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Datasheet for the decision
of 8 August 2025

Case Number:	T 0318/24 - 3.3.05
Application Number:	17781577.6
Publication Number:	3515861
IPC:	C01B21/26, C01B21/40, B01D53/86, B01D53/00, B01D53/14
Language of the proceedings:	EN

Title of invention:

PLANT AND PROCESS FOR PRODUCING NITRIC ACID

Patent Proprietor:

Stamicarbon B.V.

Opponents:

1. CASALE SA
2. thyssenkrupp Industrial Solutions AG

Headword:

Nitric acid process/Stamicarbon

Relevant legal provisions:

RPBA 2020 Art. 12(4), 13(2)
EPC Art. 123(2), 56

Keyword:
Amendment to case - suitability of amendment to address issues (yes)
Amendment after summons - exceptional circumstances (no)
Amendments - allowable (yes)
Inventive step - (yes)

Decisions cited:
T 2843/19

Catchword:

Beschwerdekammern

Boards of Appeal

Chambres de recours

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Case Number: T 0318/24 - 3.3.05

DECISION
of Technical Board of Appeal 3.3.05
of 8 August 2025

Appellant: (Patent Proprietor)	Stamicarbon B.V. Mercator 3 6135 KW Sittard (NL)
Representative:	V.O. P.O. Box 87930 Carnegieplein 5 2508 DH Den Haag (NL)
Appellant: (Opponent 1)	CASALE SA Via Giulio Pocobelli 6 6900 Lugano (CH)
Representative:	M. Zardi & Co S.A. Via G. B. Pioda, 6 6900 Lugano (CH)
Party as of right: (Opponent 2)	thyssenkrupp Industrial Solutions AG ThyssenKrupp Allee 1 45143 Essen (DE)
Representative:	Gulde & Partner Patent- und Rechtsanwaltskanzlei mbB Berliner Freiheit 2 10785 Berlin (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 2 January 2024 concerning maintenance of the European Patent No. 3515861 in amended form.**

Composition of the Board:

Chairman	E. Bendl
Members:	S. Besselmann
	O. Loizou

Summary of Facts and Submissions

I. Opponent 1's (appellant's) appeal is against the opposition division's interlocutory decision according to which European patent EP 3 515 861 B1 in amended form on the basis of then auxiliary request 1 met the requirements of the EPC.

II. The patent proprietor, having withdrawn their own appeal during the oral proceedings before the board (8 August 2025), is the respondent in the appeal of the opponent 1. Opponent 2 is a party as of right.

III. Claim 1 of the final main request, filed as auxiliary request 2B with the reply to opponent 1's appeal, reads as follows:
"*A dual pressure process for producing nitric acid comprising reacting a gas mixture of ammonia and air in a burner section thereby forming a burner gas stream; cooling said burner gas stream in a gas cooling section forming a cooled burner gas; condensing said cooled burner gas stream in a condensation section forming an aqueous nitric acid condensate and an uncondensed nitrogen oxides gas stream; feeding said aqueous nitric acid condensate and said uncondensed nitrogen oxides gas stream to an absorption/oxidation section, forming a raw nitric acid product stream and a tail gas; treating said tail gas in a tail gas treatment section, comprising a tail gas heating section, a nitrous gas removal section which is an NOx and* N_2O *gas removal zone, and an expansion section, thereby forming a purified tail gas; releasing said purified tail gas to the atmosphere; the process comprising heating the tail gas in the gas cooling section to a temperature greater*

than 460°C, wherein the process is performed in a plant for the production of nitric acid comprising:

(a) a reactor comprising at least one gas inlet for ammonia and compressed air, a combustion chamber provided with an ammonia combustion catalyst and configured to produce a burner gas stream comprising nitrogen oxides resulting from the combustion of ammonia and subsequent oxidation, and a gas outlet for burner gas;

(b) a gas cooling section having a gas inlet which is in fluid communication with the outlet for burner gas of the reactor, said gas cooling section being configured to subject the burner gas stream to cooling, so as to form a cooled burner gas, the gas cooling section comprising a steam circuit heat exchanger configured to transfer heat from the burner gas stream to a steam circuit so as to generate superheated steam, and a gas outlet for cooled burner gas;

(c) a condensation section having a gas inlet which is in fluid communication with the outlet for cooled burner gas of the gas cooling section, said condensation section being configured to subject the cooled burner gas to condensation so as to form an aqueous nitric acid condensate and an uncondensed nitrogen oxides gas stream, said condensation section having a liquid outlet for the aqueous nitric acid condensate and a gas outlet for the uncondensed nitrogen oxides gas stream;

(d) an absorption section having a gas inlet which is in fluid communication with the gas outlet of the condensation section, said absorption section being configured to subject the nitrogen oxides gas stream to

absorption in water, optionally in the form of a dilute nitric acid solution; said absorption section further comprising a liquid inlet which is in fluid communication with the liquid outlet of the condensation section and a gas outlet for nitrogen oxides tail gas;

(e) a tail gas treatment system comprising a tail gas heating section, a nitrous gas removal section which is an NOx and N_2O *gas removal zone, and an expansion section, said tail gas treatment system being configured to subject nitrogen oxides gas to purification so as to form a purified tail gas and to subject said purified tail gas to expansion, said tail gas treatment section comprising a gas inlet for nitrogen oxides tail gas and a gas outlet for purified tail gas;*

wherein the tail gas heating section comprises a further heat exchanger configured to receive heat from the burner gas stream, said further heat exchanger being positioned downstream of the steam circuit heat exchanger, and upstream of the gas outlet for cooled burner gas, and wherein the reactor, the steam circuit heat exchanger, and the further heat exchanger are integrated into one single apparatus."

Claim 2 relates to a particular embodiment.

IV. The following documents are of relevance here.

D3	"Nitric acid" brochure from Thyssenkrupp-Uhde, 15 March 2004
D4	J. Pérez-Ramírez et al., "Formation and control of N_2O in nitric acid production: Where do we stand *today*?", Applied catalysis B: Environmental 44, 2003, 117-51

D5	M. Thiemann et al., "Nitric Acid, Nitrous Acid, and Nitrogen Oxides", Ullmann's Encyclopedia of Industrial Chemistry, Vol. 24, 2012, Wiley-VCH Verlag
D6	GB 822 825 A
D7	EP 0 301 844 A1
D9	GB 1 278 828 A
D13	M. Groves and A. Sasonow, "Uhde EnviNOx® Technology for NO_X and N_2O abatement - A contribution to reducing emissions from nitric acid plants", Fifth International Symposium on Non-CO_2 Greenhouse Gases (NCGG-5), Wageningen, Netherlands, 2009

V. The appellant's and opponent 2's arguments relevant to the present decision can be summarised as follows.

The request filed as auxiliary request 2B should not be admitted into the proceedings.

The requirements of Article 123(2) EPC were not met because the amendment was based on the part of the application as filed relating to the prior art.

An inventive step was lacking starting from D3 (page 13) as the closest prior art. The distinguishing features amounted to a mere juxtaposition of features. A tail gas temperature of 460°C was not unusual and was an obvious option for the skilled person. It could easily be implemented in the process of D3.

Opponent 2's objection based on D10 and D11, raised in the submission of 4 July 2025, was to be taken into consideration as a reaction to the filing of auxiliary request 2B.

VI. The respondent's arguments are reflected in the reasons for the decision.

VII. The patent proprietor (respondent) requested that the patent be maintained in amended form on the basis of the main request previously submitted as auxiliary request 2B or, in the alternative, on the basis of one of auxiliary requests 3 or 4, all requests submitted with the reply to opponent 1's appeal.

Opponent 1 (appellant) requested that the decision under appeal be set aside and the patent be revoked.

Opponent 2's request as the respondent to the patent proprietor's - now withdrawn - appeal was that the patent proprietor's appeal be dismissed.

Reasons for the Decision

Main request (filed as auxiliary request 2B)

2. Admission into the appeal proceedings

2.1 This request is narrower in scope than the request allowed by the opposition division and thus forms part of the patent proprietor's defence against the opponent 1's appeal. It was filed for the first time as then auxiliary request 2B with the patent proprietor's reply to opponent 1's appeal. This request thus constitutes an amendment to the patent proprietor's appeal case within the meaning of Article 12(4) RPBA and may be admitted only at the discretion of the board.

2.2 The opponents were of the view that this request should not be admitted because it constituted a fresh line of defence, now placing the focus on the process claim. It was not *prima facie* allowable.

2.3 Pursuant to Article 12(4) RPBA, the board shall exercise its discretion in view of, *inter alia*, the complexity of the amendment, the suitability of the amendment to address the issues which led to the decision under appeal and the need for procedural economy. These criteria, belonging to the first level of the convergent approach, do not imply a need for *prima facie* allowability.

Compared with the request allowed by the opposition division, two claim categories have been deleted in auxiliary request 2B. These deletions are clearly suitable for addressing the objections and limiting the subject-matter under discussion. Only the claims of the process category (dual pressure process for producing nitric acid) were retained. These correspond in substance to the respective process claim of then auxiliary request 2, which had already been filed during the opposition proceedings. Compared with the request allowed by the opposition division, the same additional feature was added into all the independent claims of the former auxiliary request 2, which would have needed to be discussed in relation to that request. While it is the inevitable consequence of deleting claim categories that the focus is placed on the remaining claim category, in the case at hand, the main request (filed as auxiliary request 2B) does not confront the other parties or the board with a fresh line of defence and is not detrimental to procedural economy, for the reasons indicated.

2.4 The main request is admitted into the appeal proceedings.

3. Article 123(2) EPC

3.1 Claim 1 is derived from claim 6 as granted and additionally includes the features of claim 1 as granted (as defined in claim 7 as granted, which is the same as claim 7 as filed) and the feature that the nitrous gas removal section "is an NO_x and N_2O gas removal zone".

3.2 It was argued that claim 1 extended beyond the content of the application as filed because the feature that the nitrous gas removal section "is an NO_x and N_2O gas removal zone" had only been disclosed in relation to the prior art.

3.3 The application as filed discloses an NO_x and N_2O gas removal zone on page 3, line 8, as a general component of a nitric acid production plant. While this disclosure indeed relates to the prior art, it is the starting point for the disclosed invention. NO_x and N_2O removal are additionally mentioned on page 11, lines 12 to 14 and 27 to 28 as well as in the paragraph bridging pages 11 and 12. It is thus directly and unambiguously derivable that the NO_x and N_2O gas removal zone is to be retained in the nitric acid plant according to the claimed invention.

3.4 The requirements of Article 123(2) EPC are met.

4. Inventive step

4.1 Document D3 as the closest prior art

4.1.1 The patent in suit relates to the production of nitric acid by means of a dual pressure process (paragraph [0001]). D3 is a commercial brochure on nitric acid production that discloses a dual pressure process on page 13. It thus concerns a similar purpose as the patent in suit and is a suitable starting point for assessing inventive step.

4.1.2 According to the patent proprietor, the technical problem was to provide a process which allowed for the removal of N_2O and NO_x without the need for further natural gas provision and with good energy efficiency (see paragraphs [0009], [0013], [0029] and [0032] to [0034]).

4.1.3 As the solution to this problem, the claimed process is proposed in which the tail gas heating in the gas cooling section is to a temperature greater than 460°C, the "further heat exchanger" is integrated into a single apparatus with the ammonia reactor (the latter also including the steam circuit heat exchanger) and the nitrous gas removal section includes an N_2O gas removal zone.

4.1.4 The patent proprietor submitted that these distinguishing features interacted to solve the problem posed. A higher tail gas temperature was beneficial for NO_x and N_2O abatement, no auxiliary natural gas being needed for N_2O abatement. In their view, the cited documents did not teach that tail gas heating, in the manner defined in claim 1, could be used to achieve this temperature for implementing combined NO_x and N_2O

abatement. According to the patent proprietor, the tail gas temperature obtained in D3 could be estimated to be 350°C, based on an example dual pressure plant in D5, page 205, right-hand column, third full paragraph.

4.1.5 The opponents contested that there was any functional interaction. In their view, the distinguishing features amounted to a mere juxtaposition of features, each of which had to be addressed separately. A tail gas temperature of greater than 460°C was obvious in view of D3, which taught that nitrous oxide decomposition worked best at temperatures above about 400°C and that NO_x abatement technology was applicable between 180°C and 480°C. They contested that the temperature at tail gas heater 3 in D3 was only 350°C. The temperature could not be derived by comparison with D5 because the process flowsheet in D5 did not include any NO_x removal. According to the opponents, the skilled person would readily adjust the temperature of the tail gas heater to greater than 460°C. This temperature could easily be achieved given that the temperature in the ammonia oxidation reactor was 900°C. The opponents also pointed to the processes known from D4 (Figure 3), D6 (page 2, lines 55 to 79), D7 (claims 6 and 12) and D9 (page 3 lines 112 to 116), which in their view suggested heating the tail gas of nitric acid production well above 460°C, without, however, providing any further details (page 10 of appellant's reply to the patent proprietor's - now withdrawn - appeal, dealing with claim 6 as granted).

4.1.6 A functional interaction may be acknowledged at least in so far as the claimed tail gas temperature has been adapted for tail gas treatment. The patent in suit clearly teaches that a high tail gas temperature is beneficial in particular if N_2O removal is desired (paragraphs [0029] and [0032]). Furthermore, the specified tail gas temperature requires the heat exchanger in the tail gas heating section ("further heat exchanger" in the claim) to be configured accordingly. At the same time, this further heat exchanger is integrated into one single apparatus with the reactor and the steam circuit heat exchanger.

4.1.7 The opponents did not demonstrate how the skilled person starting from the process flowsheet on page 13 of D3 would have arrived in an obvious manner at tail gas heating to greater than 460°C in conjunction with the other features of the claimed process, in particular the claimed configuration of the further heat exchanger.

D3 does not mention any temperatures in the context of that process flowsheet. All that is known is that sufficiently hot reaction gases are available in a nitric acid plant. A typical temperature in the ammonia oxidation reactor is about 900°C, as submitted by the opponents and confirmed by D5 indicating a temperature of 890°C (see the last sentence above Figure 29, D5 being "Ullmann's Encyclopedia of Industrial Chemistry" and thus representing common general knowledge), and dual pressure nitric acid production processes with high tail gas temperatures are known (see, for example, D4, Figure 3).

However, turning to the specific process of D3 relevant here, the mere fact that sufficiently hot reaction gases form in the reactor does not mean that the temperatures at the various downstream stages of this known process could be freely and independently selected within that limit, this process being highly integrated.

It is the teaching of the patent in suit to *directly* use the heat still available, after the generation of superheated steam, for further raising the temperature of nitrogen oxides tail gas (paragraph [0013]) and to place the tail gas heater close to the superheater (paragraph [0033]).

In D3, by contrast, the heat exchanger concerned (tail gas heater 3) is positioned downstream of the steam heater STH (i.e. the superheater) and waste-heat boiler WB (page 13). D5 (representing common general knowledge, see above) shows that a probable temperature at this position is only 350°C (page 205, right-hand column, third full paragraph in conjunction with Figure 29). D5 describes an example dual pressure plant and mentions the temperature in a tail gas heater directly downstream of the ammonia reactor (890°C, see above) equipped with a steam heater and a waste-heat boiler, i.e. at a similar position as in D3 and thus comparable with D3.

The opponents contested that this value of D5 could be transferred to D3 because the flowsheet of D3 involved tail gas treatment for NO_x removal. However, they did not provide any evidence that the actual temperature at tail gas heater 3 in D3 was higher. Moreover, contrary to the opponents' view, it is not the case that a tail gas temperature of 350°C was incompatible with NO_x abatement technology. The applicable temperature range for NO_x abatement without N_2O removal starts even lower, namely from 180°C (D3, page 16, right-hand column). This disclosure is relevant because the flowsheet on page 13 of D3 does not show any N_2O removal. No different conclusion is reached if D13 is additionally taken into consideration. All the parties considered D13, also by Thyssenkrupp-Uhde, as complementing D3's teaching on NO_x and N_2O abatement. D13 supports the view that NO_x (and N_2O) abatement is possible across a broad temperature range, different abatement process variants being available. It is therefore not possible to infer from the presence of tail gas treatment for NO_x removal that the temperature of the tail gas heater in the flowsheet in D3 (page 13) was adjustable to greater than 460°C.

Merely pointing to other prior-art processes with high tail gas temperatures (i.e. D4, D6, D7 and D9, see point 4.1.5 above) does not help the opponents' case if these processes are not shown to be directly comparable with D3.

In light of the above, it has not been shown that a temperature of greater than 460°C would be available at tail gas heater 3 downstream of the steam heater STH and the waste-heat boiler WB within the constraints of the integrated process and heat streams according to the flowsheet of D3. Nor has it been shown, should modifications to the integrated flowsheet - such as a change of the position of tail gas heater 3 - be necessary, how these would have been obvious to the skilled person, i.e. how the skilled person would have been guided towards the necessary modifications, if any.

4.1.8 The objection of lack of inventive step starting from D3 as the closest prior art is therefore not convincing.

4.2 Objection based on D10 and D11

4.2.1 In their submission dated 4 July 2025, after receipt of the board's preliminary opinion (communication dated 5 June 2025), opponent 2 argued that the combination of features of claim 1 of then auxiliary request 2B - now the main request - was not based on an inventive step in view of D10 and D11 (point 5 of that submission).

4.2.2 Opponent 2 took the view that their submissions should be taken into consideration as a reaction to the patent proprietor's filing of auxiliary request 2B with the reply to opponent 1's appeal.

4.2.3 However, the indicated submission by opponent 2 was made about 10 months after the filing of auxiliary request 2B, and after notification of the board's preliminary opinion. This was the first time that opponent 2 addressed the combination of features of claim 1 of the now main request and made the attack based on D10 and D11. Consequently, that attack constitutes an amendment of opponent 2's case. The provisions of Article 13(2) RPBA apply, pursuant to which an amendment to a party's case is not to be taken into account unless there are exceptional circumstances justified with cogent reasons by the party concerned.

In this case, no exceptional circumstances may be acknowledged.

The notification of the board's communication pursuant to Article 15(1) RPBA determines whether the consideration of a case amendment is governed by the provisions of Article 13(1) RPBA (second stage of the convergent approach) or the stricter criteria of Article 13(2) RPBA (third stage of the convergent approach). At the same time, the board shall issue its communication no earlier than one month after receipt of the written reply or replies referred to in Article 12(1)(c) RPBA (Article 15(1) RPBA). This period of at least one month - and in this case several months - allows a party to respond while the more lenient provisions of Article 13(1) RPBA apply. Opponent 2 ought to have made their submissions on auxiliary request 2B during that period but failed to do so (see also T 2843/19, Reasons 3.3).

4.2.4 The objection based on D10 and D11 is therefore not taken into account (Article 13(2) RPBA).

4.3 In summary, the subject-matter of claim 1 thus involves an inventive step.

4.4 The same conclusion applies to dependent claim 2.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside. The case is remitted to the opposition division with the order to maintain the patent in amended form on the basis of the set of claims of the main request previously submitted as auxiliary request 2B with the reply to opponent 1's appeal and a description to be adapted if necessary.

2. The appeal fee of former appellant 1 (patent proprietor) is reimbursed at 25% pursuant to Rule 103(4)(a) EPC.

The Registrar: The Chairman:

Beschwerdekammern des Europäischen Patentamts
Boards of Appeal of the European Patent Office
Chambres de recours de l'Office européen des brevets

C. Vodz E. Bendl

Decision electronically authenticated