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Datasheet for the decision of 26 October 2022

Case Number: T 0859/17 - 3.2.05

Application Number: 03002915.1

Publication Number: 1336795

IPC: F17C7/00

Language of the proceedings: EN

Title of invention:
System and method for dispensing pressurized gas

Patent Proprietor:
AIR PRODUCTS AND CHEMICALS, INC.

Opponent:
L'AIR LIQUIDE, Société Anonyme
pour L'étude et L'exploitation
des procédés Georges Claude

Relevant legal provisions:
EPC Art. 123(2), 54, 56
RPBA Art. 12(4)

Keyword:

Amendments - main request - allowable (yes)
Novelty - main request (yes)
Inventive step - main request (yes)
Late-filed evidence - submitted with the statement of grounds of appeal - admitted (no)

Decisions cited:

T 0410/96, T 0096/12, T 0565/12

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Case Number: T 0859/17 - 3.2.05

D E C I S I O N
of Technical Board of Appeal 3.2.05
of 26 October 2022

Appellant I: (Patent Proprietor)	AIR PRODUCTS AND CHEMICALS, INC. 7201 Hamilton Boulevard Allentown, PA 18195-1501 (US)
Representative:	Beck Greener LLP Fulwood House 12 Fulwood Place London WC1V 6HR (GB)
Appellant II: (Opponent)	L'AIR LIQUIDE, Société Anonyme pour L'étude et L'exploitation des procédés Georges Claude 75, Quai d'Orsay 75321 Paris Cedex 07 (FR)
Representative:	Air Liquide L'Air Liquide S.A. Direction de la Propriété Intellectuelle 75, Quai d'Orsay 75321 Paris Cedex 07 (FR)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 24 February 2017 concerning maintenance of European Patent No. 1336795 in amended form.**

Composition of the Board:

Chairman	P. Lanz
Members:	M. Holz
	T. Karamanli

Summary of Facts and Submissions

I. The patent proprietor (appellant I) and the opponent (appellant II) appealed against the opposition division's interlocutory decision finding that, account being taken of the amendments made by the patent proprietor during the opposition proceedings according to auxiliary request 1, European patent No. 1 336 795 (hereinafter: the "patent") and the invention to which it related met the requirements of the EPC.

II. The following documents filed in the opposition proceedings are relevant to this decision:

D2 EP 1 205 704 A1

D3 US 5,752,552

D13 V. Raman *et al.*, "A Rapid Fill Hydrogen Fuel Station for Fuel Cell Buses", Proceedings of the 12th World Hydrogen Energy Conference, Buenos Aires, Argentina, 21 to 26 June 1998, Volume 2, pages 1629 to 1642.

With its statement of grounds of appeal, appellant II (opponent) submitted the following document:

D17 K. J. Kountz, "Modeling the fast fill process in natural gas vehicle storage cylinders", 207th spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13 to 18 March 1994, pages 462 to 469.

III. Oral proceedings before the board were held on 26 October 2022 by videoconference in the absence of

appellant I (patent proprietor), which had informed the board by letter of 19 August 2022 that it was withdrawing its auxiliary request for oral proceedings and that it would not be attending the oral proceedings.

IV. Final requests

Appellant I (patent proprietor) requests that the decision under appeal be set aside and that the patent be maintained as amended on the basis of the claims according to the main request filed with its statement of grounds of appeal dated 6 July 2017, or, alternatively, that appellant II's appeal be dismissed (first auxiliary request) or that the decision under appeal be set aside and that the patent be maintained as amended on the basis of the claims according to one of auxiliary requests 2 to 7 filed with appellant I's reply dated 20 November 2017.

Appellant II (opponent) requests that the decision under appeal be set aside and that the patent be revoked.

V. Claim 1 of the main request reads (the feature identification employed by the board is included in square brackets):

"**[1.1]** *A hydrogen system for dispensing pressurized gas, comprising:*
[1.2] *(a) a pressurized gas source (12);*
[1.3] *(b) a receiving tank (14);*
[1.4] *(c) a sealed gas flow line (16) connected between said gas source (12) and said receiving tank (14);*
[1.5] *(d) a valve (20) in said gas flow line (16) for initiating and terminating flow of the pressurized gas*

between the gas source (12) and the receiving tank (14), said valve (20) operable by a valve signal (29);
[1.6] *(e) an electronic controller (28);*
[1.7] *(f) a temperature sensor (22), said temperature sensor for sensing temperature of a gas inside the receiving tank (14), said temperature sensor including a temperature signal generator for generating a temperature signal corresponding to the temperature of the pressurized gas in the receiving tank (14), said temperature signal adapted to be received by the electronic controller (28);*
[1.8] *(g) a pressure sensor (24), said pressure sensor for sensing pressure of a gas inside the receiving tank (14), said pressure sensor including a pressure signal generator for generating a pressure signal corresponding to the pressure of the gas inside the receiving tank (14), said pressure signal adapted to be received by the electronic controller (28);*
characterized in that
[1.9] *(h) the electronic controller (28) is adapted to store a tank rated density based on the specification for a full receiving tank and the temperature and pressure signals;*
[1.10] *(i) the electronic controller (28) is adapted to periodically calculate a density of the gas in the receiving tank (14) based on the temperature and pressure signals;*
[1.11] *(j) the electronic controller (28) is adapted to periodically compare the density of the gas in the receiving tank (14) with the tank rated density based on the specification for a full receiving tank and initiate flow of pressurized gas through the valve (20) by generating the valve signal (29) when the density of gas in the receiving tank (14) is below the tank rated density based on the specification for a full receiving tank and terminate flow of pressurized gas through the*

valve (20) by generating the valve signal (29), when the density of the gas in the receiving tank (14) reaches the tank rated density based on the specification for a full receiving tank;
[1.12] *(k) the electronic controller (28) is adapted to generate a percent full signal, wherein the percent full signal is the ratio of the density of gas in the receiving tank (14) to the tank rated density based on the specification for a full receiving tank; and*
[1.13] *(l) the pressurized gas is hydrogen gas.*"

Claim 12 of the main request reads:

"**[12.1]** *A hydrogen dispensing method for dispersing pressurized gas, comprising the steps of:*
[12.2] *(a) providing a pressurized gas source (12);*
[12.3] *(b) providing a receiving tank (14);*
[12.4] *(c) providing a sealed gas flow line (16) connected between the gas source (12) and the receiving tank (14);*
[12.5] *(d) providing a valve (20) in the gas flow line (16) for initiating and terminating flow of the pressurized gas between the gas source (12) and the receiving tank (14), the valve (20) operable by a valve signal (29);*
[12.6] *(e) providing an electronic controller (28);*
[12.7] *(f) providing a temperature sensor (22) for sensing temperature of a gas inside the receiving tank (14), the temperature sensor including a temperature signal generator for generating a temperature signal corresponding to the temperature of the pressurized gas in the receiving tank (14), the temperature signal adapted to be received by the electronic controller (28);*
[12.8] *(g) providing a pressure sensor (24) for sensing pressure of a gas inside the receiving tank (14), the*

pressure sensor including a pressure signal generator for generating a pressure signal corresponding to the pressure of the gas inside the receiving tank (14), the pressure signal adapted to be received by the electronic controller (28); characterized in that

[12.9] *(h) a tank rated density based on the specification for a full receiving tank (14) and the temperature and pressure signals are stored in the electronic controller (28);*

[12.10] *(i) a density of the gas in the receiving tank (14) is periodically calculated based on the temperature and pressure signals;*

[12.11] *(j) the density of the gas in the receiving tank (14) is periodically compared with the tank rated density based on the specification for a full receiving tank;*

[12.12] *(k) flow of pressurized gas through the valve (20) is initiated by generating the valve signal (29) when the density of gas in the receiving tank (14) is below the tank rated density based on the specification for a full receiving tank;*

[12.13] *(l) flow of pressurized gas through the valve (20) is terminated by generating the valve signal (29) when the density of the gas in the receiving tank (14) reaches the tank rated density based on the specification for a full receiving tank;*

[12.14] *(m) a percent full signal is generated, wherein the percent full signal is the ratio of the density of gas in the receiving tank (14) to the tank rated density based on the specification for a full receiving tank; and*

[12.15] *(n) the pressurized gas is hydrogen gas.*"

VI. The parties' submissions relevant to this decision may be summarised as follows:

(a) *Claim interpretation*

(i) Appellant II

A binary signal indicating that the tank was full constituted a "percent full signal" (see features 1.12 and 12.14) corresponding to a ratio of the density of gas in the tank to the tank rated density of 100%. A binary signal that was ON when the tank was full was technically indistinguishable from a percent full signal that was a ratio of the density of gas to the rated density. There was no link between features 1.10 and 1.12 of claim 1 that would support the interpretation that the percent full signal was calculated periodically. Such an interpretation was not supported by the description either. Indeed, the step "Control Electronics Generates Signal to Close Fill Valve" in Figure 2 of the patent was the only place where the generation of a "full signal" was mentioned. This signal was a binary signal that was only generated when the tank density reached the rated density.

In view of the imprecise nature of the terms "to generate" and "a percent full signal" in feature 1.12 and the lack of further clarification on the use and form of this signal, this feature could not be read as "configured for" but instead had to be read as "suitable for". Feature 1.12 thus only required that the electronic controller was suitable for generating the percent full signal, but did not require that the electronic controller was actually configured (for

example, by appropriate programming) for generating the percent full signal defined in feature 1.12.

(ii) Appellant I

Feature 1.12 required the generation and transmission of a signal that was the ratio of the density of gas in the receiving tank to the tank rated density, i.e. a signal comprising the calculated quotient (that could be expressed as a percentage between 0% and 100%) produced by dividing the calculated density of the gas in the tank by the tank rated density. The generation of this signal by the electronic controller, as per feature 1.12 of claim 1, was a separate and distinct step from feature 1.11 in which the electronic controller compared the density of the gas in the receiving tank with the tank rated density and generated a valve signal to open the valve to fill the tank (when the density in the tank was below the tank rated density) or to close the valve to stop the flow (when the density in the tank reached the tank rated density).

Claim 1 did not recite an electronic controller that was merely "suitable" for carrying out the steps, but stated that the electronic controller was "adapted" to carry out said steps. Claim 1 thus required an electronic controller adapted, i.e. configured and programmed, to carry out the steps in question.

(b) *Main request: objection under Article 123(2) EPC*

(i) Appellant II

The inclusion in isolation of the wording "*based on the specification for a full receiving tank*" in claims 1 and 12 of the main request (see, for example, features 1.9, 1.11 and 1.12) did not meet the requirements of Article 123(2) EPC. In contrast to the second sentence of paragraph [0025] of the application as filed, the claims did not define that the tank rated density of the full receiving tank was based on a tank rated temperature at a tank rated pressure. The word "or" in the penultimate sentence of paragraph [0025], when read in the context of the preceding sentence, unequivocally referred to the specification at a rated temperature at a rated pressure. The references to the tank rated pressure and the tank rated temperature were inextricably linked to the specification of a full receiving tank.

(ii) Appellant I

Claim 1 of the application as filed required a tank rated density to be stored and used and did not require that the tank rated density was based on a tank rated temperature at a tank rated pressure. The application as filed thus provided a basis for claiming the storage and use of a tank rated density *per se* without further linking this to a requirement that the tank rated density be based on a tank rated temperature at a tank rated pressure. During prosecution of the application, the claims had been amended to further state that the tank rated density was "*based on the specification for a full receiving tank*". The penultimate sentence of

paragraph [0025] of the application as filed provided a basis for this amendment. In this sentence, it was explicitly disclosed that a tank manufacturer may provide a specification for a full tank in terms of a tank rated temperature at a tank rated pressure (from which the tank rated density may then be calculated and used) or may provide a specification for a full tank in terms of a tank rated density *per se* (that may then be used directly). Claims 1 and 12 of the main request thus met the requirements of Article 123(2) EPC.

(c) *Main request: objections under Article 54 EPC*

(i) Appellant II

The subject-matter of claims 1 and 12 of the main request was not new over document D13. In particular, features 1.12 and 12.14 were disclosed in view of the third and fourth paragraphs on page 1634 of document D13. According to this passage, when the tank reached the nominal density, the green light was turned on. This corresponded to a "percent full signal" at a ratio equal to 1 or 100%.

The subject-matter of claim 1 of the main request was not new over document D2 either. Feature 1.12 was disclosed in paragraph [0039] of document D2. According to the last sentence of this paragraph, the controller generated a percent full signal when the gas density in the tank was equal to the nominal density. This condition was the same as the condition that the density of gas in the tank divided by the tank rated density was 1. In document D2, this 100% percent full signal (ratio = 1) was expressed by a colour code.

(ii) Appellant I

The subject-matter of claims 1 and 12 of the main request was new over document D13. Document D13 did not disclose features 1.12 and 12.14. The passage in the third and fourth paragraphs on page 1634 of document D13 cited by appellant II amounted to no more than a teaching that the PLC should generate a binary signal ("light on" or "light off") that was sent to the control panel, based on whether the tank was full or not. Even the calculation by the PLC of whether or not the tank was full did not necessarily imply or involve the calculation of a ratio of the density of gas in the receiving tank to the tank rated density. This could be calculated in other ways instead (for example, by deducting the actual density of the gas in the tank from the tank rated density and concluding the fill was complete when the result was 0).

The subject-matter of claim 1 of the main request was also new over document D2, since this document did not disclose feature 1.12. Document D2 taught stopping the filling process when a "maximum permitted density" was reached, but there was no clear and unambiguous disclosure that this density was a tank rated density based on the specification for a full receiving tank. Moreover, the teaching of paragraph [0039] of document D2 cited by appellant II implied nothing more than that a binary signal ("open fill valve" or "close fill valve") was generated triggering the valve that controlled filling of the receiving tank to open or close, depending on whether or not the density of the gas in the tank had reached the tank rated density. This did not meet the requirement of feature 1.12 concerning the generation of a signal comprising the

ratio of the actual density of gas in the receiving tank to the tank rated density.

(d) *Main request: objections under Article 56 EPC*

(i) Appellant II

The subject-matter of claims 1 and 12 did not involve an inventive step in view of document D13 and the skilled person's common general knowledge and in view of document D13 in combination with either of documents D17 and D3.

The objective technical problem solved in respect of document D13 as the closest prior art was to configure the electronic controller to periodically compare the density of the gas in the tank to the nominal density and, in particular, to cause a gas flow until the current density was equal to the nominal density. Alternatively, the objective technical problem could be to provide more detailed information on the filling state of the tank while the tank was being filled.

In document D13, there were only two ways of detecting when the bus tanks were full: determine if the density in the tank minus the rated density was zero, or determine if the density in the tank divided by the rated density was one. The solution proposed by claim 1 corresponded to the second alternative and was thus one of only two obvious alternatives. It would also have been obvious to the skilled person to provide "step-by-step" information in the course of filling the tank since in all common filling stations the quantity transferred and/or the price of fuel transferred was always shown. Replacing a green light (as disclosed in

document D13) with the number "1" or "100 %" was a known and obvious alternative and did not provide any technical effect. It related to the presentation of information and only had a cognitive effect on the user.

Document D17 and the objection of lack of inventive step in view of a combination of documents D13 and D17 should be admitted into the appeal proceedings. Document D17 had been filed with the statement of grounds of appeal to contradict the opposition division's assertion in point 3.3.4.3 of the Reasons for the decision under appeal that the ratio of density to nominal density was neither known nor suggested in the technical field. Document D17 was provided as evidence to support appellant II's view that the parameter "ratio" was a known and obvious parameter to characterise the filling state of a tank, as appellant II had previously set out in the opposition proceedings. The independent claims of the requests previously filed by appellant I during the first-instance proceedings had been amended in view of other aspects. As compared to these previous requests, appellant I's main request changed the claimed scope in a different and diverging way. Dependent claims 2 and 14 as granted had not been in the focus of discussion in the opposition proceedings until appellant I had filed the amended claims of the main request. Document D17 had only been found after the oral proceedings before the opposition division and had been filed at the earliest opportunity. Document D17 and the objection of lack of inventive step in view of a combination of documents D13 and D17 did not introduce any additional complexity but on the contrary simplified the discussion. Document D17 was *prima facie* relevant for the discussion of inventive step.

According to page 464, second paragraph, of document D17, the "fill ratio" was the charged cylinder mass divided by the mass which the cylinder could hold at the rating condition. This ratio was exactly the same as the ratio defined in feature 1.12 since density was mass divided by volume. Document D17 disclosed a percent full ratio which was the ratio (equal to 1) of the density of gas present in a full tank divided by the rated density (see Figure 5). Filing document D17 and raising the objection of lack of inventive step in view of a combination of documents D13 and D17 did not change the legal and factual framework of the proceedings. Neither the closest prior art nor the formulation of the objective technical problem was changed as compared to the previously raised objections based on document D13 as the closest prior art.

Document D3 described, in column 10, lines 13 to 33, a filling rate expressed in percent filling by mass. This mass fill percentage was the same as the percent filling by density since density was equal to mass divided by volume. The "mass / rated mass" ratio was thus equal to the "density / rated density" ratio. The generation of such a ratio and its potential to express the filling rate of a gas tank were therefore known.

(ii) Appellant I

The subject-matter of claims 1 and 12 involved an inventive step in view of document D13 and the skilled person's common general knowledge and in view of document D13 in combination with either of documents D17 and D3. The objective technical problem solved in respect of document D13 as the closest prior art was to provide a system and method enabling improved operational flexibility and ease of use.

There was nothing in document D13 that hinted at or pointed to generating a percent full signal as defined in features 1.12 and 12.14. Appellant II's view in this regard was based on hindsight. Document D13 disclosed lighting up a light once the fill was complete but did not include any suggestion of conveying information as to the state of progress of the fill during the filling process. The argument made by appellant II based on what was done in conventional filling stations also did not hold true. In such conventional filling stations it was also the case that no signal was generated concerning the percentage level of filling during the filling process. The information conveyed concerned only the amount (i.e. mass) of fuel that had been transferred (and the corresponding cost thereof). No indication was commonly given as regards how much fuel had been conveyed relative to how much fuel the full tank could hold.

Document D17 should not be admitted into the appeal proceedings as it was late-filed and of insufficient *prima facie* relevance. Document D17 did not contradict any reasoning of the opposition division or any of appellant I's arguments. There was no teaching or suggestion in document D17 (either on page 464, second paragraph, and in Figure 5 or elsewhere) of generating a percent full signal based on the current level of fill versus a full tank, let alone any teaching of generating a percent full signal comprising the ratio of the density of the gas in the receiving tank to the tank rated density. Document D17 taught a method of modelling fast filling of vehicle storage cylinders with natural gas. The model did not analyse, predict or use the density of the gas in the receiving tank during the filing process, nor was there any suggestion in

document D17 to do so. Page 464 and Figure 5 of document D17 looked at the cylinder mass fill ratios at the end of the modelled fill process. The cylinder mass fill ratio was defined as the charged cylinder mass at the end of the fill, divided by the mass that the cylinder could hold at the rating condition. There was no suggestion or hint of an actual filling system or method in which, during the course of the filling process, an electronic controller calculated the ratio of the density of gas in the receiving tank to the tank rated density based on the specification for a full receiving tank, and generated a percent full signal comprising said ratio.

Regarding document D3, there was no suggestion in column 10, lines 13 to 33, or elsewhere in the document to generate a percent full signal based on the current level of fill versus a full tank, let alone any teaching of generating a percent full signal comprising the ratio of the density of the gas in the receiving tank to the tank rated density. In contrast, document D3 referred to a method of filling a tank with natural gas (not hydrogen) in which the mass of gas introduced into the tank was calculated. The temperature of the gas inside the tank during the fill was not measured and there was no teaching or suggestion of calculating a tank rated density or of calculating the density of the gas inside the tank during the filling process, let alone any teaching of comparing the actual density of the gas inside the tank during filling with the tank rated density. In document D3, fixed masses of gas were introduced that were estimated to fill the tank to predetermined fill states (for example, 90% full, 100% full) in order to estimate the tank volume and fill the tank. The process described would furthermore not even have any

applicability to a method where (as in document D13 or the opposed patent) the volume of the tank being filled was not calculated and did not need to be calculated.

(e) *Remittal of the case to the department of first instance for the adaptation of the description*

Appellant II did not raise any objections against a remittal of the case to the department of first instance for the adaptation of the description.

Reasons for the Decision

1. **Non-attendance of appellant I at the oral proceedings before the board**

In accordance with Rule 115(2) EPC, if a party duly summoned to oral proceedings before the EPO does not appear as summoned, the proceedings may continue without that party. Pursuant to Article 15(3) of the Rules of Procedure of the Boards of Appeal of the European Patent Office (RPBA 2020, see OJ EPO 2021, A35), which is applicable in accordance with Article 25(1) RPBA 2020, the board is not obliged to delay any step in the proceedings, including its decision, by reason only of the absence at the oral proceedings of a duly summoned party, which may then be treated as relying only on its written case.

In the case in hand, both parties requested oral proceedings as an auxiliary measure. By letter of 19 August 2022, appellant I withdrew its auxiliary request for oral proceedings and informed the board

that it would not be attending the oral proceedings scheduled for 26 October 2022. The oral proceedings before the board were held in the absence of appellant I.

By not attending these oral proceedings, appellant I effectively chose not to avail itself of the opportunity to present its observations and counter-arguments orally but instead to rely on its written submissions. The board was in a position to announce a decision at the conclusion of the oral proceedings in accordance with Article 15(6) RPBA 2020, which applies in accordance with Article 25(1) RPBA 2020.

2. **Claim interpretation**

The parties disagree on how some features of the claims of appellant I's main request would be interpreted by the skilled person. In this section, the board sets out its view on this matter.

2.1 *"percent full signal"* (see features 1.12 and 12.14)

According to feature 1.12, the electronic controller is adapted to generate a percent full signal, wherein the percent full signal is the ratio of the density of gas in the receiving tank to the tank rated density based on the specification for a full receiving tank. Appellant II is of the opinion that a binary signal that indicates that the tank is full, i.e. that is 1 when the tank is full and 0 in all other cases, is a percent full signal that corresponds to a ratio of the density of gas in the tank to the tank rated density of 100% at the time the tank is full.

The board does not share appellant II's view. A binary signal that is 1 (or ON) when the tank is full and 0 (or OFF) in all other cases is not a ratio in the sense of features 1.12 and 12.14.

Appellant II argues that a binary signal that is 1 (or ON) when the tank is full is technically indistinguishable from a percent full signal that is a ratio of the density of gas to the rated density.

The board does not find this view convincing. The skilled person is able to distinguish the number 1 as the result of dividing two values from a logical number "1" (as opposed to a logical "0"). While both may commonly be represented by the same symbol "1", the skilled person would recognise that these are different entities. Moreover, the skilled person would not read features 1.12 and 12.14 as merely requiring that, if the ratio of the density of the gas in the tank to the rated tank density happens to be one, a binary signal of "1" is to be generated. The skilled person would instead read these features in the context of the whole claim. Feature 1.10 (see also feature 12.10) specifies that the density of the gas in the receiving tank is calculated periodically. The skilled person would thus read features 1.12 and 12.14 as referring to the density of gas being periodically calculated according to features 1.10 and 12.10, respectively. Consequently, the skilled person would consider the generated percent full signal to be the ratio of the periodically calculated density of gas to the rated density.

This interpretation is not in contradiction to the description or the figures of the patent in suit. Appellant II has not convincingly demonstrated that the skilled person would understand the signal output in

the step "Control Electronics Generates Signal to Close Fill Valve" in Figure 2 of the patent to be the "percent full signal" defined in features 1.12 and 12.14. It is therefore irrelevant whether or not the signal to close the fill valve in Figure 2 is a signal that can only take values of 0 and 1.

In summary, features 1.12 and 12.14 contain an explicit definition of the term "percent full signal" in the sense of a ratio, referring to a periodically calculated density of gas in the tank. A binary signal that takes a logical value of "1" (or ON) for a full tank and "0" (or OFF) in all other cases (independently from the actual density of gas in the tank) does not meet this definition.

2.2 *"the electronic controller (28) is adapted to generate a percent full signal"* (see feature 1.12)

Appellant II is of the opinion that feature 1.12 only requires that the electronic controller be suitable for generating the percent full signal, but that it does not require that the electronic controller be actually configured (for example, by appropriate programming) for generating the percent full signal defined in feature 1.12. Appellant I disagrees and argues that claim 1 requires an electronic controller adapted, i.e. configured and programmed, to carry out the steps in question.

The board shares appellant I's view. Feature 1.12 explicitly uses the expression "*adapted to generate a percent full signal*". The electronic controller must thus be adapted (for example, by appropriate programming) to generate the percent full signal. An unprogrammed or otherwise programmed electronic

controller, on the other hand, is not adapted for performing the function of generating the percent full signal.

It is noted that this claim construction is also consistent with the interpretation of the phrase "adapted to" in the case law of the boards of appeal (see, for example, T 410/96, point 6 of the Reasons, T 96/12, point 4 of the Reasons, T 240/11, point 3.1 of the Reasons, and T 565/12, point 1.3 of the Reasons).

3. **Main request: objection under Article 123(2) EPC**

Appellant II considers that the inclusion in isolation of the wording "*based on the specification for a full receiving tank*" in claims 1 and 12 of the main request (see, for example, features 1.9, 1.11 and 1.12) does not meet the requirements of Article 123(2) EPC. In contrast to the second sentence of paragraph [0025] of the application as filed, the claim does not define that the tank rated density of the full receiving tank is based on a tank rated temperature at a tank rated pressure. Appellant I disagrees and sees a basis for this amendment, in particular, in the penultimate sentence of paragraph [0025] of the application as filed.

In the board's view, appellant II has not convincingly shown that there is an inextricable link between the feature that the tank rated density is based on the specification for a full receiving tank (as defined in claims 1 and 12 of the main request) and the feature that the tank rated density is based on a tank rated temperature at a tank rated pressure. Both features are stated in combination in the second sentence of

paragraph [0025] of the application as filed. However, in the next sentence (i.e. the penultimate sentence of paragraph [0025]), it is explicitly stated that the tank rated pressure and tank rated temperature or tank rated density are based on the receiving tank specifications for a full tank. The latter alternative corresponds to the above claim amendments. Therefore, if the person skilled in the art reads these sentences of paragraph [0025] in their context, they would not conclude that there is an inextricable link between the aforementioned features.

Claims 1 and 12 of the main request thus meet the requirements of Article 123(2) EPC.

4. Main request: objections under Article 54 EPC

4.1 *Novelty in view of document D13*

Appellant II is of the opinion that the subject-matter of claims 1 and 12 of the main request is not new over document D13. This view is contested by appellant I.

The parties disagree as to whether document D13 discloses features 1.12 and 12.14. Appellant II is of the opinion that these features are disclosed in view of the third and fourth paragraphs on page 1634 of document D13. These paragraphs read:

> "*The control panel also has a display that prints messages to guide the operator through the step-by-step refueling process. If there is a problem (wrong PIN, broken ground wire, etc.), the display indicates what the problem is and what to do about it.*

There are three strobe lights on top of the control panel. A green light turns on to indicate that the bus tanks are full. A red light turns on if the fire detection system detects a fire. A blue light turns on if the bus pressure is too high."

In the board's view, it is apparent from this text passage of document D13 that a single light, namely a green light, is provided to indicate that the tanks are full. Red and blue lights are provided as well. However, these do not relate to a density or fill level of the tanks.

The signal transmitted via the green light is a binary signal that is ON when the tanks are full and OFF in all other cases. As set out above (see point 2.1), the skilled person would not consider such a binary signal a percent full signal which is the ratio of the periodically calculated density of gas in the receiving tank to the tank rated density based on the specification for a full receiving tank in the sense of features 1.12 and 12.14. Although a green light that is ON can be interpreted as a logical "1", this is different from a hypothetical binary signal (not disclosed in document D13) that takes a logical value of 1 or 100% when the tank is full and is a result of dividing the density of gas in the tank by the tank rated density. Although both signals may be - and only in the case of a full tank are - represented in the same way, namely by the symbol "1", this does not imply that these signals are the same. As set out above, the skilled person would not consider a binary signal that is ON for a full tank and OFF in all other cases, independently from the actual density of gas in the

tank, a percent full signal in the sense of features 1.12 and 12.14.

Document D13 therefore does not disclose features 1.12 and 12.14 of claims 1 and 12, respectively. The subject-matter of claims 1 and 12 of the main request is thus new over document D13 (Article 54 EPC).

4.2 *Novelty in view of document D2*

Appellant II submits that the subject-matter of claim 1 is not new over document D2. This view is contested by appellant I. The parties disagree as to whether document D2 discloses feature 1.12. In this regard, appellant II refers to paragraph [0039] of document D2. The last sentence of that paragraph reads:

> "*Hat die Dichte p* [sic] *den Endwert* ρ_E *erreicht, so wird die Befüllung im Schritt 110 beendet, anderenfalls wird die Befüllung fortgesetzt.*"

Or, in English:

> "*If the density p has reached the end value* ρ_E*, the filling is ended in step 110, otherwise the filling is continued.*" (translation by the board)

From this passage, appellant II concludes that the controller of document D2 generates a percent full signal when the gas density in the tank is equal to the nominal density. In appellant II's view, this condition is equivalent to the condition that the density in the tank divided by the nominal density is 1.

The board does not share this view. Feature 1.12 does not refer to conditions for assessing whether the gas

density in the tank is equal to the nominal density. Therefore, the consideration of whether this condition is equivalent to a differently formulated condition is not relevant.

Feature 1.12 refers to generating a percent full signal that is the ratio of the density of gas in the receiving tank to the tank rated density based on the specification for a full receiving tank. Even assuming that it can be concluded from the cited passage of document D2 that a signal is generated when the density p reaches the end value ρ_E, this signal would not be a ratio of the density of gas in the receiving tank to the tank rated density, but rather a logical signal that is ON when the condition described in paragraph [0039] is met and OFF in all other cases. As described above, such a signal does not meet the definition of feature 1.12.

In this situation, the question (raised by appellant I) of whether the end density described in paragraph [0039] of document D2 is a tank rated density based on the specification for a full receiving tank in the sense of feature 1.12 can be left open.

In view of the above, the subject-matter of claim 1 of the main request is new over document D2 (Article 54 EPC).

5. Main request: objections under Article 56 EPC

Appellant II submits that the subject-matter of claims 1 and 12 of the main request does not involve an inventive step in view of document D13 and the skilled person's common general knowledge and in view of

document D13 in combination with either of documents D17 and D3.

5.1 *Objective technical problem*

As explained above in point 4.1, the subject-matter of claims 1 and 12 of the main request differs from the content of document D13 by features 1.12 and 12.14, respectively.

The board does not share appellant II's view that features 1.12 and 12.14 relate merely to the presentation of information. These features refer to generating a percent full signal and not to specifics of how information is presented to a user. The difference from the closest prior-art document D13 is not in the cognitive effect produced in a user's mind by the presentation of information or the manner in which the information is presented, but in the generation of the signal itself.

In a first line of argument, appellant II submits that the objective technical problem to be solved is to configure the electronic controller to periodically compare the density of the gas in the tank to the nominal density and, in particular, to cause a gas flow until the current density is equal to the nominal density.

According to appellant I, the availability of an indication of the actual fill level in the tank during the fill process allows for termination of the fill process at a predetermined fill level below that of a complete fill. In its view, the objective technical problem is to provide a system and method enabling improved operational flexibility and ease of use.

In response to appellant I's submissions regarding the technical effect produced by the differentiating features, appellant II submits, in a second line of argument, that the objective technical problem is to provide more detailed information on the filling state of the tank while the tank is being filled.

The board notes that claim 1 does not define how the percent full signal defined in features 1.12 and 12.14 is used once it has been generated. However, the skilled person understands that generating a signal that is the ratio of the gas density to the rated density allows for more than only the detection of when the current density is equal to the nominal density. The formulation of the objective technical problem suggested by appellant II in its first line of argument is therefore too narrow in view of the technical effect caused by features 1.12 and 12.14. This formulation of the objective technical problem is therefore inappropriate.

The percent full signal defined in feature 1.12 provides more detailed information on the fill status of the tank than a green light that is ON when the tank is full (as in document D13). However, even assuming that the formulation of the objective technical problem suggested by appellant II in its second line of argument is correct, the skilled person starting from document D13 and aiming at solving this objective technical problem would not arrive at the claimed subject-matter in an obvious way.

5.2 *Obviousness in view of document D13 and the skilled person's common general knowledge*

Appellant II submits that, in document D13, there are only two ways of detecting when the bus tanks are full: determine if the density in the tank minus the rated density is zero, or determine if the density in the tank divided by the rated density is one. Appellant I, in contrast, submits that these arguments are based on hindsight analysis as there is nothing in document D13 that hints at or points to generating a percent full signal as defined in features 1.12 and 12.14.

The board concurs with appellant I's view. In order to generate a signal for activating the green light in document D13, it is not required that a number is calculated either as a difference or as a quotient, as suggested by appellant II. As a further alternative, not mentioned by appellant II, it seems possible, for example, merely to compare the actual density with the target density, thereby yielding the result that the fuel density is or is not equal to the target density without providing a quantitative value such as the difference or ratio of these values. As a further implementation alternative, it seems possible that the result of the comparison is that the actual density is less than, equal to or greater than the target density, again without quantifying the deviation in terms of a difference or a ratio. The skilled person thus understands that, to provide the signal for turning the green light on, it is not necessary to perform mathematical operations such as a subtraction or even a division to decide if the green light is to be activated. Other and less complex alternatives are available to the skilled person. Consequently,

document D13 does not prompt the skilled person to provide for the generation of a percent full signal as defined in features 1.12 and 12.14.

Nor has appellant II convincingly demonstrated that it is common in conventional filling stations to generate a signal that is a ratio of the (actual) density of gas in the tank to the rated tank density. Even assuming that filling stations show the quantity transferred and/or the price of fuel transferred, as argued by appellant II, this does not imply that a percent full signal is generated, as defined in features 1.12 and 12.4.

Even assuming that the skilled person was prompted to replace the green light disclosed in document D13 with the number "1" or "100 %", as submitted by appellant II, this would not render the subject-matter of claim 1 obvious. As set out above in point 5.1, the difference between the claimed subject-matter and the content of document D13 is not in the way in which information that the tank is full is presented to a user, but that a percent full signal is generated which is the ratio of the density of gas in the receiving tank to the tank rated density. The mere presentation of a number "1" or "100 %" to the user when the tank is full does not meet the definition of features 1.12 and 12.14 (see also remarks in point 2.1 above).

The subject-matter of claims 1 and 12 of the main request involves an inventive step in view of a combination of document D13 with the common general knowledge (Article 56 EPC).

5.3 *Obviousness in view of a combination of documents D13 and D3*

According to appellant II, document D3 describes, in column 10, lines 13 to 33, a filling rate expressed in percent filling by mass. In appellant II's view, this is the same as the percent filling by density since density is equal to mass divided by volume. The "mass / rated mass" ratio is thus equal to the "density / rated density" ratio. The generation of such a ratio and its potential to express the filling rate of a gas tank are therefore known.

The board notes that, according to document D13, fuel density in the bus tanks is computed using temperature sensor and pressure transducer readings (see page 1634, first paragraph). The fuel flow is stopped when the density reaches the preset density target. In the cited passage of document D3, in contrast, an estimate is computed for the total gas mass that is needed, for example, for a 90% fill state. It is not apparent why the skilled person, starting from document D13, would have consulted document D3. The cited passages of document D3 do not address the above objective technical problem suggested by appellant II in its second line of argument. Moreover, the ratio of 90% stated in document D3 does not correspond to a ratio of the density of the gas in the receiving tank periodically calculated based on the temperature and pressure signals relating to the gas in the tank to a tank rated density as required by claims 1 and 12, but is instead a fixed value, as also submitted by appellant I. Hence, even if the skilled person had consulted document D3, they would not have arrived at the claimed solution.

The skilled person would thus not have arrived at the subject-matter of claims 1 and 12 of the main request in an obvious manner in view of a combination of documents D13 and D3. Hence, the subject-matter of claims 1 and 12 of the main request involves an inventive step in view of a combination of these documents (Article 56 EPC).

5.4 *Admittance of document D17 and the objection of lack of inventive step in view of a combination of documents D13 and D17*

Document D17 was submitted by appellant II with its statement of grounds of appeal dated 14 June 2017. In its view, the subject-matter of claims 1 and 12 of the main request does not involve an inventive step in view of a combination of documents D13 and D17. Appellant I requests that document D17 not be admitted into the appeal proceedings as it was late filed and is of insufficient relevance.

In accordance with Articles 24(1) and 25(2) RPBA 2020, Article 12(4) of the Rules of Procedure of the Boards of Appeal as amended in 2007 (RPBA 2007, OJ EPO 2007, 536 et seq.) applies to appellant II's statement of grounds of appeal. In accordance with Article 12(4) RPBA 2007, the board has discretionary power to hold inadmissible facts, evidence or requests which could have been presented in the first-instance proceedings.

Appellant II submits that document D17 was filed to contradict the opposition division's assertion that the ratio of density to nominal density was neither known nor suggested in the technical field. It refers to point 3.3.4.3 of the Reasons for the decision under appeal.

The board notes, however, that the passage of the Reasons for the decision under appeal cited by appellant II does not contain such an assertion. In point 3.3.4 of the Reasons, the opposition division addresses two lines of attack presented by the opponent, the first one based on document D13 and the knowledge of the skilled person (see point 3.3.4.1 of the Reasons) and the second one based on a combination of documents D13 and D3 (see point 3.3.4.2 of the Reasons). In point 3.3.4.3 of the Reasons, cited by appellant II, the opposition division then concludes:

> "*Available prior art does neither suggest the calculation of a ratio, nor does it disclose the potential effect created by generating the signal of this ratio.*" (underlining by the board)

In other words, the opposition division was not convinced by the objections raised by the opponent. This, however, in itself does not justify presenting a new objection of an alleged lack of inventive step based on a combination of document D13 and newly filed document D17 in the appeal proceedings.

Appellant II also submits that document D17 was provided as evidence to support the view that the ratio was a known and obvious parameter to characterise the filling state of a tank, as previously set out in the opposition proceedings.

In the board's opinion, the parties to *inter partes* proceedings are subject to a particular duty to facilitate due and swift conduct of the proceedings, which includes submitting all relevant facts, evidence, arguments and requests as early and completely as

possible (see also "Case Law of the Boards of Appeal of the European Patent Office", Tenth Edition, July 2022, V.A.5.2.1). Appellant II could and should therefore have filed any evidence in support of its view that the ratio was a known and obvious parameter to characterise the filling state of a tank in the opposition proceedings. The fact that the opposition division was not convinced by the objections of lack of inventive step in view of document D13 as the closest prior art raised by appellant II in the opposition proceedings does not justify the submission of new objections based on new documents in the appeal proceedings.

Features 1.12 and 12.14 are also included in claims 2 and 14 as granted, respectively. Therefore, the opponent could and should have raised any objections regarding these claims in the notice of opposition. In point X. of the notice of opposition, referring to claim 2 as granted, the opponent submitted that controlling the value of a parameter as a percentage of a target nominal value was an arbitrary and obvious choice for those skilled in the art as this was a simple, obvious alternative to the alternative in which the difference between the nominal value and the measured value was expressed. Reference was made to document D3, which allegedly suggested expressing a filling state as a percentage of a filled value (see reference numerals 94, 109, 119 and column 10, line 17). The board notes, however, that in the notice of opposition, the opponent did not file or cite document D17 or raise any objections based on this document.

The main request was filed on 31 October 2016, i.e. about one month prior to the oral proceedings before the opposition division held on 1 December 2016. The

board considers that filing amended claims shortly before oral proceedings may generally leave only little time for an opponent to react. However, since the feature in dispute is present in claims 2 and 14 as granted, objections regarding these claims should have been raised in the notice of opposition, submitting any evidence deemed necessary for supporting these objections as early as possible.

The fact that appellant I filed requests limiting the subject-matter of the independent claims in view of other aspects during the opposition proceedings does not retroactively remedy appellant II's failure to present its objections to claims 2 and 14 as granted with the notice of opposition. The same applies in view of appellant II's submission that claims 2 and 14 had not been in the focus of discussion in the opposition proceedings until appellant I filed the amended claims of the main request. This submission does not retroactively justify the fact that document D17 and the above objection of lack of inventive step were not filed with the notice of opposition. This view is also not affected by appellant II's submission that document D17 was only found after the oral proceedings before the opposition division. Appellant II has not provided any reasons why this document could not have been found earlier, for example during the preparation of the notice of opposition.

In view of the above, document D17 and consequently the objection of lack of inventive step based on a combination of documents D13 and D17 could and should have been filed in the first-instance proceedings. Therefore, the board has discretionary power under Article 12(4) RPBA 2007 to hold inadmissible document D17 and consequently this objection.

The board does not share appellant II's view that document D17 does not introduce any additional complexity and merely simplifies the discussion. Firstly, the board does not find that introducing a new objection based on new evidence during the appeal proceedings generally simplifies the discussion in hand. The main function of the appeal proceedings is to review the decision under appeal in a judicial manner (see, for example, Article 12(2) RPBA 2020). As the inventive-step objection based on a combination of documents D13 and D17 is not part of the decision under appeal, admitting this objection into appeal proceedings would either have the effect that the appeal proceedings are the first instance in which this objection is dealt with or that the case is to be remitted to the opposition division. Neither alternative seems desirable in view of procedural economy. Secondly, the consideration of this new inventive-step objection would give rise to new questions such as, for example, whether the skilled person would have consulted document D17 when starting from document D13 to solve the objective technical problem, whether document D17 suggests the claimed solution, etc.

In the board's view, the objection of lack of inventive step in view of a combination of documents D13 and D17 raised by appellant II is not *prima facie* convincing either. In the passage on page 464, second paragraph (see also Figure 5) of document D17, cited by appellant II, variations of the fill ratio are discussed. The fill ratio is defined as the charged cylinder mass at the end of the fill, divided by the mass that the cylinder could hold at the rating condition. This passage, however, does not relate to

the objective technical problem suggested by appellant II in its second line of argument, i.e. to provide more detailed information on the filling state of the tank while the tank is being filled. The cited passages of document D17 relate to modelling results and not to obtaining information on the filling state of a tank while the tank is being filled, as also correctly pointed out by appellant I. It is therefore not *prima facie* evident that the skilled person would have consulted document D17 to solve the above objective technical problem or that they would, if they had, thereby have arrived at the claimed solution in an obvious manner.

This also applies in view of appellant II's submission that the cylinder fill ratio defined in document D17 is the same as the ratio defined in claims 1.12 and 12.14. Even assuming that the value of the mass fill ratio disclosed in document D17 is the same as the value of the ratio defined in features 1.12 and 12.14, this in itself does not *prima facie* allow the conclusion that these features are obvious to the skilled person trying to solve the above objective technical problem and consulting document D17.

In view of the above, neither document D17 nor the objection of lack of inventive step in view of a combination of documents D13 and D17 is *prima facie* relevant. In this situation, the board exercised its discretionary power under Article 12(4) RPBA 2007 and decided not to admit document D17 and consequently the objection of lack of inventive step based on a combination of documents D13 and D17 into the appeal proceedings.

6. **Conclusions**

Taking into account the objections raised by appellant II, the board concludes that the claims of appellant I's main request meet the requirements of the EPC.

7. **Remittal of the case to the department of first instance for the adaptation of the description**

The board considers it appropriate to remit the case to the department of first instance for adaptation of the description in accordance with Article 111(1), second sentence, EPC. Moreover, appellant II did not raise any objections to a remittal of the case to the department of first instance for the adaptation of the description.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent as amended with the following claims and a description to be adapted thereto:

   Claims 1 to 16 of the main request filed with the statement of grounds of appeal dated 6 July 2017.

The Registrar: The Chairman:

N. Schneider P. Lanz

Decision electronically authenticated