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**Datasheet for the decision
of 18 August 2016**

Case Number: T 1575/14 - 3.3.05

Application Number: 09802489.6

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IPC: B01D53/79, B01D53/90,
C07C273/16

Language of the proceedings: EN

Title of invention:

PROCESS AND PLANT FOR THE PRODUCTION OF A UREA SOLUTION FOR
USE IN AN SCR PROCESS FOR REDUCTION OF NO_x

Patent Proprietor:

CASALE SA

Opponents:

I. ThyssenKrupp Industrial Solutions AG
II. Stamicarbon B.V.

Headword:

UREA FOR SCR/CASALE S.A.

Relevant legal provisions:

RPBA Art. 13(1)
EPC Art. 56

Keyword:

Inventive step - all requests - obvious alternative
late-filed request - not admitted

Decisions cited:

Catchword:



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Boards of Appeal
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Case Number: T 1575/14 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 18 August 2016

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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
30 May 2014 maintaining European patent No.
2318123 in amended form.**

Composition of the Board:

Chairman H. Engl
Members: J.-M. Schwaller
 O. Loizou

Summary of Facts and Submissions

I. The present appeal lies from the interlocutory decision of the opposition division to maintain European patent No. 2 318 123 in amended form on the basis of the claims according to the fifth auxiliary request filed during the oral proceedings of 30 April 2014, independent claim 1 thereof reading as follows:

"1. A process for the preparation of an aqueous solution of urea suitable for use in a SCR process for nitrogen oxides removal, wherein an aqueous stream (8, 8a) containing urea and obtained in the recovery section (2) of a urea production plant is used for preparing said solution, the process being characterized in that:

- said aqueous stream (8, 8a) is subject to at least one process step of evaporation, separating a vapour stream (15) containing water and ammonia, and obtaining a concentrated and substantially ammonia-free solution (11);*
- said concentrated solution (11) is then diluted to obtain a solution (14) with a concentration of urea suitable for use in the SCR process,*
- wherein the evaporation comprises a heating step and a subsequent separation under vacuum, where the vapour stream containing water and ammonia and the concentrated solution are separated;*
- and wherein the NH₃ content of the diluted solution is less than 200 ppm."*

- II. With its grounds of appeal dated 9 October 2014, opponent II ("the appellant") contested the decision and raised objections under Articles 83 and 56 EPC against the claimed subject-matter.

The appellant argued in particular that the subject-matter of claim 1 was obvious in the light of document D1 (WO 2006/096048 A1) taken in combination with the teaching of D3 (EP 0 497 215 A1), which disclosed the production of a concentrated urea solution free of ammonia from a urea aqueous solution using two evaporators in series.

- III. Further appeals were filed by the patent proprietor and opponent I.

Since however the appeal fee was not paid in due time, the patent proprietor's appeal was deemed not to have been filed and it appeared as a respondent.

Opponent I withdrew its appeal and did not participate in the appeal proceedings.

- IV. The respondent replied to the grounds of appeal with letter dated 13 February 2015.

It argued in particular that the steam stripping according to D1 only removed ammonia from the aqueous phase, whereas evaporation included heating with subsequent separation under vacuum of water and ammonia as vapours, thus leading to a more concentrated aqueous phase. In contrast, D3 did not address the problem of reducing the ammonia content in urea. The skilled person therefore would not take this document into consideration.

V. In a communication, the board expressed its preliminary opinion that the patent appeared to meet the requirements of Article 83, but that the subject-matter of claim 1 appeared not to involve an inventive step in view of D1 in combination with D3.

VI. With letter dated 14 July 2016, the respondent filed five sets of amended claims as auxiliary requests 6 to 10.

Claim 1 of auxiliary request 6 corresponds to claim 1 of auxiliary request 5, further characterised by the feature "**wherein the concentration of the solution after the dilution with water is 30 to 35 wt% urea**".

Claim 1 of auxiliary request 7 corresponds to claim 1 of auxiliary request 6, further characterised by the features "**wherein said aqueous stream (8) from the recovery section (2) is subject to a first evaporation step, obtaining a vapour phase (102) containing water and ammonia and a concentrated urea solution (103) in liquid phase; at least a portion (107) of said concentrated urea solution is then subject to a second evaporation step, separating a vapour phase (112) containing water and ammonia and obtaining a further concentrated and substantially ammonia-free urea solution (11); said further concentrated urea solution (11) is then diluted with water (13) to a predetermined concentration of urea.**"

Claim 1 of auxiliary requests 8 to 10 correspond to claim 1 of auxiliary requests 5 to 7, respectively. In these requests the apparatus claims were dropped.

VII. At the oral proceedings, which took place on 18 August 2016, the appellant contested the admissibility of

auxiliary requests 6 to 10 as late-filed. The board however admitted the requests. The discussion then focused on sufficiency of disclosure and inventive step in view of D1, D3 and common general knowledge.

After announcement by the board that none of the requests on file appeared to meet the requirements of Article 56 EPC, the respondent filed an auxiliary request 11. This request was not admitted into the proceedings.

Claim 1 of auxiliary request 11 corresponds to claim 1 of auxiliary request 5, further characterised by the feature "*wherein evaporation is carried out in shell-and-tube indirect heat exchanger(s), where the urea solution is fed to the tube side*".

VIII. At the end of the oral proceedings, the parties' requests were as follows:

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

The respondent requested that the appeal be dismissed or, alternatively, that the patent be maintained on the basis of the sets of claims of one of the sixth to tenth auxiliary requests filed with letter of 14 July 2016, or of the eleventh auxiliary request filed during the oral proceedings.

Reasons for the Decision

1. Admissibility of the auxiliary requests

1.1 The board admitted auxiliary requests 6 to 10 into the appeal proceedings because they were filed in response

to the preliminary negative opinion of the board. Furthermore, they were filed about one month before the scheduled oral proceedings and the amendments proposed concerned only subject-matter already defined in the dependent claims, so the appellant could not have been taken by surprise and also had sufficient time to prepare its case before the oral proceedings.

1.2 Auxiliary request 11

The respondent argued that the late filing of this request was the consequence of the discussion during the oral proceedings of the inventive step of the previous requests.

The board does not accept this argument, because the respondent was aware of the preliminary negative opinion of the board regarding inventive step, and so auxiliary request 11 could have been filed earlier, namely with the requests 6 to 10 which were admitted in response to the preliminary negative opinion of the board regarding inventive step. The board therefore made use under Article 13(1) RPBA of its power of discretion not to admit this request into the appeal proceedings.

2. Inventive step of the patent as maintained (auxiliary request 5)

Applying the problem-solution approach, the board came to the conclusion that the subject-matter of claim 1 as maintained by the opposition division (see point I above) does not involve an inventive step, for the following reasons:

2.1 The parties agreed that document D1 is the best starting point to assess the inventive step of the claimed subject-matter, and so represents the closest state of the art. The board shares this view.

D1, claim 1, discloses a process for the preparation of a urea-comprising aqueous stream suitable for reducing NO_x in combustion engine exhaust gases, wherein the urea-comprising aqueous stream is separated directly from or after a recovery section in a urea production process and is thereafter diluted with water until the urea-comprising stream comprises 30-35 wt% urea.

According to D1, page 4, lines 7 to 24, the NH_3 content of the urea-comprising aqueous stream can be reduced by subjecting the urea-comprising aqueous stream to dissociation before dilution with water, preferably by steam stripping at a pressure of 0.001-0.2 MPa.

In the specific embodiment disclosed at page 4, D1 discloses the treatment by steam-stripping under at 0.04 MPa of such an aqueous stream comprising 75 wt% urea and 0.7% NH_3 , the treated stream being further diluted with water to a urea content of 31.5 wt% and an NH_3 content of 300 ppm.

2.2 As to the problem underlying the contested patent, this is described at paragraph [0010] as consisting in the provision of a cost effective way to obtain an aqueous urea solution with an acceptable ammonia content suitable for use as an additive in an SCR unit.

2.3 As a solution to this problem, claim 1 at issue proposes a process characterised in particular in that the urea-containing aqueous stream is subject to at least one step of evaporation comprising a heating step

and a subsequent separation under vacuum so as to separate a vapour stream containing water and ammonia, and obtaining a concentrated and substantially ammonia-free solution which is further diluted to contain less than 200 ppm NH₃.

2.4 The board notes that the above problem has already been solved by the process according to D1, so that the above-defined technical problem needs to be reformulated, as agreed by the parties, as the provision of a cost effective process to obtain an aqueous urea solution suitable as an additive in an SCR unit and containing less ammonia than in D1.

2.5 As to the question whether the proposed solution was obvious to the skilled person, the respondent argued that the evaporation section known from D3 was used for removing water from a urea-containing aqueous solution in the context of making a concentrated urea solution or a urea melt for subsequent shaping of urea into solid form. D3 did not suggest the use of evaporation for removing ammonia in the context of making an SCR urea-containing aqueous solution.

The board accepts that D3 does not disclose the preparation of an SCR urea-containing aqueous solution. However, the skilled person cannot fail to note that the vacuum evaporators E1 and E2, which receive the urea-containing aqueous solution from the recovery section RE, remove ammonia as vapour streams 18 and 20 to provide concentrated urea-containing solutions 17 and 19 containing 200 ppm and 0 ppm NH₃, respectively (see the figure; page 2, line 49 to page 3, line 17 and the table at page 9). The skilled person is thus taught by D3 that the treatment by vacuum evaporation of an aqueous solution from the recovery section in a urea

production process leads to a urea-containing solution containing less ammonia than in D1.

Since it is trivial that such a concentrated urea-containing solution may be diluted with water to any urea concentration, in particular to a urea concentration of 30 to 35% which is suitable as SCR additive, thereby also further reducing the ammonia concentration, the board is of the opinion that the skilled person faced with the problem identified in point 2.4 above would inevitably have an incentive to substitute the vacuum evaporation process known from D3 for the steam-stripping operation known from D1, and so arrive at the wording of claim 1 at issue. The claimed process therefore lacks an inventive step under Article 56 EPC.

3. Inventive step - auxiliary request 6

Claim 1 of this request differs from claim 1 as maintained by the addition of the feature "**wherein the concentration of the solution after the dilution with water is 30 to 35 wt% urea**".

For the board, this feature does not make any inventive contribution to the claimed subject-matter, since in the process of document D1, the concentration of the diluted urea-containing solution to be used as an SCR additive is the same as in claim 1 at issue (see for instance D1, paragraph [0032]). Consequently, the reasons in points 2.1 to 2.5 above apply likewise to claim 1 of this request, which therefore does not meet the requirements of Article 56 EPC.

4. Inventive step - auxiliary request 7

Claim 1 of this request differs from claim 1 of auxiliary request 6 by the addition of the features **"wherein said aqueous stream (8) from the recovery section (2) is subject to a first evaporation step, obtaining a vapour phase (102) containing water and ammonia and a concentrated urea solution (103) in liquid phase; at least a portion (107) of said concentrated urea solution is then subject to a second evaporation step, separating a vapour phase (112) containing water and ammonia and obtaining a further concentrated and substantially ammonia-free urea solution (11); said further concentrated urea solution (11) is then diluted with water (13) to a predetermined concentration of urea."**

For the board, these additional feature do not make any inventive contribution to the claimed subject-matter, since the claimed sequence of two evaporation steps exactly corresponds to what is taking place in the vacuum evaporators E1 and E2 of the process known from document D3. Consequently, the reasons in points 2.1 to 2.5 above also apply to claim 1 of this request, so that the requirements of Article 56 EPC are not met.

5. Inventive step - auxiliary requests 8 to 10

Auxiliary requests 8 to 10 correspond to auxiliary requests 5 to 7, respectively, modified in that the claims relating to a plant for the production of an aqueous solution suitable for use in a SCR process for NO_x removal have been deleted. The respective process claims 1 of these requests having not been amended, they correspond to those claims which have been found lacking an inventive step in points 2 to 4 above, with

the consequence that none of these requests is allowable under Article 56 EPC either.

6. As none of the pending requests is allowable, the patent must be revoked.

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:



C. Vodz

H. Engl

Decision electronically authenticated