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**Datasheet for the decision  
of 14 October 2021**

**Case Number:** T 1887/17 - 3.3.10

**Application Number:** 07818804.2

**Publication Number:** 2086928

**IPC:** C07C273/04

**Language of the proceedings:** EN

**Title of invention:**

PROCESS FOR UREA PRODUCTION AND RELATED PLANT

**Patent Proprietor:**

CASALE SA

**Opponent:**

Stamicarbon B.V.

**Headword:**

UREA PRODUCTION / CASALE

**Relevant legal provisions:**

EPC Art. 56, 84, 123(2)

**Keyword:**

Main Request: Inventive step - (no)

Auxiliary Request: Inventive step - non-obvious alternative -  
(yes)

Claims - clarity after amendment (yes)

Amendments - allowable (yes)

**Decisions cited:**

T 0807/14

**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 1887/17 - 3.3.10**

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.10**  
**of 14 October 2021**

**Appellant:** CASALE SA  
(Patent Proprietor) Via Giulio Pocobelli 6  
6900 Lugano (CH)

**Representative:** M. Zardi & Co S.A.  
Via G. B. Pioda, 6  
6900 Lugano (CH)

**Appellant:** Stamicarbon B.V.  
(Opponent) Mercator 3  
6135 KW Sittard (NL)

**Representative:** V.O.  
P.O. Box 87930  
2508 DH Den Haag (NL)

**Decision under appeal:** **Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
30 June 2017 concerning maintenance of the  
European Patent No. 2086928 in amended form.**

**Composition of the Board:**

**Chairman** P. Gryczka  
**Members:** M. Kollmannsberger  
F. Blumer

## **Summary of Facts and Submissions**

I. The patentee as well as the opponent appealed the interlocutory decision of the Opposition Division to maintain European Patent No. 2 086 928 under Article 101(3)(a) EPC in amended form based on the claim set of auxiliary request 1.

II. The disputed patent was opposed under Article 100(a) EPC for lack of novelty and lack of inventive step. In a first decision of the Opposition Division the opposition was rejected. The opponent appealed the decision and the appeal proceedings lead to decision T 807/14. T 807/14 held that the claims of the granted patent lacked an inventive step. The first auxiliary request on file was remitted to the Opposition Division for further prosecution.

For the continuation of the opposition proceedings the patentee defended the patent on the basis of the first auxiliary request underlying decision T 807/14, which became the new main request. In the second decision of the Opposition Division this main request was held to lack inventive step, but the patent was maintained on the basis of a first auxiliary request filed during oral proceedings before the Opposition Division.

III. Claim 1 of the patentee's main request underlying the impugned decision reads as follows (numbering of the process steps by the Board):

*"Process for urea production from ammonia and carbon dioxide, comprising the steps of:*

- a) - feeding ammonia and carbon dioxide into a urea synthesis section operating at a predetermined high pressure;
- b) - reacting said ammonia and said carbon dioxide in said synthesis section obtaining an aqueous solution comprising urea, ammonium carbamate and ammonia;
- c) - feeding a first part of said aqueous solution comprising urea, ammonium carbamate and ammonia to a treatment section operating at a predetermined medium pressure for the recovery of the ammonium carbamate and of the ammonia contained in it;
- d) - subjecting said first part of aqueous solution comprising urea, ammonium carbamate and ammonia to thermal dissociation in a dissociation unit of said treatment section obtaining an urea aqueous solution and a vapour phase comprising ammonia, carbon dioxide and water;
- e) - subjecting said vapour phase comprising ammonia, carbon dioxide and water to condensation in said treatment section obtaining an ammonium carbamate aqueous solution;
- f) - recycling said ammonium carbamate aqueous solution to said urea synthesis reaction;

characterised in that it comprises the further steps of:

- g) - feeding said urea aqueous solution obtained by said thermal dissociation in said treatment section to

*a decomposer of a urea recovery section operating at a predetermined low pressure;*

*h) - subjecting said urea aqueous solution to decomposition in said decomposer of said urea recovery section obtaining a concentrated urea solution and a second vapour phase comprising ammonia, carbon dioxide and water;*

*i) - subjecting said second vapour phase to condensation in a condenser of said urea recovery section in fluid communication with said decomposer obtaining a first recycle ammonium carbamate aqueous solution;*

*j) - subjecting a second part of said aqueous solution comprising urea, ammonium carbamate and ammonia to stripping including heat in a stripping unit operating substantially at said predetermined high pressure and in the presence of carbon dioxide feed as a stripping agent, obtaining a second urea aqueous solution and a third vapour phase comprising ammonia, carbon dioxide and water, said heat being provided through indirect thermal exchange with a steam flow with condensates to condensed steam,*

*k) - using at least a part of said condensed steam as a heating fluid for dissociating said first part of the aqueous solution comprising urea, ammonium carbamate and ammonia in said dissociation unit of said medium pressure treatment section,*

*and characterized in that it comprises the further steps of*

*l) - subjecting said third vapour phase comprising ammonia, carbon dioxide and water obtained in said stripping unit to condensation in a condensation unit operating substantially at said predetermined high pressure, obtaining a second aqueous solution of recycle ammonium carbamate,*

*m) - feeding said second urea aqueous solution obtained in said stripping unit in said decomposer of the urea recovery section operating at low pressure."*

Claim 1 of the auxiliary request differs from claim 1 of the main request in that step g) contains the additional feature "*directly after dissociation*" inserted between "treatment section" and "to a decomposer".

IV. Relevant for the present decision are the following documents:

D1: WO 02/090323

D2: GB 1 542 371

V. In its grounds of appeal and in the further appeal proceedings the appellant-patentee essentially argued that the processes claimed in both the main and the auxiliary request were inventive over D1 since the wording of the claim excluded the presence of a medium pressure stripping unit (MST) after the dissociation in step g), a feature obligatory in D1. Both requests thus overcame the reason for which the Board of Appeal in T 807/14 had found the then pending main request to lack an inventive step over D1. Regarding the objections under Articles 84 and 123(2) EPC raised by

the appellant-opponent it agreed to the Opposition Division's conclusion and considered them unfounded.

VI. In its grounds of appeal and in the further appeal proceedings the appellant-opponent essentially argued that the wording of claim 1 of neither the main nor the auxiliary request excluded the presence of a medium pressure stripping unit (MST) as present in figure 2 of D1. Thus, these claims were not inventive, as found in T 807/14. Furthermore, even if one assumed that the claim wording did exclude such a unit, the claimed process was still not inventive over D1. Moreover the claims of both requests were deficient under Articles 84 and 123(2) EPC.

VII. In the communication under Article 15(1) RPBA accompanying the summons to oral proceedings the Board gave a provisional opinion as to the merits of the appeals. It was of the provisional view that the decision of the Opposition Division appeared to be well founded and that thus the appeals were likely to be dismissed.

VIII. Oral proceedings were held on 14 October 2021 in form of a videoconference, to which all parties agreed. At the end of the oral proceedings the Board announced its decision.

IX. The final requests of the parties were as follows:

The appellant-patentee requested that the decision under appeal be set aside and the patent be maintained



on the basis of the main request underlying the decision under appeal or, subsidiarily, that the opponent's appeal be dismissed (i.e., that the patent is maintained on the basis of the first auxiliary request underlying the decision under appeal).

The appellant-opponent requested that the decision under appeal be set aside, that the European patent No. 2 086 928 be revoked and that the patent proprietor's appeal be dismissed.

### **Reasons for the Decision**

1. The appeals are admissible.
2. The claimed invention and T 0807/14

The claims are directed to a process for the synthesis of urea from ammonia and carbon dioxide.

The process is carried out in three distinct pressure zones, a high pressure zone, a medium pressure zone and a low pressure zone. After the reaction of ammonia and carbon dioxide, carried out at high pressure, an aqueous solution is obtained containing urea, ammonium carbamate and unreacted ammonia. This urea containing stream is split; a first part passes into a medium pressure treatment section where ammonium carbamate and ammonia are recovered, whereas a second part is, after stripping at high pressure, sent to the urea recovery section which operates at low pressure. The first part of the urea containing solution is eventually, upon

exiting the middle pressure treatment section, also sent to the low pressure urea recovery section.

A similar process is known from D1, figure 2. Exiting the high pressure zone, the urea containing solution is split in an analogous way, one part remaining in the high pressure zone for further treatment before being sent to the urea recovery zone, operating at low pressure. Another part enters a dissociator in the medium pressure zone, where ammonium carbamate is dissociated into ammonia and carbon dioxide, and is then stripped with carbon dioxide in a medium pressure stripping unit (MST). The exit stream of this stripping unit is then finally discharged into the low pressure urea recovery zone.

T 807/14 held that the claims of the patent as granted lacked an inventive step over D1 as closest prior art. In particular, the Board in T 807/14 held that the claimed process did not exclude the presence of a MST. This optional presence of a MST was the reason to deny inventive step over D1 since the other features distinguishing the claim from the process disclosed in D1 were found to be obvious from D1 or from D2 (see points 3.2.3 and 8 of T 807/14).

3. Main Request (MR) - Patentee's appeal

3.1 The MR was not allowed by the Opposition Division. The reasoning of the Opposition Division (see point 12 of the decision) is based on its finding that the additional features in steps (d) and (g) of claim 1 of the MR compared to claim 1 of the granted patent were not suitable to exclude the presence of a medium pressure stripper (MST) after the dissociation zone.

For this reason inventive step had to be denied, following T 807/14.

- 3.2 The Board notes that claim 1 of the MR contains amendments with respect to the granted claims, i. e. with respect to the claims found to lack inventive step in T 807/14, in steps d), g) and j) and comprises additional steps l) and m), as highlighted in point 9 of the impugned decision on pages 2 and 3.

During the appeal proceedings the patentee has not forwarded reasons why the amendment in step j) or the introduction of steps l) and m) would have any bearing on inventive step. During the oral proceedings the patentee confirmed that inventive step hinged on the amendments in features d) and g) only. Thus, features j), l) and m) can be ignored for the inventive step assessment.

- 3.3 In step d) it has been specified that dissociation takes place in a dissociation unit, and that dissociation is a *thermal* dissociation. Step g) now also refers to the urea solution obtained by *thermal* dissociation.

Thus, the question arises whether these amendments now require to feed the exit stream of step d) directly to the low pressure recovery section without passing through a MST or whether these amendments do not change the assessment made in T 807/14 .

The patentee's argument is that step g) requires feeding *said* urea aqueous solution *obtained by dissociation* to a low pressure recovery reactor. According to the patentee this can only be understood

to mean that the effluent of the dissociation unit is directly passed to the low pressure section.

However, this argument had already been considered in T 807/14 (see point 3.2.3) and it was decided that the presence of a MST downstream of the dissociation is not excluded by this wording. The reasoning in T 807/14 already assumes that the dissociation takes place in a dissociation unit (see first paragraph on page 12). The requirement that the dissociation is a thermal dissociation does not bring any change to the question of whether an MST may be present after the dissociator or not. Thus, the new features introduced into steps d) and g) do not change the assessment made in T 807/14.

3.4 The analysis presented in point 3.3 above was already part of the Board's preliminary opinion set out in its communication under Article 15(1) RPBA. During the oral proceedings the patentee did not make any further substantive comments with respect to inventive step of the MR.

3.5 Thus, since the additional features in claim 1 of the MR with respect to the claims of the granted patent do not change the inventive step analysis carried out in T 807/14, the process defined in claim 1 of the MR likewise lacks inventive step over D1 and D2.

3.6 The patentee's appeal must therefore be dismissed.

4. Auxiliary request (AR) - Opponent's appeal

4.1 Clarity of the amendments (Article 84 EPC)

- 4.1.1 Compared to claim 1 as granted claim 1 of the AR has been amended in various process steps. Step g) has been amended in the following way (amendments in *italics*):

"feeding said urea aqueous solution obtained by *said thermal dissociation* in said treatment section *directly after dissociation* to a decomposer of a urea recovery section operating at a predetermined low pressure;"

Following decision G 03/14 (OJ EPO 2015, A102), amended claims are open to clarity objections insofar as lack of clarity is introduced by the amendments.

- 4.1.2 The opponent's objection concerns the fate of the process stream in step g). In particular, the opponent is of the opinion that the feature "*directly after dissociation*" does not necessarily refer to the dissociation mentioned previously in the claim, but could, due to the "comprising"-language of the claim also refer to some other dissociation not defined in the claim. The opponent underlines that step g) relates to "*said thermal dissociation*", referring back to the thermal dissociation defined in step d), whereas the feature "*directly after dissociation*" lacks the reference "*said*" and could thus also refer to some other dissociation. It stressed that such a claim reading would also make technical sense since, e. g. referring to figure 1 of the patent, the decompression occurring at valve 20 would also cause dissociation of at least some of the ammonium carbamate present in the process stream.

Thus, it was not clear whether the feature "*directly after dissociation*" related to the thermal dissociation defined in steps g) and d) or to some other dissociation not explicitly defined in the claim.

4.1.3 The Board does not find this objection convincing.

The patentee has argued that the feature "directly after dissociation" clearly refers to the thermal dissociation defined in steps g) and d).

The Board agrees. The feature "directly after dissociation" in step g) immediately follows the reference to the thermal dissociation. This thermal dissociation clearly refers to step d) since there is no other thermal dissociation mentioned in the claim before. In fact, there is no other dissociation mentioned at all in the previous process steps so a skilled person's understanding, reading the claim, is that the feature "directly after dissociation" refers to this thermal dissociation in step d).

It is true that the claim, due to its "comprising" language, also covers processes having additional process steps which may not necessarily be defined in claim 1. However, this does not change the understanding that the disputed feature "directly after dissociation" in step g) of the claim relates to the dissociation step recited immediately before and thus to step d) of the claimed process.

4.1.4 Thus, the amendments made to the granted claim do not introduce any lack of clarity.

4.2 Allowability of amendments (Article 123(2) EPC)

4.2.1 The opponent contested the allowability of the introduction of the feature "*directly after dissociation*" in step g) of claim 1.

4.2.2 It is uncontested that the amendment is derived from the description as originally filed, page 16 lines 13-17. In the context of explaining the process shown in figure 1 this passage defines that *"the urea aqueous solution exiting the dissociator 17 of the treatment section 16 is directly fed to the decomposer 22 of the urea recovery section 21"*.

4.2.3 In the view of the opponent this passage of the description and the amended claim define two different things.

Whereas the passage of the description defined that the urea solution is directly fed into the decomposer 22, i. e. without passing through any other processing unit, the claim only defined that feeding of the urea solution starts directly after the dissociation. Feeding, however, might be direct or indirect, i. e. not excluding additional processing steps before the solution arrives at the decomposer. In the opponent's view this reading of the claim is corroborated by the previous decision T 807/14 in which step g) of the granted patent was considered not to exclude an additional process step such as the medium pressure stripping carried out in D1. Moreover, also the patent itself showed that additional process steps may be included, e. g. the decompression in valve 20.

4.2.4 The patentee argued that the only difference was the verbal form. Whereas the description uses a passive construction ("is directly fed"), the claim language uses an active construction ("feeding (...) directly"). The meaning, however, was the same in both cases. The urea containing process stream exits the decomposer and enters the decomposer in the low pressure section without any further process steps.

4.2.5 The Board concurs with the patentee. The feature "directly after dissociation" requires the urea containing process stream to exit the dissociator and enter the low pressure decomposition unit without any further processing step, in the same way as set out in the cited passage of the description. This is not in contradiction to the finding in T 807/14, since in the claim as granted underlying the decision this feature is absent; the decision was concerned with the feature "feeding", not "directly feeding". It is also not in contradiction with the presence of a valve between the dissociator and the decompression unit. The presence of a valve is implicit when passing from a medium pressure unit directly to a low pressure unit.

4.2.6 Thus, the amended step g) in claim 1 of the AR does not extend beyond the content of the application as originally filed.

4.3 Inventive step (Article 56 EPC)

4.3.1 The claimed process differs from the process described in D1, in particular from the process described in figure 2 of D1, in that after passing the dissociator in the medium pressure zone the exit stream is directly discharged into the low pressure urea recovery zone, without an additional stripping step in the medium pressure section.

The opponent disputed that the wording of the claim actually required the direct feeding of the solution exiting the dissociation unit to the low pressure section, i.e. excluded the presence of the medium pressure stripper of D1.



However, this issue has been discussed and decided above in the context of clarity and added matter. Thus, claim 1 of the AR in fact requires that the aqueous urea solution exiting the dissociator is fed directly to the low pressure section.

- 4.3.2 Starting from D1 as closest prior art the technical problem to be solved was, in the least ambitious case, the problem of providing an alternative process for the production of urea. This problem has been solved by the claimed process, which is characterized by omitting the stripper after the dissociation step in the medium pressure zone.

This was not disputed.

The patentee has argued, and the opponent has disputed, that the claimed process leads to an improvement compared to D1, since the omission of the medium pressure stripping step opens up the possibility for passing more carbon dioxide to the high pressure stripping step, leading to an overall gain in efficiency.

Since the Board comes to the conclusion, set out below, that already the provision of the claimed process as an alternative was not obvious starting from D1 it is not necessary to discuss whether any such improvement has been obtained, in an obvious or in a non-obvious way.

- 4.3.3 The patentee has submitted, and the Board agrees, that the omission of the MST in the process of D1 would not have been obvious for a skilled person when looking for an alternative process starting from D1.

This step is presented as obligatory in D1. It is depicted in figure 2 and in the corresponding passage starting on page 11 line 29, in particular in the first lines of page 12. In fact, splitting of the aqueous urea solution obtained in the high pressure synthesis into two streams, one of which is introduced into a medium pressure zone is the core of the invention described in D1. The medium pressure zone contains a dissociation zone, a stripping zone and a condensation zone (see page 5 lines 8-10, page 9 lines 24-28 and the passage bridging pages 11 and 12). The advantages of the introduction of such a medium pressure zone are explained on pages 4 and 5 and on page 9. They are weighed against the necessity for installation of additional equipment (page 5, first paragraph) compared to a classical process where the aqueous urea solution exiting the high pressure part is discharged into a low pressure urea recovery section without splitting it into two process streams.

A skilled person would have had no reason to assume that one of the three medium pressure process steps (dissociation, stripping, condensation) could be omitted. A complex process as the one described in D1 cannot be assumed to contain superfluous steps, even less in a part that is described as being its core. Operating such a process in a different way by removing individual process steps goes beyond any routine variations a skilled person would envisage. Recognising that the medium pressure stripping step and the corresponding apparatus can be omitted is an inventive contribution over D1.

- 4.3.4 The opponent has submitted various lines of arguments why in its opinion leaving out the MST from the process

described in D1 would have been obvious for a skilled person. These arguments are addressed in the following.

- 4.3.5 The opponent argued that the MST is not actually presented as obligatory in D1. In particular it referred to the description of fig. 2 on page 11/12 where it is stated that "The urea solution leaving this medium pressure dissociation zone (DUSS), which contains relatively much ammonia, *can be* stripped with fresh carbon dioxide in a medium pressure carbon dioxide stripper (MST)." In its view thus the solution can be stripped (or not), the stripping thus being an optional step.

However, the Board agrees with the Opposition Division in that the verb "can" does not refer to an option but rather to the fact that the solution is ready to be sent to the stripper (see point 15.4 of the impugned decision). It is repeatedly stressed in D1 that the medium pressure zone comprises three components, dissociation zone, stripping zone and condensation zone. The opponent's interpretation of "can" is not supported by the teaching of D1.

- 4.3.6 The opponent argued that, the claim being a process claim, it only excludes the stripping step, not the stripper as such. The claimed process could thus be carried out using the equipment of D1, just not operating the stripper. Since it was commonly known that stripping is more effective in the high pressure unit than at lower pressure, it would have been obvious to operate the process of D1 without operating the MST.

The Board does not find this argument convincing. Even assuming that the claimed process indeed covers the operation of the equipment of D1 without sending any

carbon dioxide to the MST there is nothing in D1 that would point to such a way of running the process. If a stripper is described as essential in the process of D1 it is there to be used for stripping. A skilled person had no reason to assume that the process was equally feasible without such a stripping step.

- 4.3.7 The opponent argued it was well known for a skilled person that as much as possible carbon dioxide should be sent to the high pressure stripping section, since stripping at lower pressure was less effective. It was thus an obvious desideratum to omit the medium pressure stripping step in favour of high pressure stripping. The disadvantage would be to accept a higher concentration of ammonia in the urea solution exiting the medium dissociator, as described in D1, page 12 lines 1/2). The claimed process thus provided nothing more than an obvious desideratum, without however remedying the issue of the higher ammonia concentration in the effluent stream. This disadvantage was just accepted.

However, even if a skilled person knew that a stripping process at medium pressure was less effective than at higher pressure D1 does not prompt the skilled person to leave out the medium pressure stripping step. There is no teaching in D1 to leave out the stripping step if one is prepared to accept the disadvantage of an ammonia-rich stream entering the urea recovery section. On the contrary, the only teaching in D1 is to use a stripping process in the medium pressure section because the stream exiting the dissociator contains much ammonia.

- 4.3.8 Finally, the opponent argued a skilled person would have understood from D1 that the MST is used in order

to reduce the gas flow to the condenser. In particular, a skilled person would have understood that the bottleneck in the process of D1 is the capacity of the high pressure carbamate condenser. If one used a larger condenser, and accepted the corresponding costs, one could omit the need to feed carbon dioxide to the MST to bypass the limited capacity of the high pressure condenser.

However, there is no hint in D1 to proceed in this way. As discussed previously, D1 does not present the stripping at medium pressure as an optional part of the process which can be omitted if other parts of the process are modified. Without having the knowledge of the present invention a skilled person would not have had any reason to carry out the process in the claimed way.

4.3.9 Thus, the claimed process involves an inventive step.

4.4 For these reasons the Board agrees to the Opposition Division's conclusion that the patent as amended in form of the AR complies with the requirements of the EPC, Article 101(3)(a) EPC.

4.5 The opponent's appeal is also to be dismissed.

## **Order**

### **For these reasons it is decided that:**

The appeals are dismissed.

The Registrar:

The Chairman:



B.Brückner

P. Gryczka

Decision electronically authenticated