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**Datasheet for the decision  
of 12 June 2012**

**Case Number:** T 2015/09 - 3.2.03

**Application Number:** 03255052.7

**Publication Number:** 1391670

**IPC:** F25J 3/04, F17C 9/02

**Language of the proceedings:** EN

**Title of invention:**

Process for the temporary supply of a back-up gas to maintain the level of production of a gas from a cryogenic separation unit

**Patentee:**

AIR PRODUCTS AND CHEMICALS, INC.

**Opponent:**

L'AIR LIQUIDE SOCIETE ANONYME POUR L'ETUDE ET L'EXPLOITATION  
DES PROCEDES GEORGES CLAUDE

**Headword:**

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**Relevant legal provisions:**

EPC Art. 100(a)(b)(c), 123(2), 54, 56

**Keyword:**

"Novelty (yes)"  
"Sufficiency of disclosure (yes)"  
"Inventive step (yes)"  
"Extended subject-matter (no)"

**Decisions cited:**

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**Catchword:**

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Case Number: T 2015/09 - 3.2.03

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.03  
of 12 June 2012

**Appellant:**  
(Opponent)  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 5 August 2009  
rejecting the opposition filed against European  
patent No. 1391670 pursuant to Article 101(2)  
EPC.

**Composition of the Board:**

**Chairman:** U. Krause  
**Members:** C. Donnelly  
K. Garnett

## Summary of Facts and Submissions

- I. The appeal lies from the decision of the opposition division, posted on 5 August 2009, rejecting the opposition against European patent no. 1391670.
- II. The opponent (hereinafter "the appellant") filed a notice of appeal on 2 October 2009 and paid the fee the same day. The grounds of appeal were filed on 15 December 2009.
- III. The patent proprietor (hereinafter "the respondent") responded by letter of 26 April 2010.
- IV. The following documents were cited by the appellant in the grounds of appeal:
- D1: US-A-6038885;  
D2: EP-A-1202012.
- V. In a communication dated 7 February 2012, pursuant to Article 15(1) RPBA annexed to the summons to oral proceedings, the Board informed the parties of its provisional opinion.
- VI. Oral proceedings were held on 12 June 2012. The parties made the following requests:
- The appellant (opponent) requested that the decision under appeal be set aside and that the European patent No. 1 391 670 be revoked.
- The respondent requested that the appeal be dismissed.

VIII. Claim 1 as granted reads:

"A process for the temporary supply of a back-up quantity of a "first" gas during the time taken for a vaporiser (28) in a main back-up system (20 to 36) to come fully on line to maintain the level of production of the first gas from a cryogenic separation of a gaseous mixture comprising the first gas and at least one other gas in the event of reduction in the level of production of said first gas from the separation, said separation comprising

separating the mixture, or a mixture derived therefrom, in at least one cryogenic distillation system (2,4) to produce liquefied first gas, the or each system retaining a portion of said liquefied first gas as inventory; and vaporising a further portion of said liquefied first gas by indirect heat exchange against a process stream in at least one heat exchanger to produce said first gas (6 to 10);

said process comprising, in the event of reduction in the level of production of said first gas from the separation, withdrawing liquefied first gas inventory from the or at least one of said cryogenic distillation systems (2,4); and vaporising the withdrawn liquefied first gas inventory to produce said back-up quantity of first gas,

wherein at least a portion of the vaporisation duty required to vaporise said withdrawn liquefied first gas inventory is provided by heat inventory from the or at least one of said heat exchangers."

VIII. The Appellant's arguments can be summarised as follows:

(a) *Insufficiency of Disclosure, Article 100(b)*

Claim 1 also covers processes whereby the vaporisation of liquid by the heat inventory in the heat exchanger continues after the main back-up system comes on-line. Thus, it must be asked if the skilled person has sufficient information to carry out the invention in particular when:

- (i) the vaporisation of liquid is carried out solely by heat transfer from the heat inventory (i.e. if compressor air is lost) and especially if there is only a single ASU;
- (ii) liquid supply continues after the short period required for the vaporiser to come on-line.

In these cases the process cannot function since, in the absence of a heat-source, the liquid oxygen cannot be vaporised. Thus, the patent in suit does not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

(b) *Extended subject-matter, Article 100(c)*

The feature "during the time taken for a vaporiser in a main back-up system to come fully on line" introduced into claim 1 has been taken out of context. The section from page 3, lines 22 to 29 of the application as filed does not specify anything other than that there is sufficient liquid in the separation system to supply the demand during the time taken for the vaporiser in the main back-up system to come on-line. However, this

does not amount to a statement concerning the volume of the distillation columns. The invention itself is not described in this section, which does little more than suggest that the inventors have found "a way" of using this source to produce gas.

Thus, the subject-matter of the patent in suit extends beyond the content of the application as originally filed.

(c) *Novelty, Art. 100(a), Art. 54*

The subject-matter of claim 1 as granted lacks novelty over common general knowledge of the skilled person and over US-A-6038885 (D1).

The last paragraph of page 1 and the first paragraph of page 2 explain that it is well known that when the pressure or the flow of gaseous oxygen falls below a "certain level", the oxygen is vaporised in a back-up vaporiser. This vaporiser cannot come fully on-line instantaneously. Accordingly, the pressure or flow level may drop without the back-up vaporiser being activated; it is only when a threshold value is reached that the back-up vaporiser is brought on-line.

Thus, when the vaporiser is started, liquid oxygen continues to be vaporised in the heat-exchanger, otherwise the gaseous oxygen flow would be zero. However, the threshold value is definitely not zero since the pressure continues to drop thereafter.

Hence, there is reduced production of oxygen by vaporisation in the heat-exchanger during the interval

between the vaporiser being started and it coming fully on-line. Since the heat-exchanger has considerable thermal inertia it would be possible to continue vaporising oxygen for some time if the air-compressor stopped.

D1 states at column 2, lines 32 to 42 and column 4, lines 25 to 30 that in the case of an "operating disturbance", liquid is sent from a storage to a back-up evaporator and that "preferably" the supply of liquid to the pre-heating exchanger is stopped. However, this means that it is also envisaged that this supply may be maintained. If liquid is always supplied to the pre-heater, it seems necessary that this liquid is also then sent somewhere subsequently, even if this is not explicitly specified. Thus, it is implicit that the pre-heated liquid is then sent to the main heat-exchanger to be evaporated.

(d) *Inventive step, Art. 100(a), Art. 56*

With respect to D1

Even if it is not accepted that it is implicit that the pre-heated liquid is sent to the main heat-exchanger, then it must be considered obvious for the skilled person to do this since there is no means for storing the pre-heated liquid.

With respect to D2

D2 describes an apparatus comprising two air separation units supplying a product to the same user, each of the units being capable of providing up to 200% of its

nominal required output. Paragraph [0059] explains that it is possible to supply oxygen from only one of the units via a common storage. Thus, one of the units can provide the nominal flow of the two units combined. This solution corresponds exactly to that suggested in the contested patent at column 5, lines 3 to 9.

As shown in figure 2, the system also comprises a back-up evaporator 17 as described in paragraph [0067] which is capable of providing all the necessary flow. It is obvious that should one of the units cease to function, the other one must continue working and produce all of the necessary oxygen normally provided by the two units until the back-up evaporator comes on-line.

IX. The Respondent's arguments can be summarised as follows:

(a) *Insufficiency of Disclosure, Art. 100(b)*

The appellant is incorrect to assert that the withdrawing and vaporising actions required by claim 1 do not necessarily take place when the vaporiser is not fully on-line.

It is implicit in the wording of claim 1 that withdrawal and vaporisation of the inventory takes place only during the short period of time required for the back-up vaporiser to be brought on line. Since the period of time under consideration is very short, it would be technically impossible for anything else to be understood.

For the case of a single ASU, the skilled person is aware that the heat inventory of the heat exchanger is



sufficient to vaporise the LOX withdrawn from that ASU during the short period of time in question, so no measures other than those described in the patent, i.e. withdrawing LOX inventory from the ceased ASU and vaporising it with the heat inventory of its heat-exchanger, are necessary.

(b) *Extended subject-matter, Art 100(c)*

It is clearly stated at page 3, lines 19 to 29 of the application as filed, that the invention resides in a way of using liquefied gas inventory to obviate the use of buffer vessels. At page 2, lines 26 to 33 it is stated that the buffer vessels provide a back-up quantity of gas during the time that the back-up vaporiser comes fully on-line. Further, at original page 5, lines 5 to 8 it is indicated that vaporisation of the gas inventory is achieved by the use of heat inventory in the heat exchanger(s) for the period of time necessary for the vaporiser to come fully on-line. Thus, there is no doubt concerning the period for which the temporary process operates.

(c) *Novelty, Art. 54*

It is conventional practice to interrupt immediately the liquid flow to the main heat-exchanger should the oxygen supply to the oxygen critical process fall to a level at which start-up of the back-up vaporiser is triggered. The present invention makes a deliberate decision to go against this standard procedure and continue to pump liquid to the main exchanger.

The passage at column 2, lines 24 to 28 of D1 confirms this standard procedure. The passage at column 4, lines 24 to 31 of D1 referred to by the appellant, which implies that the interruption is optional, has been drafted to cover the case of an "operating disturbance" consisting of an increase in demand for oxygen when it would make no sense to cut supply to the main heat exchanger, which is functioning normally to supply oxygen and is in equilibrium.

Thus, the subject-matter of claim 1 is new with respect to both the skilled person's general knowledge and D1.

(d) *Inventive step, Art 56*

D1 teaches that the supply to the main heat-exchanger is immediately interrupted in the event of the start-up of the back-up vaporiser being initiated. Therefore, in order to arrive at the invention starting out from D1 the skilled person would need to recognise that there is a problem with the start-up phase, realise that the heat inventory available in the main heat-exchanger can be used to continue vaporisation and is sufficient to cover the duration of the start-up.

Since D1 does not mention the problem or the heat inventory of the main exchanger it does not give any hint to the skilled person about how to arrive at the invention.

The claimed invention enables capital costs to be reduced since there is no need for the buffer tanks to provide gaseous first gas while the back-up evaporator is being brought on line.

As regards D2, there is no reason for the skilled reader to conclude that the heat duty for any LOX vaporisation has been provided by heat inventory in the heat exchanger 17 or any heat exchanger associated with GOX production in any ASU.

Thus, the subject-matter of claim 1 also involves an inventive step.

### **Reasons for the Decision**

1. The appeal is admissible.
2. *Insufficiency of Disclosure, Article 100(b)*
  - 2.1 Claim 1 specifies a process for the temporary supply of a back-up quantity of a first gas during the time taken for a vaporiser in a main back-up system to come fully on line. The Board cannot see how this can be construed to mean that processes whereby the vaporisation of liquid by the heat inventory in the heat exchanger continues after the main back-up system comes on-line are also covered, particularly since there is no suggestion anywhere in the description of the patent that this might be the case. Since such processes do not fall within the scope of the claim the question of a lack of disclosure does not arise.

In the case of a single ASU, as argued by the respondent, the skilled person is aware that the heat inventory of the heat exchanger is sufficient to vaporise the LOX withdrawn from that ASU during the

short period of time in question, so no further measures beyond those described in the patent, i.e. withdrawing LOX inventory from the ceased ASU and vaporising it with the heat inventory of its heat-exchanger, are required.

2.2 Hence, the appellant's objections in this respect are ill-founded and the invention is disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

3. Main request, Extended subject-matter, Art. 100(c)

3.1 The feature: "during the time taken for a vaporiser (28) in a main back-up system (20 to 36) to come fully on line" is based on the passage at page 3, lines 25 to 27 in the application as filed which states:

"there is usually more than enough liquefied first gas stored in the distillation system itself to satisfy demand for the first gas *during the time taken for the vaporiser in the main back-up system to come fully on-line.*"

3.2 Thus, an almost identical wording to that originally disclosed in the description has been introduced into the claim. The appellant's assertion that the extraction of this feature from the context of the description means that the word "during" can also be interpreted to mean at a singular point in time during the start-up phase of the back-up vaporiser is not convincing. The start-up phase of the back-up vaporiser lasts about 30 seconds (see the contested patent, column 2, lines 13 to 14), which is already a short

period of time in terms of the processes under consideration. Thus, it is not a practical interpretation to consider that the gas feed to the heat-exchanger would first be stopped, then restarted and finally stopped within this period. Further, at original page 5, lines 5 to 8 it is indicated that vaporisation of the gas inventory is achieved by the use of heat inventory in the heat exchanger(s) *for the period of time necessary for the vaporiser to come fully on-line*. Thus, there is no doubt concerning the period of time for which the temporary process operates.

4. Novelty, Art 100(a), Art. 54

4.1 D1 discloses strategies for providing a back-up supply when "operating disturbances" occur. This term includes failure or malfunctioning of the system components or a temporary increase in demand (see column 2, lines 32 to 42).

4.2 At column 4, lines 25 to 33 of D1 it is stated that, in the event of an operating disturbance, a portion of the liquid fraction is removed from the tank and fed to an emergency evaporator and that, in this case, the liquid flow to the preheat exchanger is "preferably" interrupted. The appellant has argued this indicates that the interruption need not necessarily be implemented.

4.3 However, at column 2, lines 23 to 28, it is stated that "should an operating disturbance of the low-temperature air separation system occur, the liquid stored in the tank, by means of the device for increasing the

pressure, is pumped not into the preheat exchanger, but into an emergency evaporator and evaporated."

- 4.4 Taking these two passages together, it is clear that the option of interrupting the liquid supply to the preheat-exchanger, hinted at in column 4, lines 25 to 33 is determined by the nature of the operating disturbances under consideration. Should the "disturbance" in fact be a temporary increase in demand then it would make no sense to cut the supply coming from the main heat-exchanger, which would only exacerbate the problem. Rather, one would attempt to supplement it for a temporary period through the back-up system.
- 4.5 On the other hand, in the event of an operating disturbance affecting the capability of the air-separation unit to produce the first gas at the required quantity, D1 teaches that a back-up system is brought on-line and feed gas to the main heat exchanger is simultaneously cut.
- 4.6 This interpretation is also coherent with the position taken by the respondent as regards the standard procedure of immediately isolating the main heat-exchanger in the event of a reduction in the first gas supply which is sufficient to trigger the back-up vaporiser system.
- 4.7 Since the claimed process is directed at a process initiated when the reduction is sufficient to trigger the operation of the back-up system, the argument that reduction in gas production may occur without isolation

of the heat-exchanger allowing vaporisation to continue, is not relevant.

4.8 Thus, the step in a process for the temporary supply of a back-up quantity of a first gas during the time taken for a vaporiser in a main back-up system to come fully on line in the event of reduction in the level of production of said first gas from the separation unit, whereby at least a portion of the vaporisation duty required to vaporise said withdrawn liquefied first gas inventory is provided by heat inventory from the or at least one of said heat exchangers is not disclosed either by D1 nor is it part of the skilled person's general knowledge.

4.9 Thus, the subject-matter of claim 1 is new.

5. *Inventive Step, Art. 100(a), Art. 56*

5.1 By deliberately choosing not to isolate the main heat exchanger, even in the event of a reduction in the level of production of said first gas from the separation, the need to provide additional buffer tanks of gaseous first gas for supply during the time taken for the back-up vaporiser to come on-line is avoided (see paragraph [0006] of the patent).

5.2 D1 confirms that the supply to the main heat-exchanger is usually immediately interrupted in the event of the start-up of the back-up vaporiser being initiated.

5.3 There is no reason given in D1 which might induce the skilled person to turn away from this procedure. Indeed, as suggested by the respondent, if there has been some

kind of malfunction in the air-separation unit which has lead to the reduction in first gas supply and consequent initiation of the back-up supply, it is plausible that isolation of the main heat-exchanger is the safest option available for the skilled person.

5.4 As regards D2, the heat exchanger 17 in figure 2 referred to by the appellant is not part of the air separation unit 101. Heat for vaporisation of the liquid in line 125 is provided by the excess steam line 103 such that it can be used even if the column system is not operating. However, there is no suggestion that the heat duty for any vaporisation is provided by heat inventory in the heat exchanger 17 or any heat exchanger associated with GOX production in any ASU.

5.5 Thus, the subject-matter of claim 1 also involves an inventive step.

## **Order**

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

The appeal is dismissed.

Registrar:

Chairman:

D. Hampe

U. Krause