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Case Number: T 1488/23 - 3.3.05

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Title of invention:
UREA PRODUCTION PLANT AND SCRUBBING SYSTEM

Patent Proprietor:
thyssenkrupp Fertilizer Technology GmbH
thyssenkrupp AG

Opponent:
Stamicarbon B.V.

Headword:
Urea plant/thyssenkrupp

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Catchword:

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Case Number: T 1488/23 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 18 March 2025

Appellant: (Patent Proprietor 1)	thyssenkrupp Fertilizer Technology GmbH Vosskuhle 38 44141 Dortmund (DE)
Appellant: (Patent Proprietor 2)	thyssenkrupp AG ThyssenKrupp Allee 1 45143 Essen (DE)
Representative:	Gulde & Partner Patent- und Rechtsanwaltskanzlei mbB Berliner Freiheit 2 10785 Berlin (DE)
Respondent: (Opponent)	Stamicarbon B.V. Mercator 3 6135 KW Sittard (NL)
Representative:	V.O. P.O. Box 87930 2508 DH Den Haag (NL)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 15 June 2023 revoking European patent No. 3560907 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chair	S. Besselmann
Members:	G. Glod
	R. Winkelhofer

Summary of Facts and Submissions

I. The present appeal of the patent proprietors (appellants) lies from the opposition division's decision revoking European patent No. 3 560 907 B1. In the impugned decision, it was held that the main request and auxiliary request 1 were not novel, and that auxiliary requests 2 and 3 lacked an inventive step.

II. The documents cited in the decision under appeal included the following.

D1: WO 2013 165245 A1
D2: "Ullmann's Encyclopedia of Industrial Chemistry", vol. A27, 5th edition, 1996, pages 333-365
D4: WO 2015 002535 A1
D9: US 2011 0229394 A1

III. Claim 1 of the main request (patent as granted) reads as follows.

"*1. A urea production plant at least comprising*

a. a synthesis and recovery section (1);
b. a first evaporation section (2) connected with the synthesis and recovery section (1) and a first condensation section (6);
c. a granulation section (3) connected with the first evaporation section (2);
d. a scrubbing section (4) connected with the granulation section (3)
e. a second evaporation section (5) connected with the scrubbing section (4) and wherein the second

evaporation section (5) is connected with the granulation section (3),
f. a second condensation section (7) connected with the second evaporation section (5);
g. a quenching section (8) comprising a liquid inlet for the distribution of a quenching liquid, located and connected between the granulation section (3) and the scrubbing section (4) and
wherein the quenching section (8) is connected with a quenching liquid providing section (10) and the second condensation section (7)."

Compared with claim 1 of the main request, claim 1 of auxiliary request 1 also includes the following underlined feature in step d.

"*1. [...] d. a scrubbing section (4) connected with the granulation section (3) wherein the scrubbing section comprises a dust scrubber and an acid scrubber;*
e. a second evaporation section (5) connected with the scrubbing section [...]."

Compared with claim 1 of the main request, claim 1 of auxiliary request 2 also includes the following underlined feature in step d.

"*1. [...] d. a scrubbing section (4) connected with the granulation section (3) wherein the scrubbing section comprises a dust scrubber and a cooler scrubber;*
e. a second evaporation section (5) connected with the scrubbing section [...]."

Auxiliary request 3 is a combination of auxiliary requests 1 and 2 and comprises the following underlined feature in step d.

"*1. [...] d. a scrubbing section (4) connected with the granulation section (3) wherein the scrubbing section comprises a dust scrubber and an acid scrubber and a cooler scrubber;*
e. a second evaporation section (5) connected with the scrubbing section [...]."

IV. The arguments of the appellants, where relevant to the present decision, can be summarised as follows.

A combination of D1 and D4 would not have led to the feature that "the quenching section is connected with a quenching liquid providing section and the second condensation section", which is present in all of the requests; rather, a combination of these documents could only have led to the process condensate being returned to the scrubbing section. The claimed feeding of the process condensate into the quench led to a more efficient cleaning of the gas. Moreover, D4 only disclosed quenching as part of Venturi scrubber systems, which were complicated devices and therefore the skilled person would not have included them in a plant according to D1.

In addition, D1 was silent about acid scrubbing and did not contain an acid scrubber as present in auxiliary requests 1 and 3.

Lastly, none of the prior-art documents disclosed a cooler scrubber as present in auxiliary requests 2 and 3.

V. The arguments of the respondent (opponent) are reflected in the Reasons given below.

VI. The appellants request that the decision under appeal be set aside and amended such that the opposition be rejected, or alternatively that the patent be maintained in amended form on the basis of one of auxiliary requests 1 to 3 underlying the impugned decision.

The respondent requests that the appeal be dismissed.

Reasons for the Decision

Main request (patent as granted)

1. Article 100(a) EPC and Article 54 EPC

D1 discloses in Figure 2 a plant according to claim 1 of D1, i.e. a urea production plant comprising a synthesis and recovery section (A); said section being in fluid communication with an evaporation section (B), said evaporation section being in fluid communication with a finishing section (i.e. a granulation section) (C) and having a gas flow line to a condensation section (E); said finishing section (C) having a gas flow line to a dust scrubbing section (D); wherein the plant comprises an additional evaporation section (G) placed downstream of the dust scrubbing section (D), and wherein said additional evaporation section (G) is in fluid communication with the finishing section (C); wherein the additional evaporation section (G) has a gas flow line to an additional condensation section (H), and wherein the additional condensation section (H) is in fluid communication with the dust scrubbing section (D).

The opposition division was right in concluding that D1 does not disclose a quenching section. The respondent's interpretation that section D shown in Figure 2 of D1 should be considered a quenching section cannot be accepted, since quenching and scrubbing are different processes which require two distinguishable sections in the apparatus. This was rightly pointed out by the opposition division in Reasons 4.2.3 of the impugned decision.

Consequently, D1 does not anticipate the novelty of claim 1 of the main request.

2. Article 100(a) EPC and Article 56 EPC

2.1 The invention relates to a urea production plant (paragraph [0001]).

2.2 D1 is a possible starting point for the question of inventive step as it also relates to the field of urea production. As indicated above, it discloses in Figure 2 a plant having all of the features of claim 1 of the patent as granted except for the quenching section.

2.3 The problem to be solved by the patent is to provide a urea plant with a more efficient dust removal process (paragraph [0019]).

2.4 It is proposed that the problem be solved by a urea plant according to claim 1, characterised in that the plant comprises a quenching section comprising a liquid inlet for the distribution of a quenching liquid, located and connected between the granulation section and the scrubbing section, and wherein the quenching

section is connected with a quenching liquid providing section and the second condensation section.

2.5 In favour of the appellants, the posed problem is presumed to be successfully solved. The appellants explained that the feeding of the process condensate, which was very pure, into the quench, had a surprising effect in that the sticky urea particles from the granulation did not adhere to connecting parts, pipes and the like in the system. In addition, the quench could humidify the gas stream, which meant that the gas stream could be cleaned efficiently at the scrubbing stage. This ultimately led to a more efficient dust removal process.

The question as to whether this explanation is to be taken into account in accordance with Article 13(2) RPBA does not have to be addressed since the main request cannot succeed in any case, even presuming the problem is successfully solved.

2.6 The reason for this is that the solution to the problem is obvious, for the following reasons.

D4 also relates to the field of urea production and efficient dust removal (page 5, line 27, to page 6, line 2). D4 explicitly discloses that the quenching of the off-gas not only has advantageous effects on the conservation of energy, but also leads to a more efficient removal of urea dust (page 8, lines 1 to 3). The skilled person trying to solve the posed problem will consult D4 since it relates to the same field and addresses the posed problem. Quenching is clearly taught as being beneficial.

Consequently, the skilled person trying to solve the problem posed would have good reason to include a quenching section in the setup of D1. D4 teaches that the quenching step occurs prior to scrubbing (page 6, lines 13 to 15, page 14, lines 1 to 3, and Figure 1). In view of this teaching, the skilled person would introduce such a scrubbing section in the plant according to Figure 2 of D1 prior to the dust scrubbing (D) (Figure 2). A connection with a quenching liquid providing section and a second condensation section (H) is the logical consequence of combining the teachings of D1 and D4. In particular, D4 indicates that the liquid flow 06 in Figure 2 (i.e. the quench feed) can either be a clean water flow or a urea solution in water (page 23, lines 5 and 6). This corresponds to the scrubber feed known from D1, which is condensate from condensation section (H) with additional water when needed (page 9, lines 4 to 11). Accordingly, D1 teaches two connections for the scrubbing unit, whereby one originates from the second condensation section (lines 10 and 18 in Figure 2). The skilled person implementing the quenching section known from D4 in the plant from D1 would thus be motivated to provide two such connections to the quenching section for sourcing water.

The appellants' argument that the skilled person would not use the valuable pure water (i.e. condensate) for the quenching step is not convincing. This argument is linked to the processing of the gas and not to structural features reflected in apparatus claim 1. This also applies to the alleged surprising effect (lower stickiness of the urea particles) of using pure water. Furthermore, D4 explicitly mentions clean water (page 23, line 6) and clearly teaches the two possibilities of sourcing water, as indicated. The

skilled person would include these possibilities in the apparatus and when carrying out the process would then choose according to the availability of water and/or according to the process conditions.

The appellants' argument that Venturi scrubbers were complicated devices cannot be accepted since claim 1 does not exclude such scrubbers. In addition, the teaching of the benefit of quenching in D4 is not limited to the combination with a Venturi scrubber.

Therefore, the proposed solution is obvious in view of D4.

2.7 The subject-matter of claim 1 lacks an inventive step in view of D1 in combination with D4.

3. The main request is thus not allowable.

Auxiliary request 1

4. Article 56 EPC

Claim 1 of this request includes the feature that the scrubbing section comprises a dust scrubber and an acid scrubber.

4.1 As indicated, a dust scrubbing section (D) is present in D1. D1 does not mention an acid scrubber. However, D4 discloses in claims 9 and 14 that an acid scrubber can be added downstream of the dust scrubbing section for the removal of ammonia.

It is generally known that off-gases from the finishing section may be contaminated with ammonia (D2, page 350, section 3.4, first paragraph), as is also clear from

the observation that D4 discloses ammonia removal.

The appellants were of the view that the skilled person would not use acid scrubbing in the process of D1 because this was prohibited by the teaching of D1, as could be derived from page 5, lines 19 to 26. The resulting presence of ammonium salts in stream 9 in Figure 1 would contaminate section (F) and recycle stream 13.

However, Figure 1 of D1 and the passage on page 5, lines 19 to 26, relate to a conventional process involving a first evaporation step, not to a process involving a second evaporation step and a second condensation step. Contrary to the appellants' arguments, it cannot be seen how adding an acid scrubber downstream of the dust scrubber (D) in D1 (i.e. in line 8 in Figure 2) can lead to the contamination of section (F). In fact, the argument that adding a downstream acid scrubber could necessarily affect any of the upstream process steps is not convincing.

A downstream acid scrubbing step is not explicitly excluded by D1. Since such a step is taught in D4, the skilled person would add it to the process of D1 if ammonia contamination was a concern.

Consequently, claim 1 of auxiliary request 1 does not involve an inventive step either.

Auxiliary request 2

5. Article 56 EPC

Claim 1 of this request includes the feature that the scrubbing section comprises a dust scrubber and a cooler scrubber.

5.1 In the absence of any arguments as to how the presence of a cooler scrubber could provide a technical effect, let alone provide a combined effect with any of the other features in the claim, including the quenching section (i.e. the other distinguishing feature), the associated technical problem is merely to provide an alternative.

The appellants are of the view that none of the documents provided any indication that a dust scrubber and a cooler scrubber should be used in D1.

However, a cooler scrubber in the sense of a scrubber connected to an additional granulation cooler is a known device in a urea plant and is taught in D9 (paragraph [0016]).

The skilled person wishing to provide an alternative would thus readily equip the granulation cooler with the cooler scrubber known from D9 in the urea plant known from D1.

5.2 Consequently, claim 1 of auxiliary request 2 does not involve an inventive step either.

Auxiliary request 3

6. Article 56 EPC

6.1 Claim 1 of this request includes the feature that the scrubbing section comprises a dust scrubber, an acid scrubber and a cooler scrubber, i.e. the additional features of auxiliary requests 1 and 2 combined.

6.2 In the absence of any synergistic effect, the distinguishing features (acid scrubber and cooler scrubber) need to be addressed independently. The considerations set out with respect to auxiliary requests 1 and 2 also apply in combination.

6.3 Consequently, claim 1 of auxiliary request 3 does not involve an inventive step either.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chair:

C. Vodz S. Besselmann

Decision electronically authenticated