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D E C I S I O N
of 22 October 2003

Case Number: T 0113/99 - 3.3.1

Application Number: 93117226.6

Publication Number: 0598250

IPC: C07C 273/04

Language of the proceedings: EN

Title of invention:
Method of retrofitting a pre-existing plant for urea production including an ammonia stripping section

Patentee:
UREA CASALE S.A.

Opponent:
Snamprogetti S.p.A.

Headword:
Urea production/UREA CASALE

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes) - non-obvious solution of the technical problem underlying the patent in suit"

Decisions cited:
-

Catchword:
-

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Case Number: T 0113/99 **-** 3.3.1

D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 22 October 2003

Appellant: (Opponent)
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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 19 November 1998 concerning maintenance of European patent No. 0598250 in amended form.

Composition of the Board:

Chairman: A. J. Nuss
Members: J. M. Jonk
S. C. Perryman

Summary of Facts and Submissions

I. The Appellant (Opponent) lodged an appeal against the interlocutory decision of the Opposition Division indicating that subject-matter of the patent in suit No. 0 598 250 (European patent application No. 93 117 226.6) as amended was found to meet the requirements of the EPC.

II. The decision was based on Claim 1 filed during oral proceedings before the Opposition Division on 28 October 1998 and Claims 2 to 6 as granted, said Claim 1 reading as follows:

"A method of retrofitting a pre-existing plant for urea production including a first synthesis reactor (R) in fluid communication with an ammonium stripping section (SS) for separating free ammonia and carbamate leaving the reactor from an aqueous urea solution (SU), said method including the step of providing a second urea synthesis reactor (ROT) of the once-through type having a higher efficiency yield than said first urea synthesis reactor (R), characterized in that it further comprises the steps of:

(a) connecting said second reactor (ROT) to and upstream of said ammonia stripping section (SS) and with means (4,5) for feeding high purity ammonia and carbon dioxide;

(b) distributing overall production capacity to apportion from 50 to 95% of said capacity to said first urea synthesis reactor (R) and from 5 to 50% to said second synthesis reactor (ROT); and

(c) reducing the production capacity of the pre-existing reactor (R)."

III. The opposition was filed against the patent as a whole, and based on the grounds of lack of inventive step as indicated in Article 100(a) EPC. It was supported by several documents including:

(1) EP-A-0 479 103,
(3) US-A-3 091 637,
(4) US-A-4 210 600, and
(10) NL-A-68 08167 (English translation).

IV. The Opposition Division held that the claimed subject-matter of the patent in suit then on file was novel and also involved an inventive step. In this context, it considered that in view of document (1) as the closest prior art the technical problem underlying the patent in suit was the provision of a method of retrofitting a pre-existing urea production plant such that a substantial increase of the production capacity was achieved, while reducing at the same time the overall energy consumption required by the retrofitted plant thus obtained, and that the solution of this technical problem as claimed was not obvious to the skilled person in view of the cited prior art.

V. Oral proceedings before the Board were held on 22 October 2003.

VI. During these oral proceedings the Respondent (Patentee) filed a new set of Claims 1 to 6 as main request and 3 sets of claims as auxiliary requests, Claim 1 of the main request reading as follows:

"A method of retrofitting a pre-existing plant for urea production according to a isobaric ammonia stripping process including a first synthesis reactor (R) in fluid communication with an ammonium stripping section (SS) for separating free ammonia and carbamate leaving the reactor from an aqueous urea solution (SU), the free ammonia and carbamate being recycled to said reactor (R), the stripping section (SS) is in turn in fluid communication with a urea recovery section (RE), including a medium pressure distillation stage (SMP), a rectifying column (CR) wherein highly pure ammonium stream (NEP) is separated from a carbamate solution (SC), the pre-existing plant also comprising pump means (PP') for feeding pure ammonia, obtained by mixing the ammonia stream (NEP) separated from the carbamate solution (SC) with a fresh ammonia stream (NA), and recycling the carbamate solution (SC) to a carbamate condenser (CC) and to the synthesis reactor (R), respectively, said method including the step of providing a second urea synthesis reactor (ROT) of the once-through type having a higher efficiency yield than said first urea synthesis reactor (R), characterized in that it further comprises the steps of:

(a) connecting said second reactor (ROT) to and upstream of said ammonia stripping section (SS) and with means (4,5) for feeding high purity ammonia and carbon dioxide;

(b) distributing overall production capacity to apportion from 50 to 95% of said capacity to said first urea synthesis reactor (R) and from 5 to 50% to said second synthesis reactor (ROT);

(c) reducing the production capacity of the pre-existing reactor (R)."

VII. The Appellant accepted that the subject-matter of this Claim 1 met the requirements of Article 123 EPC and that it was novel over the cited prior art.

However, referring to the declaration of Mr. Granelli filed on 29 March 1999 and calculations submitted on 22 October 1998 (document (9)), he argued that the process of this Claim 1 differed from the process of document (1) by connecting said second reactor (ROT) to and upstream of said ammonia stripping section (SS) only, and that it did not involve inventive step in view of the disclosure of said document (1) in combination with the teaching of documents (10), (3) and/or (4). In this context, he accepted the Respondent’s submission that the process of Claim 1 represented an improvement over the process of document (1) in that less energy was necessary in performing the process of Claim 1 of the patent in suit due to a reduced amount of recycled water, but he requested not to admit the test-report filed by the Respondent on 14 October 2003, since he had insufficient time to verify the test-result as specified therein.

VIII. The Respondent argued that the process of present Claim 1 not only differed from that of document (1) by connecting the second reactor (ROT) to and upstream of

the ammonia stripping section (SS), but also by reducing the production capacity of the pre-existing reactor (R). Moreover, he argued that the technical problem underlying the patent in suit in the light of document (1) was the provision of a process of retrofitting an urea production plant as defined in present Claim 1 giving a retrofitted plant needing a reduced energy consumption, and that its solution by the claimed process involving said two characterising measures was not obvious in view of the cited documents (10), (3) and (4), since the plants which were modified according to these document differed from the pre-existing plant as defined in present Claim 1 and because said documents did not provide any incentive to the skilled person to reduce the capacity of the pre-existing reactor.

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

The Respondent requested that the decision under appeal be set aside and that the patent be maintained on the basis of the claims of the main request, or of the first, second or third auxiliary request, all submitted at the oral proceedings on 22 October 2003.

X. At the conclusion of the oral proceedings the Board's decision was pronounced.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments under Article 123(2) and (3) EPC*

2.1 Present Claim 1 is supported by the application as filed as follows:

(a) by Claim 1;

(b) by page 3, first paragraph, with respect to the feature indicated under (c) of present Claim 1; and

(c) by page 3, line 24 to page 4, line 21, concerning the specification of the pre-existing urea production plant in the preamble of present Claim 1.

2.2 The subject-matter of present Claims 2 to 6 is supported by the originally filed Claims 2 to 6, respectively.

2.3 Therefore, the amended subject-matter of the present claims does not contravene Article 123(2) EPC, which only requires that no subject-matter extending beyond the application as filed is added by an amendment to a European patent or patent application.

2.4 Furthermore, since the process of Claim 1 as granted is restricted to

(a) a more specifically defined pre-existing plant, and

(b) the process step as defined under (c) of present Claim 1,

it is the Board's position that the subject-matter of the present claims does not contravene Article 123(3) EPC either.

2.5 In this context, the Board notes that also the Appellant did not raise an objection with respect to the admissibility of the amendments either.

3. *Novelty*

After examination of the cited prior art, the Board has reached the conclusion that the subject-matter of the present claims is novel. Since novelty was not in dispute, it is not necessary to give reasons for these findings.

4. *Inventive step*

4.1 Article 56 EPC states that an invention is held to involve an inventive step if, having regard to the state of the art (in the sense of Article 54(2) EPC), it is not obvious to a person skilled in the art.

4.2 For deciding whether or not a claimed invention meets this criterion, the Boards of Appeal consistently apply the problem and solution approach, which involves essentially identifying the closest prior art, determining in the light thereof the technical problem which the claimed invention addresses and successfully

solves, and examining whether or not the claimed solution to this problem is obvious for the skilled person in view of the state of the art.

4.3 The Board considers, in agreement with the parties to the proceedings, that the closest state of the art with respect to the claimed subject-matter of the patent in suit is the disclosure of document (1).

4.3.1 This document is concerned with a process for retrofitting a pre-existing urea production plant corresponding to that of Claim 1 of the patent in suit by the addition of a reactor of the once-through type having a higher yield efficiency than the reactor of the pre-existing plant, preferably expanding the solution of urea coming out of said additional reactor in a separator, and sending the solution of flash urea into the medium pressure distillation stage of the recovery section in order to recover the unreacted substances (NH_3 and CO_2) (see Fig. 3, page 2, lines 13 to 18, and page 3, line 38 to page 4, line 20).

4.3.2 The Appellant argued that document (1) implicitly disclosed the reduction of the production capacity of the pre-existing reactor (R) and that therefore the process of Claim 1 of the patent in suit only differed from that of said document by connecting the additional reactor (ROT) to and upstream of said ammonia stripping section (SS).

4.3.3 The Appellant based his contention that the reduction of the production capacity of the pre-existing reactor (R) was implicitly known from document (1) on the declaration of Mr Granelli filed on 29 March 1999 and

his calculations submitted on 22 October 1998 (document (9)). According to said declaration a 50% increase of the plant capacity as disclosed in the Example of document (1) and in the Example of the patent in suit, would not be possible without a reduction of the production capacity of the pre-existing plant or without the use of a pre-existing plant being overdesigned with respect to a correct design for its nominal capacity including a safety margin. According to said calculations as reported in document (9) a 10% reduction of load (from 1500 to 1350 MTD as disclosed in the Example of the patent in suit) in the pre-existing reactor would only allow a maximum capacity increase of 20% in order to fit with the duty of the pre-existing plant.

4.3.4 However, said declaration and calculations are based on the presumption that the pre-existing production plant has a loading capacity strictly limited to cope with some fluctuations in the reaction parameters only, which presumption does not have any support in document (1) and also is of no relevance in view of the scope of present Claim 1 of the patent in suit, which does not exclude the use of a pre-existing production plant having a loading capacity well over the design safety margin. Furthermore, the Board finds that the skilled person, *prima facie*, rather would derive from the Example in document (1) that the retrofitting process as disclosed in document (1) would not involve a reduction of the production capacity of the pre-existing reactor, since in calculating the approximately average yield of the retrofitted plant as indicated in the Example (see page 5, lines 9 to 16) a yield of 63% has been applied, which actually

corresponds to that of the pre-existing plant as such (see page 2, lines 10 to 28, in particular line 27).

4.3.5 Therefore, the Board concludes that the process step of reducing the production capacity of the pre-existing reactor (R) cannot be directly and unambiguously derived from document (1) and, consequently, represents a novel characterising feature of the process of Claim 1 of the patent in suit in addition to that of connecting the additional reactor (ROT) to and upstream of said ammonia stripping section (SS).

4.4 In the light of this closest state of the art, the Board finds that the technical problem underlying the patent in suit can be seen in the provision of a process of retrofitting a particular urea production plant as specified in the pre-characterising part of present Claim 1 for urea production according to an isobaric ammonia stripping process, in which a retrofitted urea production plant having a reduced energy consumption is achieved.

In this context, the Board observes that during the oral proceedings before the Board the Appellant explicitly acknowledged that this technical problem has been solved by the process of Claim 1 of the patent in suit due to a reduced amount of recycled water in the retrofitted plant, and that, in these circumstances, there is no need anymore to decide upon the admissibility of the late filed test-report provided by the Respondent.

4.5 The question now is whether the solution of the technical problem as defined above by the process of present Claim 1 would have been obvious to the skilled person in view of the cited prior art.

4.6 As follows from the considerations above with respect to document (1), this document does not provide any pointer to the use of the two differentiating characterising features of present Claim 1 indicated under Point 4.3.5 above. Therefore, this document is of no help when trying to solve the above defined technical problem.

4.7 Document (10), which was found particularly relevant by the Appellant, relates to a process of retrofitting a plant for urea production, in which starting with NH_3 and CO_2, via ammonium carbamate, an ammonium carbamate containing urea solution is prepared and then a large proportion of the ammonium carbamate is removed in the form of gas containing NH_3, CO_2 and a small amount of water by subjecting the urea solution to a stripping treatment with a stripper gas such as NH_3 in order to reduce the energy consumption (see page 1, and page 2, lines 4th paragraph). The production of urea in the retrofitted production plant is conducted in two reactors in such a way that between 20% and 50% of the production takes place in the first reactor at a pressure of at least 50 atmospheres higher than the pressure in a second reactor, after which the urea solutions which are discharged are subjected to the stripping treatment at the pressure of the second reactor, whereby the reduction of energy consumption is achieved by at least partly covering the heat required for the stripping treatment by using the heat which is

obtained from the condensation of NH_3 and CO_2 to ammonium carbamate under the pressure of the second reactor (see page 2, 5th paragraph).

However, this document is not related to the problem of reducing the energy consumption of a pre-existing plant as specified in present Claim 1 for urea production according to an isobaric ammonia stripping process. Moreover, it does not give any pointer to the skilled person that this problem could be solved by combining the process step of connecting the additional reactor (ROT) to and upstream of said ammonia stripping section (SS) with that of reducing the production capacity of the pre-existing reactor (R).

Therefore, the Board comes to the conclusion that document (10) does not provide an incentive to the skilled person of the solution of the technical problem underlying the patent in suit as claimed in present Claim 1.

4.8 With respect to documents (3) and (4) the Board comes to the same conclusion. These two documents were only cited by the Appellant to show that feeding of the product streams from two separate urea producing reactors in parallel to and upstream of a stripping zone was well known in the art. However, even if this process feature were known from said documents, the skilled person would not arrive at the solution of the technical problem underlying the patent in suit as claimed in present Claim 1, since both documents concern different urea production plants and because the teaching of these two documents in combination with that of document (1) would not provide any incentive to

the skilled person to apply a reduction of the production capacity of the pre-existing reactor (R).

4.9 Thus, in view of these considerations, the Board concludes that the solution of the above defined technical problem as claimed in Claim 1 of the patent in suit is not obvious to the skilled person in the light of the cited documents, and consequently involves an inventive step in the sense of Article 56 EPC.

The dependent Claims 2 to 6 relate to particular embodiments of the process of Claim 1. They are therefore also allowable.

5. In the light of the above findings, it is not necessary to consider the Appellant’s auxiliary requests.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent on the basis of the claims of the main request submitted at the oral proceedings on 22 October 2003 and a description to be adapted thereto.

The Registrar: The Chairman:

N. Maslin A. Nuss