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**Datasheet for the decision
of 28 August 2007**

Case Number: T 0618/05 - 3.3.10

Application Number: 98900772.9

Publication Number: 0977731

IPC: C07C 273/12

Language of the proceedings: EN

Title of invention:
Process for preparing Urea

Patentee:
DSM IP Assets B.V.

Opponent:
Urea Casale S.A.

Headword:
Urea/DSM

Relevant legal provisions:
EPC Art. 56, 114(2)

Keyword:
"Inventive step - (yes)- claimed solution not taught in the
prior art - non-obvious"

Decisions cited:
T 1072/98, T 0540/01, T 1018/04

Catchword:
-



Case Number: T 0618/05 - 3.3.10

D E C I S I O N
of the Technical Board of Appeal 3.3.10
of 28 August 2007

Appellant: UREA CASALE S.A.
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Respondent: DSM IP Assets B.V.
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Representative: Fleischer, Holm Herbert
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 15 March 2005
rejecting the opposition filed against European
Patent No. 0977731 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: R. Freimuth
Members: C. Komenda
J.-P. Seitz

Summary of Facts and Submissions

I. The Appellant (Opponent) lodged an appeal on 4 May 2005 against the decision of the Opposition Division dated 15 March 2005 rejecting the opposition against European patent No. 977 731 which was granted on the basis of eight claims, and on 25 July 2005 filed a written statement setting out the grounds of appeal. Claim 1 of the granted patent reads as follows:

"1. Process for the preparation of urea, in which the gas stream which is released during the synthesis of melamine and is essentially composed of ammonia and carbon dioxide is used to synthesize urea, characterized in that the gas stream which originates from a high-pressure melamine process and is essentially composed of ammonia and carbon dioxide is condensed at a pressure virtually equal to the pressure in the melamine reactor, in which process substantially anhydrous ammonium carbamate is formed, after which said ammonium carbamate is fed to a high-pressure section of a urea stripping plant."

II. Notice of Opposition had been filed by the Appellant requesting revocation of the patent as granted in its entirety on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC). *Inter alia* the following documents were submitted in opposition proceedings:

- (2) GB-A-1 148 767 and
- (16) Nitrogen N°185, May-June 1990, pp. 22-29.

- III. The Opposition Division held that the invention was novel and based on an inventive step, since the prior art did not disclose that the waste gases coming from the melamine process were condensed to form anhydrous ammonium carbamate, which was fed to the high pressure section of a urea stripping plant. The Opposition Division started from document (2) as closest prior art, which was directed to a combined process for the production of melamine and urea. However, neither this document, nor any other cited prior art taught to adapt the reaction conditions in such a way that the gas stream originating from the melamine process should be condensed to form substantially anhydrous ammonium carbamate, and to feed it in a later process step to a high pressure section of a urea stripping plant
- IV. The Appellant submitted that the claimed process was not inventive. With respect to document (2) he argued that this document disclosed most of the technical features of the patent in suit. In particular, document (2) disclosed a process for the preparation of urea using the by-product gas stream originating from a high-pressure melamine process. The process of document (2) disclosed all technical features of claim 1 of the patent in suit apart from the step of condensing the gas stream originating from the melamine process to form substantially anhydrous ammonium carbamate. The step of feeding said ammonium carbamate to a high pressure section of a urea stripping plant was not regarded as being a distinguishing feature, since document (2) disclosed a recovery coil 34 for decomposition of unreacted ammonium carbamate (page 3,

lines 33 to 36 and 56), which recovery coil was, thus, equivalent to a stripping unit.

Starting from document (2) the process of the patent in suit was regarded as being merely an alternative process. Since the condensation of substantially anhydrous ammonium carbamate was already known from document (16), the subject-matter of the patent in suit was regarded as being obvious from a combination of the cited documents (2) and (16).

With his statement of the grounds for appeal the Appellant filed the following document:

(17) Presentation "The High Efficiency Combined (HEC) Urea Process for Plant Revamping and New Plants", F. Zardi and L. Golzi, the British Sulphur Corporation ASIA 96 Nitrogen Conference, Singapore, February 14, 1996.

Document (17) comprised the content of a presentation held by Mr. F. Zardi at a conference in Singapore in 1996. It was offered to hear Mr. F. Zardi as a witness to confirm the statements given in document (17). The Appellant submitted that document (17) disclosed a process for the preparation of urea, wherein substantially anhydrous ammonium carbamate formed during condensation of ammonia and carbon dioxide was fed to the high-pressure section of an urea plant. Thus, a combination of documents (2) and (17) rendered the subject-matter of the patent in suit obvious.

In support of document (17) further documents and affidavits were submitted; however, they were not addressed in the appeal proceedings.

- V. The Respondent (Proprietor of the Patent) submitted that document (2) referred to a conventional total recycling process for the preparation of melamine and urea, wherein the gas stream released during the synthesis of melamine was condensed to an aqueous ammonium carbamate solution, which was fed to a conventional urea plant, which was not of the stripping type. The recovery coil 34 for decomposition of unreacted ammonium carbamate, referred to by the Appellant, was not equivalent to a stripping unit, since the decomposition of the ammonium carbamate was not a thermal decomposition step, but was only due to a reduction of the pressure to 40 to 60 kg/cm² (approximately 4 to 6 MPa, page 3, lines 55 to 56). Therefore, recovery coil 34 was not falling within the definition of a high pressure urea stripping plant. According to the Respondent the problem to be solved starting from document (2) was to improve the overall efficiency of the urea production process without increasing the complexity of the process in terms of process units and operation. The solution to this problem, as proposed by the patent in suit was to condense the gas stream released during the synthesis of melamine to form substantially anhydrous ammonium carbamate and to feed said ammonium carbamate to the high-pressure section of a urea stripping plant, without having to provide further pumping units. This solution was not suggested in document (2) nor in any of the other cited references. In particular, document (16) merely disclosed the chemical equations for the

preparation of urea from ammonia and carbon dioxide. Document (17), which was regarded as having been late filed, did not disclose the condensation of ammonia and carbon dioxide to substantially anhydrous ammonium carbamate and did not refer to a combined process for the preparation of urea and melamine. Further, document (17) did not contain any indication of a urea stripping plant. Thus, the skilled person would not have had any incentive from documents (16) and (17) to modify the process disclosed in document (2) in order to arrive at the subject-matter of the patent in suit.

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

The Respondent requested that the appeal be dismissed.

VII. Oral proceedings were held on 28 August 2007 at the end thereof, the decision of the Board was announced.

Reasons for the Decision

1. The appeal is admissible.
2. The submission by the Appellant of fresh documents in the Statement of the Grounds for Appeal to overturn the appealed decision is to be considered as a normal action of a losing party. Thus, in the present case, the fresh document (17) submitted with the Appellant's Statement of the Grounds of Appeal is not considered to have been filed late in the sense of Article 114(2) EPC (see decisions T 1018/04, point 2 of the reasons;

T 540/01, point 2 of the reasons; T 1072/98, point 2.3 of the reasons, none published in the OJ EPO).

3. *Novelty*

In opposition proceedings the Opposition Division found the subject-matter of the patent in suit to be novel. The Appellant did not raise any objections in appeal proceedings to the novelty of the claimed process. The Board on its own does not see any reason to take a different view. Hence, it is unnecessary to go into more detail in this respect.

4. *Inventive step*

4.1 For the assessment of inventive step in accordance with the "problem-solution approach", it is necessary to establish which document represents the closest prior art in order to determine in the light thereof the technical problem which the invention addresses and solves. The "closest prior art" is normally represented by a prior art document disclosing subject-matter aiming at the same objective as the claimed invention and having the most relevant technical features in common.

4.2 In the present case the patent in suit is directed to a process for the preparation of urea involving supplying a gas stream released from a high-pressure process for making melamine.

4.3 A similar process belongs to the state of the art. Document (2) relates to a process for synthesizing urea from a gaseous mixture containing ammonia and carbon

dioxide that is a by-product of the synthesis of melamine (claim 1; page 1, lines 10 to 15). According to claim 1 the reaction vessel for producing melamine is operating at a pressure of 60 to 150 kg/cm² (approximately 6 to 15 MPa), thus referring to a high-pressure melamine process. The waste gas stream composed of ammonia and carbon dioxide is discharged from the melamine reaction vessel (page 2, lines 3 to 6) and is introduced into the waste gas absorption cell operating at a pressure equal to the pressure in the melamine reaction vessel (page 2, lines 6 to 11 and 46 to 49). In said waste gas absorption cell the waste gas is recovered as aqueous ammonium carbamate solution (page 2, lines 10 and 65), which is transferred to the urea-producing tower (page 3, lines 43 to 47). The synthesis of urea in the urea-producing tower occurs at a pressure of 180 to 220 kg/cm² (approximately 18 to 22 MPa; page 3, line 53), thus, corresponding to a high-pressure urea process. Subsequently, the urea-producing liquid is depressurized and fed to the heat recovery coil 34, where unreacted ammonium carbamate is further decomposed (page 3, lines 53 to 60).

The Appellant and the Respondent had diverging views on whether or not the feeding of the urea-producing liquid to the recovery coil 34 in document (2) corresponded to the step of feeding the ammonium carbamate to a high pressure section of a urea stripping plant. However, a decision on that point is not necessary, since this process step is not relevant in the assessment of inventive step, as set out below.

Thus, the process disclosed in document (2) is within the same technical field as the patent in suit and has

numerous features in common. Therefore, the Board, in agreement with the Appellant, the Respondent and the Opposition Division, takes this document as starting point in the assessment of inventive step.

- 4.4 Having regard to this prior art the technical problem underlying the patent in suit at least was to provide a further process for the preparation of melamine and urea.

Only in case the solution to this least ambitious problem were found to be obvious *vis-à-vis* the closest prior art, the matter whether or not an improved technical effect was achieved over that prior art, as alleged by the Respondent, representing a more ambitious problem, would arise.

- 4.5 As the solution to the technical problem defined above the patent in suit proposes the process according to claim 1, which is characterized at least by the feature that the gas stream which is released during the synthesis of melamine is condensed to substantially anhydrous ammonium carbamate.

- 4.6 The Appellant never disputed that the claimed process produces urea from the gas stream which is released during the synthesis of melamine and the Board is not aware of any reason for challenging that finding. The specification of the patent in suit reveals in paragraphs [0015] to [0017] a process for the preparation of urea and in the examples the preparation of the substantially anhydrous ammonium carbamate is described.

4.7 It remains to be decided whether or not the proposed solution to that objective technical problem is obvious in view of the state of the art. The Appellant exclusively addressed documents (16) and (17) in order to object to obviousness. Therefore, the Board limits itself to consider obviousness in view of these documents.

4.7.1 Document (16) refers to the synthesis of urea in general terms. It discloses the chemical reaction scheme for the preparation of urea from ammonia and carbon dioxide as starting materials. In a first reaction step, ammonia and carbon dioxide react to form ammonium carbamate, which according to a second reaction step is decomposed to urea and water. However, this reaction scheme describes merely the basic chemical reactions without giving any detail; thus it is silent about the presence or absence of water in the formation of ammonium carbamate with the consequence that this document does not specifically describe or teach the formation of anhydrous ammonium carbamate. Due to that lack of teaching or even addressing this characterizing feature of the proposed solution, document (16) cannot render the claimed invention obvious.

The Appellant submitted that the appendix "(1)" to the ammonium carbamate in that reaction scheme may be interpreted as indicating its "liquid" state of matter with the consequence that it was anhydrous. However, the indication of a state of matter, in the present case "liquid" according to the Appellant's allegation, is not tantamount to the feature "anhydrous" characterizing the proposed solution, since the latter

only requires the absence of water regardless of the state of matter. Therefore, the Appellant's interpretation is not supported by the facts.

- 4.7.2 With respect to document (17) the Board observes that it is a generally applied principle that for concluding obviousness, there must be a clear and unambiguous teaching in that state of the art which would inevitably lead the skilled person to the proposed solution for solving the problem underlying the invention.

Document (17) describes a process for the preparation of urea starting from ammonia and carbon dioxide, but does not clearly and unambiguously teach to form from these starting compounds substantially anhydrous ammonium carbamate. As described on page 4, first paragraph, the production of urea is obtained in a "once-through" reaction section, i.e. the conversion of carbamate to urea is obtained in a single pass. Consequently, the indication at line 2 that this particular process step is conducted "in the absence of recycle water" merely reveals that this step is not part of the recycling process. Further, this passage refers to the conversion of ammonium carbamate to urea, which is a process step different to the claimed one of condensing ammonia and carbon dioxide to ammonium carbamate. The same conclusion applies to the operating conditions of the primary reactor given at the bottom of page 4 of document (17) specifying the ratio of water to carbon dioxide as being zero ($H_2O/CO_2 = 0$), since in the primary reactor urea is produced and not ammonia and carbon dioxide condensed to ammonium carbamate. Therefore, that section of document (17)

does not specifically teach to form anhydrous ammonium carbamate in a condensation step carried out in a different reactor, namely the carbamate condenser. Page 5, first paragraph of document (17) states that a carbon dioxide feed is introduced into the carbamate condenser, where it reacts with ammonia to form ammonium carbamate, without any indication as to whether water is present or absent in the carbamate condenser. The figures in document (17) being only schematic illustrations of the process, they neither give any operating details at all, nor in particular on the presence or absence of water in the ammonium carbamate condensation process step. Thus, the Appellant's allegation that according to figure 1 the only feed of ammonia and carbon dioxide to the carbamate condenser would implicitly indicate that anhydrous ammonium carbamate would be formed is mere hindsight having the present invention in mind what the Board cannot sanction.

Hence, a skilled person would not derive from document (17) the clear and unambiguous teaching that the condensation step should be carried out under anhydrous conditions; the feature of forming substantially anhydrous ammonium carbamate characterising the claimed solution is not suggested in document (17).

- 4.8 The Appellant offered the hearing of a witness to show that the content of the written document (17) was made available to the public at the oral presentation. Since the content of document (17) does not render the claimed solution obvious anyhow (see paragraph 4.7.2 above), there was no need to hear the witness offered

by the Appellant on the ground of lacking any impact on the decision to be taken.

4.9 To summarize, in the Board's judgement document (2) taken in combination with either of documents (16) or (17) does not render the claimed invention obvious.

4.10 For these reasons, the Board concludes that the subject-matter of claim 1 and by the same token that of dependent claims 2 to 8, which include all the features of claim 1, involves an inventive step within the meaning of Articles 52(1) and 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar

The Chairman

P. Cremona

R. Freimuth