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**Datasheet for the decision  
of the Enlarged Board of Appeal  
of 22 November 2010**

**Case Number:** R 0011/09  
**Appeal Number:** T 0680/06 - 3.3.06  
**Application Number:** 98307188.7  
**Publication Number:** 0901807  
**IPC:** B01D 53/04  
**Language of the proceedings:** EN

**Title of invention:**  
Purification of gases using solid adsorbents

**Patentee:**  
AIR PRODUCTS AND CHEMICALS, INC.

**Opponent:**  
L'AIR LIQUIDE S.A.

**Headword:**  
Fundamental violation of Article 113 EPC/AIR PRODUCTS AND  
CHEMICALS

**Relevant legal provisions:**  
EPC Art. 112a, 113  
EPC R. 106

**Keyword:**  
"Petition for review"  
"Not clearly inadmissible"  
"Clearly unallowable"

**Decisions cited:**

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**Catchword:**

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Case Number: R 0011/09

**D E C I S I O N**  
of the Enlarged Board of Appeal  
of 22 November 2010

**Petitioner:** AIR PRODUCTS AND CHEMICALS, INC.  
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**Decision under review:** Decision of the Technical Board of Appeal  
3.3.06 of the European Patent Office of  
15 April 2009.

**Composition of the Board:**

**Chairman:** B. Günzel  
**Members:** S. Perryman  
D. H. Rees

## Summary of Facts and Submissions

I. The petition for review concerns decision T 680/06 dated 15 April 2009 of Board of Appeal 3.3.06 revoking European patent No. 901 807. The patent concerned the purification of gases using solid adsorbents and was granted with a claim 1 reading:

"1. A method for removing a component from a gas stream comprising

- a) passing the gas stream in a first direction in contact with an adsorbent to adsorb the component from the gas stream on the adsorbent with liberation of heat of adsorption,
- b) ceasing passing said gas stream in contact with said adsorbent,
- c) heating a regenerating gas to add heat thereto and to raise the temperature of the regenerating gas to a temperature above that of said gas stream,
- d) passing said heated regenerating gas in a second direction opposite to said first direction to desorb said gas stream component from said adsorbent for a period such that the heat added to the regenerating gas so passed in contact with the adsorbent is no more than 70% of the heat of the heat of adsorption liberated during the adsorption of the said gas component,
- e) ceasing to heat said regenerating gas and continuing to pass regenerating gas in an unheated state to continue to desorb said gas stream component from said adsorbent and

allowing said added heat to be consumed in the desorption process, and  
f) repeating steps (a) to (e)."

II. The proceedings leading to decision T 680/06 can be summarised as follows:

(a) In the opposition proceedings the opposition division rejected the opposition, not accepting the arguments made under the grounds of opposition firstly of Article 100(c) EPC that the patent in suit violated Article 123(2) EPC since a feature of claim 1 was not originally disclosed, secondly of Article 100(b) EPC that the patent in suit did not enable a skilled person to work the invention in the whole scope of the claims, and thirdly under Article 100(a) EPC that the subject matter of claim 1 was not new having regard to documents D1 (EP-A-0 766 989), already cited during examination proceedings, or D3 (US-A-4 698 073), and further that the subject matter of claim 1 did not involve an inventive step having regard to documents D1 or D3.

(b) An appeal against this decision was lodged by the opponent asking for revocation of the patent and relying *inter alia* on a new document

D4 M. Grenier et. al., "Adsorption Purification for Air Separation Units" in Cryogenic Processes and Equipment - 1984, presented at the fifth intersociety cryogenics symposium - the winter annual meeting of the American

Society of Mechanical Engineers, pages 143  
to 148

The opponent appellant argued *inter alia* that what was claimed was obvious in view of D1 and D4.

- (c) The parties were summoned to oral proceedings before Board 3.3.06, appointed for 15 April 2009. On 13 March 2009, the representative of the appellants indicated that due to his commitments in the United States no-one would be attending the oral proceedings on behalf of the appellants, but indicating that the request to set aside the decision under appeal and revoke the patent were maintained.
- (d) At the oral proceedings on 15 April 2009, the respondent patent proprietors argued *inter alia* that the cycle time would be shorter in D1 than according to the invention.
- (e) Also at the oral proceedings the respondent patent proprietors submitted a new auxiliary request in replacement of its previous auxiliary request, in which new auxiliary request Claim 1 differed from that of the main request (see point II above) in that the features of Claim 2 of the main request had been added at the very end of the claim 1 as granted, by the addition of the words:

"..., wherein step (b) further comprises reducing the gas pressure over said adsorbent and wherein the said gas pressure

is restored prior to or at the commencement of repeating step (a)"

(f) At the end of the oral proceedings Board 3.3.06 gave its decision to revoke the patent.

III. In its decision Board of Appeal 3.3.06 rejected both the main and the auxiliary request of the respondent patent proprietor for lack of inventive step stating *inter alia* the following:

"...

5. The technical problem underlying the patent in suit (point 2.), namely to overcome the drawbacks linked to the high temperatures necessary in the TSA process and the short cycle times in the PSA process has been solved already by the process of document D1 in that those processes are combined into a new single system of operation where part of the adsorbate is desorbed by TSA using hot regenerating gas and the other part is desorbed by PSA due to the lower pressure (page 3, lines 36 to 56 and page 4, lines 17 to 19). According to the problem and solution approach applied by the Boards of Appeal for assessing inventive step, the technical problem actually solved by the claimed invention in view of the closest prior art derives from the technical results obtained by the claimed invention when compared with the prior art (Case Law of the Boards of Appeal of the European Patent Office, chapter I.D.2.).

6. It is immediately plausible that the technical result and, hence, the technical problem actually solved by the feature that less than 70% of the

liberated heat is reintroduced during regeneration (cf. point 4.5) consists in that heat energy is saved during regeneration.

It is, however, not immediately plausible that the other feature distinguishing the claimed process from the known one, namely that the reintroduced heat is consumed by desorption (cit. loc.), brings about an increase in the cycle time as stated by the Respondent. In particular, the Respondent argued that according to document D1 the flow of regeneration gas is not continued to result in the consumption of the heat pulse produced by the hot regeneration gas but rather the heat pulse is prematurely stopped and retained in the bed. Therefore, the cycle time could be shorter in document D1.

The Board is not convinced by that argument since in order to return to the conditions required in the online period for adsorption, any heat left in the bed has to be removed and recycled (document D1, page 6, lines 7 to 8) which means that in the prior art a time consuming extra step is necessary.

The Board further notes that the cycle time depends on process conditions, such as the temperature of the regeneration gas and size of the bed (see e.g. document D4, page 144, right-hand column, line 15 to page 145, left-hand column, line 4). However, no such process conditions are specified in Claim 1.

Therefore, the alleged effect of increased cycle time is not supported by evidence. Rather, the only

effect credibly achieved by the feature of allowing the heat pulse to be consumed during regeneration is seen in that a surplus of heat energy supplied for regeneration is avoided. In other words, the consumption of the heat pulse also saves heat energy during regeneration as compared with a process according to document D1 where residual heat is left in the bed.

7. Hence, it is accepted that the technical problem actually solved by the claimed process in view of the disclosure of document D1 consists in that heat energy is saved during regeneration.

...

9. The Board is convinced that saving energy is an elementary problem existing throughout all technical fields. It also exists in the field of gas separation such as the purification and separation of air by adsorption. This is shown in document D4 where it is suggested to save energy for example by reducing the heat needed for regeneration (e.g. page 143, left-hand column, lines 28 to 29). The Board agrees with the Respondent insofar as document D4 does not give any specific instructions how to save the energy. However, in the Board's opinion, it is apparent to those skilled in the art and also from document D4 that the overall energy costs in a process for purifying air by adsorption are not only linked to the heat needed for desorption but also to any pressure drop during regeneration, to the proportion of adsorbent bed which is actually regenerated and to the need of recycling any heat



left in the bed after regeneration. Hence, the skilled person knows that heat energy can be saved during regeneration at the expense of desorption if part of the bed is not regenerated since the heat pulse has died in the bed too early (see also paragraph 18 of the patent and document D4, page 144, left hand column, lines 18 to 26 and right-hand column, lines 28 to 40) and/or at the expense of energy required for repressurising if part of the bed is regenerated by depressurisation, i.e. PSA, as in document D1 (page 4, lines 17 to 19). It is noted that Claim 1 of both requests does not exclude that a part of the bed is regenerated by PSA. On the contrary, dependent Claim 2 of the main request, the features of which have been added to Claim 1 of the auxiliary request (see point V above), explicitly mentions depressurisation of the bed during regeneration and re-pressurisation for adsorption (see also paragraphs 22 and 37 of the patent). Further, the Respondent never relied on any other relevance of the specific limit of heat reintroduced during regeneration of less than 70% of the heat liberated in the on-line period than that of saving heat energy during regeneration. However, it has never been argued, let alone shown by evidence that reintroducing more than 70% but less than 100 % of the liberated heat would not be suitable for saving heat energy during regeneration. Hence, it was at the disposal of a skilled person to select the amount of heat reintroduced for desorption in accordance with the amount of heat energy desired to be saved.

10. The Board concludes, therefore, that for the purpose of saving energy during regeneration someone skilled in the art would have reintroduced in the process of document D1 less heat energy for desorption than was liberated during adsorption and allowed that heat to be consumed during regeneration.

11. For these reasons, the Board finds that the subject matter of Claim 1 of the Respondent's main and auxiliary requests does not comply with the requirements of Articles 52(1) and 56 EPC."

IV. On 15 July 2009 the proprietor of the patent (hereinafter: the petitioner) filed a petition for review of the decision by the Enlarged Board of Appeal pursuant to Article 112a EPC.

The petition is based on the ground referred to in Article 112a(2)(c) EPC that a fundamental violation of Article 113 EPC occurred.

V. The submissions of the petitioner may be summarized as follows:

- Only on study of the decision did it become apparent that at least one aspect of the grounds or evidence relied on by the Board in its decision was one which was not contained in the proceedings prior to the decision and was one upon which the petitioner had no opportunity to comment, so objection to this could not be raised with the Board of Appeal during the appeal proceedings. The

provisions of Rule 106 were therefore complied with.

- Specifically complaint was made of third paragraph of point 6 of the decision in which the Board stated that it was not convinced by the petitioner's arguments regarding the cycle time according to the invention being extended by comparison with the cycle time in D1 "because [in D1] any heat left in the bed has to be removed and recycled (document D1, page 6, lines 7 to 8) which means that in the prior art a time consuming extra step was necessary."
  
- The underlined words reflected a view of a feature of D1 which was not put to the petitioner (patentee) at or prior to oral proceedings and was furthermore in their view an erroneous view of the technical situation. Since this was at least the first and principal reason for the Board not being convinced by the Patentee's arguments on the issue of inventive step, it was clear that the Board reached its view taking into account highly material alleged facts on which the Patentee had no opportunity to comment.

VI. In a communication dated 27 October 2010 the Enlarged Board indicated the following:

- The only matter which the petition appeared to make complaint of was that the alleged effect of increased cycle time compared to D1 was not accepted on the basis of reasoning not put to the petitioner, referring in particular to what is

said in the paragraph on page 11 of the Board 3.3.06 decision reading "The Board is not convinced by that argument since in order to return to the conditions required in the on-line period for adsorption, any heat left in the bed has to be removed and recycled (document D1, page 6, lines 7 to 8) which means that in the prior art a time consuming extra step is necessary."

- However the critical reason for Board 3.3.06's decision appeared to be stated in the next paragraph reading "The Board [3.3.06] notes that the cycle time depends on the process conditions, such as the temperature of the regeneration gas and size of the bed ....However, no such process conditions are stated in Claim 1." It is on this basis that Board 3.3.06 concluded that "Therefore, the alleged effect of increased cycle time is not supported by evidence."
  
- Hence it appeared that, even assuming in the petitioner's favour that the reason given in the first full paragraph on page 11 of the impugned decision was never put forward to the petitioner prior to the decision, a causal link between that reasoning and the outcome of the appeal appeared to be missing.
  
- The burden of proof of showing that an effect of increased cycle time necessarily existed for the present invention was on the patentee/petitioner, and Board 3.3.06 indicated that it had not been discharged. The Enlarged Board thus yet had to be

persuaded that the decision involved a fundamental violation of Article 113 EPC.

- It was also noted that the patent in suit itself stated in paragraph [0027] "Because the heat pulse has to be displaced into the water absorption zone, the cycle time can be as long as in a conventional TSA process but will be shorter than in the processes described in EP-A-0766989". This latter document was D1. An equivalent passage appeared in the application as originally filed on page 9, lines 13 to 15. Board 3.3.06 in its decision did not cite this passage. But the passage seemed to indicate that at the time of filing the application the petitioners themselves were not stating that the invention allowed the cycle time to be extended compared to D1, so it seemed hard to understand why this should be accepted as a benefit necessarily achieved by carrying out the invention as claimed.
  
- The provisional view of the Enlarged Board of Appeal in its present composition was thus that the present petition was clearly unallowable, and oral proceedings were appointed in accordance with the petitioner's request.

VII. Oral proceedings took place before the Enlarged Board of Appeal on 22 November 2010.

- Regarding paragraph [0027] of the patent specification stating that "Because the heat pulse has to be displaced into the water absorption zone, the cycle time can be as long as in a conventional

TSA process but will be shorter than in the processes described in EP-A-0766989", it was submitted that this reference in the patent to the cycle time being shorter than in the processes described in D1, EP-A-0766989 was simply an error.

- Had the Board not rejected the appellant's submission that according to the invention cycle time was extended as compared with D1 by relying on the necessity of a time consuming extra step in D1, which argument was never put to him before, the ground relied on by the Board in the following paragraph of the decision, i.e. that the cycle time depended on process conditions and that no such process conditions were stated in claim 1 would have been flawed as well. Hence, the decision would not stand on the basis of the latter argument alone.
- Otherwise the arguments essentially repeated what had been already submitted in writing.
- The petitioner indicated his final requests to be the following:
  1. that the Enlarged Board set aside the decision of the Technical Board of Appeal and order re-opening of the proceedings before the Board of Appeal.
  2. that the members of the Board of Appeal that took the decision be replaced.

The Enlarged Board of Appeal gave its decision at the end of the oral proceedings.

## **Reasons for the Decision**

### *Admissibility of the petition for review*

1. The petitioner is adversely affected by decision T 680/06 to revoke its patent. The petition for review was filed under Article 112a(2)(c) EPC on the ground that a fundamental violation of Article 113 EPC occurred.
  
2. Pursuant to Rule 106 EPC a petition under Article 112a(2)(c) EPC is only admissible where an objection in respect of the procedural defect was raised during the appeal proceedings and dismissed by the Board of Appeal, except where such objection could not be raised during the appeal proceedings. Here the petitioner complains that the written decision of Board 3.3.06 relies as an essential part of its reasoning on a ground of which the petitioner was not aware and on which the petitioner had had no opportunity to comment prior to the issuance of the decision of Board 3.3.06, and which is alleged to amount to a fundamental violation of Article 113 EPC. For the purpose of assessing the admissibility of the petition, the position can be assumed to be as stated by the petitioner, and on this basis Rule 106 EPC can be regarded as complied with.
  
3. Accordingly, the Enlarged Board of Appeal is satisfied that the petition is not clearly inadmissible.

*Allowability of the petition*

4. It appears to the Enlarged Board that the decisive reason for Board 3.3.06 revoking the patent is to be found in that Board's point 10 (as set out in point III above) namely the conclusion that "for the purpose of saving energy during regeneration someone skilled in the art would have reintroduced in the process of document D1 less heat energy for desorption than was liberated during adsorption and allowed that heat to be consumed during regeneration".
  
5. Furthermore, Board 3.3.06 in its point 6 did not find the petitioner's alleged effect of increased cycle time supported by evidence, Board 3.3.06 noting in particular (fourth paragraph of its point 6, see point III above) "... that the cycle time depends on process conditions ...However, no such process conditions are specified in Claim 1". Board 3.3.06 thus considered that even if the alleged increased cycle time could be achieved, contrary to Board 3.3.06's own view, this would be irrelevant since the claim did not require that such increased cycle time compared to D1 be achieved, and Claim 1 was not limited to the achievement of such increased cycle time.
  
6. The passage complained of by the petitioner appearing in the third paragraph of point 6 of Board 3.3.06's decision, in which the Board stated that it was not convinced by the petitioner's arguments regarding the cycle time according to the invention being extended by comparison with the cycle time in D1 "because [in D1] any heat left in the bed has to be removed and recycled



(document D1, page 6, lines 7 to 8) which means that in the prior art a time consuming extra step was necessary" cannot be seen as decisive for the outcome of the decision. The Enlarged Board does not share the petitioner's view that the Board 3.3.06's reasoning referred to in 5. above, relying on the absence of any process conditions being defined in claim 1 of the patent in suit, would have been flawed as a basis for the decision taken had the Board not refused to recognise any extended cycle time of the invention as claimed compared with D1. On the contrary, the reference in the fourth paragraph of point 6 of the Board's decision (referred to above under 5.) to the dependence of the cycle time on process conditions and the absence of any definition of such process conditions in claim 1, when read in a sensible way, can only be interpreted to mean that according to the Board a cycle time as in D1 would in any case be within the ambit of claim 1. Thus any arguments comparing the cycle time in D1 and in the method put forward in the description of the disputed patent were anyway irrelevant.

7. Moreover the petition did not claim that the argument of paragraph 4 of point 6 was first put forward in the decision. Thus if the petitioner considered this argument to be flawed it evidently did have the opportunity to make counter-arguments.
8. Hence, even if the subject matter of Board 3.3.06's reasoning referred to the third paragraph of point 6 of its decision was not put to the petitioner at the oral proceedings, a causal link between that reasoning and the outcome of the appeal is missing.

9. The only ground for review of the petition is thus clearly not made out.

**Order**

**For these reasons it is decided that:**

The petition is unanimously rejected as clearly unallowable.

The Registrar:

The Chairman:

P. Martorana

B. Günzel