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**Datasheet for the decision
of 18 September 2012**

Case Number: T 0175/09 - 3.3.10

Application Number: 00110451.2

Publication Number: 1035112

IPC: C07C273/04

Language of the proceedings: EN

Title of invention:

Apparatus for the preparation of urea

Patentee:

TOYO ENGINEERING CORPORATION

Opponent:

DSM IP Assets B.V.

Headword:

Relevant legal provisions:

EPC Art. 56, 100(a), 114(2)

RPBA 12(2), 13(1), 13(3)

Keyword:

Inventive step - main request (no)

Auxiliary request - not admitted into the proceedings

Decisions cited:

T0197/86, T0270/90, T0020/81

Catchword:



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Case Number: T 0175/09 - 3.3.10

D E C I S I O N
of the Technical Board of Appeal 3.3.10
of 18 September 2012

Appellant: DSM IP Assets B.V.
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted 25 November 2008
rejecting the opposition filed against European
patent No. 1035112 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chairman: P. Gryczka
Members: R. Pérez Carlón
F. Blumer

Summary of Facts and Submissions

- I. The appellant (opponent) lodged an appeal against the decision of the opposition division to reject the opposition.
- II. Notice of opposition had been filed by the appellant requesting revocation of the patent in its entirety *inter alia* on the ground of lack of inventive step (Article 100(a) EPC).

Inter alia, the following documents were submitted in opposition proceedings:

D1: EP 0 329 215 A1
D2: GB 1,188,051
D3: EP 0 155 735 A1

- III. Independent claim 1 of the patent as granted (main request) reads as follows.

"A urea synthesis apparatus comprising

- (a) a vertical urea synthesis column,*
- (b) a vertical condenser with a cooler, installed on or above said urea synthesis column*
- (c) a stripper for stripping unreacted ammonia and unreacted carbon dioxide, contained in a urea synthesis solution from said urea synthesis column, by means of feed carbon dioxide to separate them from the solution as a mixed gas of ammonia, carbon dioxide and water,*
- (d) a heat-exchanger for preheating feed liquid ammonia,*
- (e) an ejector using the preheated feed liquid ammonia as the driving fluid,*
- (f) a first down pipe that has an opening in the top part of said vertical condenser and is for supplying a*

condensate from the top part of said vertical condenser to the suction side of the ejector,

(g) a piping for introducing the feed liquid ammonia and said condensate from the delivery side of the ejector into the bottom part of said vertical urea synthesis column,

(h) a second down pipe that has an opening in the top part of said vertical urea synthesis column and is for introducing the urea synthesis solution into the top part of said stripper,

(i) a piping for introducing said mixed gas from said stripper into the bottom part of said vertical condenser,

(j) a piping for introducing an absorption medium or an absorption medium and feed ammonia into the bottom part of said vertical condenser,

(k) a piping for discharging inert gas, joined to the top part of said vertical condenser,

(l) a piping for introducing at least a part of feed carbon dioxide, joined to the bottom part of said stripper, and

(m) a piping for discharging an aqueous urea solution containing unseparated unreacted ammonia and unreacted carbon dioxide from the bottom part of said stripper for further treatments."

- IV. The opposition division agreed with the parties that document D1 was the closest prior art. D1 failed to disclose an ejector connecting the top of the condenser and the bottom of the reactor (feature (e) of claim 1), and a vertical condenser (feature (b)). The problem to be solved was the provision of an apparatus for the production of urea which allowed forming additional urea in the condensation zone and was capable of improving circulation. The claimed solution was not

obvious in the light of the art.

- V. The appellant (opponent) requested that the drawings and the PowerPoint (R) presentation on which the respondent wanted to rely during the oral proceedings before the board not be admitted, as it was not prepared to respond to what could be presented. The patent in suit did not contain figures, and representing the claimed invention in the form of a diagram could introduce information which was complex to examine for the first time during the oral proceedings.

With respect to inventive step, the appellant argued that each of the distinguishing features solved an independent problem and were, therefore, not a true combination. The ejector served to improve circulation, which was obvious from D2, whereas the vertical placement of the condenser required less ground space, which was obvious from D3. Urea was obtained in any submerged condenser, independently from whether it was horizontally or vertically placed. The ejector did not increase the N/C ratio in the reactor, because said ratio was kept constant in every urea apparatus by adjusting the feed and the recirculation. Therefore, the claimed apparatus did not involve an inventive step.

The appellant also requested that the first auxiliary request filed during the oral proceedings before the board not be admitted, since it considered that it was taken by surprise at that late stage of the proceedings. The respondent had ample opportunity to amend the claims earlier since the objections were known to it from the opposition proceedings. This new request was thus not a reaction to any new evidence or

argument.

VI. The respondent (patent proprietor) saw as additional distinguishing features that the condenser was placed on or above the urea synthesis column (feature (b) of claim 1), and that the pipings (i), (j) and (h) could not be further split, so that the additional pipes disclosed in D1 were not present in the claimed apparatus.

Turning to inventive step, the problem to be solved by the invention was the provision of an improved apparatus for the synthesis of urea which needed less ground space, was more flexible in the relative disposition of its different parts, and increased the urea synthesis rate, measured as the conversion of CO₂ to urea. Comparison of examples 4 and 5 of the patent in suit and the example of the closest prior art document D1 proved that the problem was solved. The ejector increased the nitrogen to carbon ratio in the reactor and the pressure in the condenser, and the gas residence time in a vertical condenser was longer than in a horizontal equivalent. Hence, the distinguishing features worked in combination to achieve a synergistic effect not obvious in the light of the art. The claimed subject-matter involved, therefore, an inventive step.

The respondent requested that the drawings and PowerPoint (R) presentation on which it intended to rely during the oral proceedings be admitted into the proceedings, since they were only intended to show the features distinguishing the invention from the state of the art.

The auxiliary request filed during the oral proceedings before the board was a response to a new situation

which arose from a different way of assessing the alleged synergistic effect. If the auxiliary request would not be admitted, the proprietor would not be given a fair chance to properly defend its patent.

VII. Oral proceedings were held before the board on 13 September 2012.

The chairman closed the debate, informed the parties that the decision would be announced in writing and asked them to state their final requests, which were as follows:

- The appellant (opponent) requested that the decision under appeal be set aside and that the European patent No. 1 035 112 be revoked.
- The respondent (patentee) requested that the appeal be dismissed and the patent be maintained as granted, or, subsidiarily, that the patent be maintained on the basis of the auxiliary request as filed during the oral proceedings before the board.

VIII. With a communication sent by fax on 18 September 2012, the board announced its decision.

Reasons for the Decision

1. The appeal is admissible.

Admissibility of late filed evidence:

2. The respondent filed during the oral proceedings three pages containing drawings, allegedly for explaining the distinguishing features of claim 1 of the patent in

suit vis-à-vis the state of the art.

The appellant objected to their admission into the proceedings. As the patent in suit did not contain any figure, presenting claim 1 in the form of a drawing could introduce additional information, and it was very complicated to compare the wording of claim 1 with a figure, especially at that late stage of proceedings.

The late filed drawings are *prima facie* not pertinent, as on the page labelled "present invention" the condenser is not placed on or above the urea synthesis column, as required by feature (b) of claim 1, but on the ground. As these drawings have been filed at a very late stage of the proceedings, namely only at the oral proceedings before the board, and are not pertinent to the claimed invention, the board makes use of the discretion given to it by Article 13(1) of the Rules of Procedure of the Boards of Appeal not to admit said drawings into the proceedings (Article 114(2) EPC).

3. The respondent announced at the beginning of the oral proceedings before the board that it intended to use a PowerPoint (R) presentation, whose content essentially corresponded to the figures mentioned under point 2, above.

As before, the appellant considered that it was not prepared to respond to what could be presented. The patent in suit did not contain figures, and a diagram could introduce information which was complex to examine for the first time during the oral proceedings.

The presentation had not been announced in due time and the respondent failed to provide in advance a copy of its content, so that there is a risk of the appellant

being caught unawares, or of new issues being raised for the first time at the oral proceedings before the board (see Case Law, 6th edition 2010, VI.C.4.6). For these reasons, the board makes use of the discretion given to it by Article 13(1) of the Rules of Procedure of the Boards of Appeal not to admit said presentation into the proceedings (Article 114(2) EPC).

Main request, novelty, Article 54 EPC:

4. Neither the opposition division nor the appellant had any objection with regard to the novelty of claim 1 of the main request, and the board sees no reason to depart from this view in the light of the available prior art.

Main request, inventive step, Article 56 EPC:

5. Closest prior art:
 - 5.1 The board considers, in agreement with the opposition division and the parties, that the closest prior art is the disclosure of document D1.

Document D1 describes an apparatus for producing urea which comprises (see figure) a vertical urea synthesis column (A), a condenser (C) and a stripper (B).

- 5.2 The board agrees with the parties and the opposition division that the apparatus of D1 fails to disclose:
 - an ejector (feature (e) of claim 1) whose suction side is connected via line (f) to the top part of the vertical condenser, and
 - a vertical condenser (feature (b) of claim 1).

5.3 The respondent saw lines (i) and (j) as additional distinguishing features, because these lines were further split in D1. The wording of claim 1 excluded the presence of those additional pipes present in the apparatus of D1, since claim 1 contained all the features required by the claimed invention.

However, claim 1 defines an apparatus "comprising" the features defined therein, which does not exclude the splitting of its lines. Line 12 of document D1 is "a piping for introducing an absorption medium or an absorption medium and feed ammonia into the bottom part of said [vertical] condenser", as required by feature (j) of claim 1. Similarly, lines 6, 8 and 9 disclose "a piping for introducing said mixed gas from said stripper into the bottom part of said [vertical] condenser", and corresponds to feature (i) of claim 1.

Therefore, lines (i) and (j) are not features distinguishing the claimed apparatus from that disclosed in document D1.

5.4 The respondent saw as an additional distinguishing feature the location of the condenser *on or above* the urea synthesis column.

However, in the example of D1, the reactor is at ground level, its height is 18 meters and the condenser is placed 20 meters over ground level (see column 6, line 58 to column 7, line 4). The figure of D1 also depicts the condensation zone (C) at a level higher than the top of the urea synthesis column. Thus, document D1 discloses a condenser above the urea synthesis column.

5.5 Finally, the respondent considered that feature (h) had not been disclosed in document D1. Feature (h) reads "a

second down pipe that has an opening in the top part of said vertical urea synthesis column and is for introducing the urea synthesis solution into the top part of said stripper". In the view of the respondent, sending a part of the product of the urea synthesis column to the condenser, as required by line 10 of the apparatus disclosed in D1, was excluded from the subject-matter of claim 1 by feature (h).

However, line 16 of document D1 is, as required by feature (h) of claim 1, a down pipe linking the top part of the urea synthesis column and the top of the stripper, which is intended for bringing the urea synthesis solution (but not the off-gas) from the reactor to the stripper. The presence of an additional line (see 10 in the figure of D1) for feeding the off-gas to the condenser, still falls within the subject-matter of claim 1 which, by the use of the wording "comprising", only defines the required features without excluding additional elements.

Therefore, also line (h) is not a distinguishing feature over the closest prior art document D1.

5.6 The distinguishing features of claim 1 with respect to the closest prior art document D1 are, thus, those mentioned under point 5.2, above.

6. Technical problem underlying the invention:

The respondent defined the problem underlying the claimed invention as to provide an apparatus which needs less ground space, allows flexibility in the relative position of the condenser, improves circulation, and increases the urea production rate,

measured as CO₂ conversion.

7. Solution:

The solution claimed in the patent in suit is the apparatus subject-matter of claim 1, characterised in that it comprises a vertical condenser and an ejector between the condenser and the urea synthesis column.

8. Success:

- 8.1 It has not been disputed that the apparatus subject-matter of claim 1 requires less ground space, allows flexibility in the position of the condenser and improves the circulation with respect to the closest prior art document D1.

The parties were, however, divided as to whether it also solved the problem of increasing the urea synthesis rate.

- 8.2 The respondent relied on the comparison of examples 4 and 5 of the patent in suit with the sole example of D1 for proving that an improvement over D1 in terms of urea synthesis rate had been achieved.

According to established jurisprudence, in the case where comparative tests are chosen to demonstrate an inventive step with an improved effect over a claimed area, the nature of the comparison with the closest state of the art must be such that the effect is convincingly shown to have its origin in the characterising features of the invention. For this purpose, it may be necessary to modify the elements of comparison so that they differ only by such characterising features (see T 197/86, EPO OJ 1989,

371, points 6.1.2 and 6.1.3 of the reasons).

Comparing examples 4 and 5 of the patent in suit and example 1 of document D1 cannot convincingly show any improvement in urea synthesis rate, because most of the operating conditions (pressures, throughput, etc.) are different. Hence, these data do not reflect solely the effect of the distinguishing features of the invention.

Thus, in view of the fact that these examples do not differ exclusively by virtue of the characterising features of the claimed invention, namely in that an ejector is placed between the condenser and the synthesis column, and in that a vertical condenser is used, a causal link between any possible increase in urea synthesis rate and the characterising features of claim 1 has not been shown.

8.3 The respondent argued that the ejector and condenser worked in combination and resulted in a synergistic effect in terms of the urea conversion rate, by increasing the N/C ratio and the pressure in the condenser and by increasing the gas residence time for the following reasons:

8.3.1 The respondent explained that urea synthesis was normally carried out under an ammonia to carbon dioxide ratio (from now on N/C) higher than stoichiometric (2:1). An increase in the relative amount of ammonia led to an increase in the CO₂ conversion and a reduction in the NH₃ conversion, which was advantageous, as separating ammonia from the reaction mixture was less expensive in terms of energy. As the ejector introduced more ammonia in the reactor, the N/C ratio was necessarily higher, and the CO₂ conversion increased.

However, claim 1 does not exclude adding more CO₂ to the reactor or increasing the recirculation of unreacted material, which would maintain a low N/C ratio. Additionally, whether the ejector introduces more ammonia in the vertical reactor with respect to D1 is a matter of its operating conditions, which are not features of claim 1.

- 8.3.2 According to the respondent, the ejector would increase the total pressure in the condenser and, hence, the urea conversion rate therein.

It is not plausible, however, that the sole location of the ejector (e) as required by claim 1 implies an increase on the pressure in the condenser with respect to D1, where an ejector (F) feeds also ammonia into the urea synthesis column.

- 8.3.3 Finally, according to the respondent, the residence time of the gases in a vertical condenser was longer than in a horizontal equivalent, therefore the cooling was more efficient and more liquid phase was formed. As urea synthesis took place in the liquid phase, its synthesis rate increased.

In this respect, it is doubtful whether the orientation of the vertical condenser changes the residence time of the gaseous phase as long as the remaining design of the condenser and in particular its length which, according to the appellant, is primarily responsible for this residence time, is left open in claim 1. Therefore, the alleged improvement in urea synthesis rate due to a longer gas residence time vis-à-vis a horizontal condenser is not plausible.

These arguments should, therefore, fail.

8.4 Thus, the board concludes that it has neither been proven, nor is it plausible having solely regard to the distinguishing technical features, that the problem of increasing the urea synthesis rate is solved by the subject-matter of claim 1.

8.5 The respondent further argued that it had not to carry the onus of proof for the fact that the claimed process achieved the alleged technical benefit over the closest prior art. It was rather on the appellant to show that the claimed process did not achieve said benefit.

However, according to the established jurisprudence of the Boards of Appeal, each of the parties to the proceedings carries the burden of proof for the facts it alleges (see e.g. decision T 270/90, OJ EPO 1993, 725, point 2.1). In the present case, where the respondent relies on an improvement over the process disclosed in D1 with respect to urea synthesis rate, the burden of proof for this fact lies on its side.

In addition, as the respondent did not present a fair and convincing comparison between the closest prior art and the claimed invention, the purported technical benefits are devoid of corroborating evidence. Hence, the respondent has not discharged its burden of proof.

8.6 According to the jurisprudence of the Boards of Appeal, alleged but unsupported advantages cannot be taken into consideration in respect of the determination of the problem underlying the invention (see e.g. decision T 20/81, OJ EPO 1982, 217, point 3, last paragraph of the reasons). As the alleged improvement in terms of urea synthesis rate lacks the required support, the

technical problem as defined in point 6 above needs reformulation.

Thus, in view of the teaching of D1, the objective problem underlying the invention is providing an apparatus which needs less ground space, allows flexibility in the position of the condenser, and improves circulation.

It is not disputed that this technical problem has been solved by the claimed solution. The ejector solves the problems of allowing flexibility and improving circulation, whereas a vertical condenser needs less ground space than a horizontal condenser.

9. Finally, it remains to be examined whether the claimed solution was obvious for the person skilled in the art:
 - 9.1 There is no functional dependency between both distinguishing features of present claim 1, as the ejector solves the partial problem of improving circulation and of allowing flexibility in the position of the condenser, whereas the placing of the condenser solely solves the problem of requiring less ground space. The distinguishing features are, hence, a mere aggregation of features. Therefore, it needs to be examined whether the solution of each partial problem is inventive in the light of the state of the art.
 - 9.2 The skilled person, trying to design a urea synthesis apparatus which needs less ground space, will recognise that horizontal condenser (C) of document D1 needs more ground space than any other unit disclosed therein, and will attempt to replace it by a more suitable condenser. The person skilled in the art will then turn to the disclosure of document D3, which describes that

both vertical and horizontal condensers of the submerged type can be used in a urea apparatus (see page 4, lines 29 and 30) and both have the advantage that additional urea is formed therein (see page 4, lines 7-13). A vertical submerged condenser is, therefore, as efficient as a horizontal condenser in terms of urea conversion, and requires less ground space. Hence, the skilled person would combine the teaching of document D3 with document D1 and design an apparatus with a vertical instead of horizontal condenser in order to solve this part of the problem underlying the invention.

9.3 When trying to improve circulation and allow flexibility on the position of the condenser, i.e. the other partial problem, the skilled person would turn to the disclosure of document D2, dealing with these problems (page 1, lines 57-61). From the figure of document D2, it is obvious that the sole component of the urea synthesis apparatus therein disclosed which improves circulation is the ejector (7) linking the condenser (6) and the synthesis column (1), which uses as entraining fluid either CO₂ or ammonia (page 2, lines 27-32). In the apparatus of the closest prior art D1, ammonia is fed to the synthesis column (A) (lines (1)-(15)) and CO₂ to the stripper (B) (see line (2)). Therefore, the skilled person will choose ammonia as entraining fluid, place an ejector linking the condenser and the synthesis column, and arrive to the subject-matter of claim 1 without using inventive skills.

For these reasons, the apparatus according to claim 1 is not inventive over the combination of document D1 and the teaching of documents D2 and D3.

9.4 The respondent argued that the distinguishing features represented a true combination, and relied for that on an enhancement on the urea synthesis rate. This argument is rejected for the reasons already explained in point 8, above.

9.5 The respondent further argued that D2 related to ammonia stripping technology, which was so remote from the CO₂ stripping technology of D1 that the skilled person would not contemplate combining the teaching of D2 with the closest prior art D1.

However, document D2 mentions on page 1, lines 48 and 49, that the stripping agent could be selected from ammonia and carbon dioxide. The disclosure of document D2 also applies to CO₂ stripping and, hence, does not relate to a remote area of technology.

This argument of the respondent should, therefore, fail.

9.6 The respondent further argued that neither document D2 nor document D3 disclosed a line connecting the stripper to the bottom of the condenser, as required by feature (i) of claim 1, and considered for this reason that the teaching of D2 and D3 could not be combined with the closest prior art document D1.

However, a line (i) as required by claim 1 is already disclosed in the closest prior art document D1 (see lines (6), (8) and (9)), and the board does not see a reason why the teachings of D2 and D3 could not be combined with D1 unless the former also disclosed said line.

9.7 The respondent further argued that the combination of documents D1 and D3 did not teach placing the vertical condenser on or above the urea synthesis column, as the horizontal condenser depicted in the figure of D3 was placed below it.

However, the driving force for feeding the product of the condensation zone into the urea synthesis column of D1 is gravity. Although installing the ejector as taught by D2 allows flexibility in the placement of the equipment, gravity can also contribute to the flow of the feed. For that reason, the skilled person would install the condensation zone on or above the urea synthesis column in order to be able to use gravity to enhance the flow. The argument of the respondent should, therefore, fail.

10. Thus, the main request must be refused for lack of inventive step pursuant to Article 56 EPC.

First auxiliary request, admissibility:

11. The first auxiliary request was filed at the very last stage of the appeal proceedings, namely at the end of the oral proceedings before the board.

The respondent argued that the proprietor should be allowed enough chances to properly defend its patent. It had always considered that the appellant had not discharged its burden of proof, the arguments of the opposition division had been very convincing on its favour, and the board had not provided a preliminary opinion. During the oral proceedings, it had been confronted for the first time with a different way of assessing the alleged synergistic effect, and the first auxiliary request was justified by this new situation.

The amendments proposed in claim 1 of the first auxiliary request found a basis on the first part of dependent claim 2 as granted, and did not introduce any new issue in terms of added subject-matter or clarity.

The purpose of the appeal procedure in *inter partes* proceedings is mainly to give a party being adversely affected the possibility of challenging the decision of the first instance. According to Article 12(2) of the Rules of Procedure of the Boards of Appeal, the statement of grounds of appeal and the reply shall contain a party's complete case. If, at a later stage of the proceedings, the respondent wants other requests to be considered, admission of these requests into the proceedings is a matter of discretion of the board of appeal and not a matter of right of the proprietor of the patent (Article 13(1) of the Rules of Procedure of the Boards of Appeal).

In the present case, the objections which may have prompted the first auxiliary request, namely lack of inventive step over the combination of documents D1, D2 and D3, and the arguments why the appellant considered the patent in suit a mere aggregation of features, had been known to the respondent from the statement of grounds of appeal. Therefore, the filing of the first auxiliary request is not induced by objections, facts or evidence freshly raised.

The board concurs with the appellant that he could not be expected to provide during the oral proceedings sufficient counter arguments to support its case without a detailed analysis of the state of the art and without the possibility to provide additional evidence.

Thus, the board concludes that if this new request, filed at this late stage, would be admitted in the proceedings the appellant could not be expected to deal with it so that the oral proceedings would have to be postponed which, according to Article 13(3) of the Rules of Procedure of the Boards of Appeal, should be avoided. The board, therefore, uses its discretion under Article 13(1) of the Rules of Procedure of the Boards of Appeal not to admit the auxiliary request into the proceedings.

Order

For these reasons it is decided that:

The decision under appeal is set aside.

The patent is revoked.

The Registrar:

The Chairman:



C. Rodríguez Rodríguez

P. Gryczka

Decision electronically authenticated