.

4.3 The appellant has not provided any arguments as to why these features would result in unexpected improvements. It submitted that these features brought the claimed process closer to the simulations shown in D4.

However, the reasons for which the board considers the data in D4 not to be suitable to prove unexpected improvements compared with the process disclosed in D1 (see points 3.3.1 to 3.3.3 above) remain unaffected by the amendments.

4.4 Thus, in line with the decision of the opposition division, the board also concludes that the process defined in claims 1 of ARs 4 and 5 lacks an inventive step (Article 56 EPC). Thus the patent cannot be maintained on the basis of these requests either (Article 101(3)(b) EPC).

Auxiliary request (AR) 6

5. Amendments, Article 123(2) EPC

5.1 Claim 1 of AR6 corresponds to claim 1 of AR5, compared with which it is additionally required that "*a second portion of the high-pressure condensate is transferred to a crystallization zone for use as a crystallizer flush.*" This feature is taken from paragraph [0018] of the application as filed.

5.2 Claim 1 of AR5 is based on a combination of claims 1, 3, 5 and 9 of the application as filed. Claim 1 of AR5 specifies that the boiler feed water comprises between 65% and 97% of the high-pressure condensate, i.e. that not all of the high-pressure condensate is recycled to the boiler. This is in agreement with claim 1 as filed, which requires that the boiler feed water comprises "*at least a portion*", i.e. not necessarily all, of the high-pressure condensate. No objection of added subject-matter had been raised against claim 1 of AR5.

5.3 The respondent objected to claim 1 of AR6 for two reasons. Firstly, the use of part of the high-pressure condensate as a crystallizer flush was mentioned in paragraph [0018] of the application as filed as possibility (a), but was not specifically highlighted among the optional process features (a), (b) and (c) presented there. Secondly, there was no indication that this possibility (a) could be combined with the features from claims 3, 5 and 9 as filed, i.e. with the features defined in claim 1 of AR5. There was no functional connection between them. Thus the features combined in claim 1 of AR6 were plucked from the reservoir of features provided by the application as

filed, but were not originally disclosed in combination.

5.4 The board disagrees.

5.4.1 Paragraph [0018] of the application as filed discloses, in a general way, further process features that may be present in some embodiments "*in accordance with the present teachings*". Thus this paragraph generally defines process features which may optionally be realised, and which may be applied to all processes disclosed. It is irrelevant whether process feature (a), the feature taken up for claim 1 of AR6, is highlighted compared with features (b) or (c) or not.

5.4.2 Claims 3, 5 and 9 as filed relate to the part of the high-pressure condensate that *is* recycled to the boiler. Feature (a) in paragraph [0018] defines the fate of the part of the high-pressure condensate that *is not* recycled to the boiler. A skilled person would have recognised that, in contrast to the respondent's submission, there is evidently a functional connection between these features since both define the use of different fractions of the high-pressure condensate. Combining these features does not result in originally undisclosed subject-matter.

5.4.3 For these reasons, claim 1 of AR6 does not contain any subject-matter extending beyond the content of the application as filed. The requirements of Article 123(2) EPC are thus met.

6. Sufficiency of disclosure, Article 83 EPC

AR6 complies with the provisions of Article 83 EPC for the same reasons as mentioned above for the main

request, i.e. the patent as granted. No additional arguments relating to the added features in AR6 were submitted by the respondent.

7. Inventive step, Article 56 EPC

7.1 Closest state of the art

7.2 D1 remains the document representing the closest state of the art for claim 1 of AR6 as well.

The process defined in claim 1 of AR6 differs from the process disclosed in D1 not only in such technical features that would have been obvious to a skilled person, namely

(i) the high-pressure steam (26) is provided by a boiler

(ii) the resulting high-pressure condensate (24) is recycled to the boiler

(iii) the boiler feed water comprises between 65% and 97% of the high-pressure condensate (24)

(iv) the boiler feed water comprises makeup water from at least one additional source

(v) the makeup boiler feed water is at a lower temperature than the high-pressure condensate prior to their combination

but additionally in that

(vi) a second portion of the high-pressure condensate (24) is transferred to a crystallization zone for use as a crystallizer flush.

7.3 Objective technical problem and its solution

Transferring a portion of the high-pressure condensate to a crystallization zone for use as a crystallizer flush prevents clogging by deposition of solids, or removes solids already formed. The parties disagreed on whether "crystallizer flush" referred to a continuous (appellant) or discontinuous (respondent) stream; they also disagreed on whether flushing meant a smooth stream (appellant) or a high kinetic energy flow (respondent), but these different views do not affect the following inventive-step assessment.

Thus, starting from D1, the objective technical problem to be solved is the provision of an alternative energy-efficient process in which clogging of the crystallizers is prevented.

7.4 Obviousness of the solution

7.4.1 Neither D1 nor any of the other cited documents discloses preventing clogging of crystallizers by using part of high-pressure condensates. None of the available documents addresses this problem or provides any solution to it. The proposed solution, and thus the process defined in claim 1 of AR6, is therefore not obvious to a skilled person.

7.4.2 The respondent argued that the claimed solution to the technical problem would have been obvious for the following reasons:

(a) The technical problem was not credibly solved, since there was no corresponding evidence in the application as filed.

(b) As decided by the opposition division, flushing was merely the result of an arbitrary choice a skilled person would make according to circumstances and needs. Flushing was well known in many systems, as had been admitted by the appellant itself.

(c) Diverting part of the high-pressure condensate for flushing was more energy efficient than heating cold water for the same purpose. Moreover, it was obvious to use the high-pressure condensate for this purpose, since it was of higher temperature than any of the crystallizers and could thus be used to dissolve precipitated solids or prevent their formation.

7.4.3 These arguments are not convincing.

It cannot be reasonably disputed that flushing with hot water dissolves water-soluble precipitates, such as the crystallized aromatic carboxylic acids prepared in the present process, or prevents their deposition. The respondent has not presented any corresponding technical arguments to the contrary. Thus the technical problem is solved by the process defined in claim 1 of AR6.

That flushing is a generally known concept was undisputed. However, in the absence of any disclosure in the cited prior art about this problem in installations for the preparation of aromatic carboxylic acids or similar products, it cannot be concluded that a skilled person would have come up with the claimed solution to the technical problem as a result of an arbitrary choice. There is no disclosure on file from which a skilled person would have chosen this solution. Evidently, it is more economic to use a hot process stream for flushing than to heat up water separately, but a skilled person had no indication anywhere in the cited documents that the problem of clogging crystallizers would have been solved by a hot process stream for flushing them, and even less by the high-pressure condensate (24) disclosed in figure 2 of D1.

7.5 Thus the process defined in claim 1 of AR6 involves an inventive step (Article 56 EPC).

8. Since the amended patent and the invention to which it relates meet the requirements of the EPC, the patent can be maintained in amended form based on the claims of AR6 (Article 101(3)(a) EPC).

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 in amended form with the following claims and a description to be adapted thereto:

   Claims: Nos. 1 to 9 of the sixth auxiliary request filed with the statement of grounds of appeal.

The Registrar: The Chairman:

U. Bultmann M. Maremonti

Decision electronically authenticated