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Datasheet for the decision of 16 May 2025

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Language of the proceedings: EN

Title of invention:

METHOD OF TREATING A PORTION OF A SUBTERRANEAN FORMATION WITH IMPROVED WATER IN OIL EMULSION

Patent Proprietor:

S.P.C.M. SA

Opponent:

Kemira Oyj

Relevant legal provisions:

RPBA 2020 Art. 13(2)
EPC Art. 56

Keyword:

Amendment after summons - exceptional circumstances (no)
Inventive step - reasonable expectation of success (yes)

Decisions cited:
T 1862/15

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Case Number: T 0983/23 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 16 May 2025

Appellant: (Opponent)	Kemira Oyj Energiakatu 4 00180 Helsinki (FI)
Representative:	Santarelli Tour Trinity 1 bis Esplanade de la Défense 92035 Paris La Défense Cedex (FR)
Respondent: (Patent Proprietor)	S.P.C.M. SA ZAC de Milieux 42160 Andrézieux Bouthéon (FR)
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Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 21 March 2023 concerning maintenance of the European Patent No. 3604351 in amended form.**

Composition of the Board:

Chairman	D. Semino
Members:	M. Barrère
	A. Bacchin

Summary of Facts and Submissions

I. The appeal of the opponent lies against the interlocutory decision of the opposition division concerning maintenance of European Patent No. 3 604 351 in amended form on the basis of the claims of the main request filed with letter dated 14 February 2022 and an adapted description.

II. Claim 1 of the main request read as follows:

"1. Method of treating a portion of subterranean formation, comprising:

a. Providing a water in oil emulsion of at least one water-soluble polymer, said emulsion comprising at least one inverting agent, and at least one emulsifying agent, wherein the mass ratio R of the total amount of inverting agent to the total amount of emulsifying agent is superior to 1.2 and inferior to 10, wherein the inverting agent is a surfactant having a HLB superior or equal to 10 and the emulsifying agent is a surfactant having a HLB strictly inferior to 10,

Wherein the water in oil emulsion contains from 0.5% to 6% by weight of inverting agent; and wherein the water-soluble polymer has an average molecular weight by weight comprised between 1 and 30 million g/mol as calculated from the intrinsic viscosity of the polymer using the Mark-Houwink equation;

b. Inverting the water in oil emulsion by adding it into an aqueous fluid to form an injection fluid;

c. Introducing the injection fluid into portion of the subterranean formation,

wherein
- when the aqueous fluid of step b. is fresh water or a brine comprising up to 30.000 ppm of salts, R ratio is above 1.2,
- when the aqueous fluid of step b. is a brine comprising from 30.000 ppm to 70.000 ppm of salts, R ratio is above 1.8,
- when the aqueous fluid of step b. is a brine comprising from 70.000 ppm to 100.000 ppm, R ratio is above 2,
- when the aqueous fluid of step b. is a brine comprising from 100.000 ppm to 150.000 ppm of salts, R ratio is above 2.5,
- when the aqueous fluid of step b. is a brine comprising from 150.000 ppm to 200.000 ppm of salts, R ratio is above 3,
- when the aqueous fluid of step b. is a brine comprising from 200.000 ppm to 250.000 ppm of salts, R ratio is above 3.5, and
- when the aqueous fluid of step b.is a brine comprising more than 250.000 ppm of salts, R ratio is above 4."

III. The following document was *inter alia* cited in the decision of the opposition division:

D6: WO 2016/011106 A1

IV. In that decision the opposition division held, among others, that the subject-matter of claim 1 of the main

request involved an inventive step starting from document D6 as the closest prior art.

V. The opponent (appellant) filed an appeal against said decision. The following document was submitted by the appellant with the statement of grounds of appeal:

D14: graphs illustrating the results presented in the examples of the opposed patent

VI. With the rejoinder to the statement of grounds of appeal, the patent proprietor (respondent) filed five sets of claims as auxiliary requests 1 to 5 as well as the following documents:

Annexe 1: figures 1B, 7B, 13B and 14B of D14 with a different scale
Annexe 2: tables 1 to 5 of the opposed patent highlighting the differences between the examples

VII. The parties were summoned to oral proceedings and a communication pursuant to Article 15(1) RPBA indicating specific issues to be discussed at the oral proceedings was then sent to the parties.

VIII. With letter of 14 March 2025 the respondent filed the following document:

D15: US 7,004,254 B1

IX. With letter of 7 May 2025 the appellant filed further submissions, together with the following documents:

D16: product information brochure for polyoxyethylene (40) sorbitol hexaoleate, which is marketed by Croda under the name Atlas™ G-1086

D17: US 2016/200961 A1

X. Oral proceedings were held before the Board on 16 May 2025. At the end of the oral proceedings, the parties' final requests were as follows:

- The appellant requested that the decision under appeal be set aside and the patent be revoked.

- The respondent requested that the appeal be dismissed (main request) or, in the alternative, that the patent be maintained in amended form on the basis of one of auxiliary requests 2 or 5 filed with the reply to the statement of grounds of appeal.

XI. The respondent's main request corresponded to the main request considered allowable by the opposition division (reference is made to point II. for the wording of claim 1).

Claim 1 of auxiliary request 2 was amended with respect to claim 1 of the main request by the following addition at the end of the claim:

"wherein the inverting agent is selected from the group consisting of an ethoxylated nonylphenol; an ethoxy/propoxy alcohol; a tridecylic alcohol ethoxylated; and an ethoxy/propoxy fatty alcohol,

wherein the water-soluble polymer is either an anionic polymer having an anionicity comprised between 1 to 60 mol% or a cationic polymer having a cationicity comprised between 1 to 100 mol%."

Claim 1 of auxiliary request 5 was amended with respect to claim 1 of auxiliary request 2 by increasing the minimum R ratio as follows

"- when the aqueous fluid of step b. is fresh water or a brine comprising up to 30.000 ppm of salts, R ratio is above 2.5,
- when the aqueous fluid of step b. is a brine comprising from 30.000 ppm to 70.000 ppm of salts, R ratio is above 3,
- when the aqueous fluid of step b. is a brine comprising from 70.000 ppm to 100.000 ppm, R ratio is above 3.5,
- when the aqueous fluid of step b. is a brine comprising from 100.000 ppm to 150.000 ppm of salts, R ratio is above 4,
- when the aqueous fluid of step b. is a brine comprising from 150.000 ppm to 200.000 ppm of salts, R ratio is above 4.2,
- when the aqueous fluid of step b. is a brine comprising from 200.000 ppm to 250.000 ppm of salts, R ratio is above 4.5, and
- when the aqueous fluid of step b.is a brine comprising more than 250.000 ppm of salts, R ratio is above 5".

The remaining claims of these requests are not relevant to this decision.

XII. The parties' submissions, in so far as they are relevant to the present decision, can be derived from the reasons for the decision set out below. They essentially concerned the admittance of document D15 and whether claim 1 of the requests on file involved an inventive step starting from D6 as the closest prior art.

Reasons for the Decision

1. Admittance of document D15

1.1 D15 is a new item of evidence filed by the respondent with letter of 14 March 2025 and therefore after notification of the Board's communication under Article 15(1) RPBA (dated 17 January 2025). Its admission to the proceedings, which is contested by the appellant, is subject to the provisions of Article 13(2) RPBA, which provide that:

> "any amendment to a party's appeal case made after the expiry of a period specified by the Board in a communication under Rule 100, paragraph 2, EPC or, where such a communication is not issued, after notification of a communication under Article 15, paragraph 1, shall, in principle, not be taken into account unless there are exceptional circumstances, which have been justified with cogent reasons by the party concerned."

1.2 D15 was filed by the respondent to show that the friction reduction values reported in D6 (in particular in table 6 and 7 thereof) were not the maximum friction reduction. According to the respondent, D15, which was referenced in D6 and represented common general knowledge, provided evidence that it was not possible to determine the maximum friction reduction from four measurements only (see letter dated 14 March 2025, page 10, first to third paragraphs).

During the oral proceedings before the Board, the respondent stated that D15 allowed a better understanding of the results reported in D6 and that this document merely supported the arguments put forward in their rejoinder to the statement of grounds of appeal. Its filing was in reaction to the Board's communication under Article 15(1) RPBA, which expressed the view that D6 defined the maximum FR.

1.3 The appellant requested that D15 not be admitted into the appeal proceedings. This document had been filed without any justification for its late submission. The respondent had ample opportunity to introduce this document earlier, particularly since they were aware of document D6 and of the inventive step objection based on that document from the outset of the opposition proceedings. Furthermore, D15 was not *prima facie* relevant as it did not raise doubts on the results reported in D6.

1.4 As noted previously, D15 has been filed with the intention of showing that the friction reduction values reported in the examples of D6 could not be equated with the maximum friction reduction (see D6, tables 6 and 7). It is, however, noted that the question of whether it was possible to deduce the maximum friction reduction from the results of D6 had been discussed in the appellant's grounds of appeal (page 23, figures). In this regard, the appellant contended that the friction reduction values reported in Tables 6 and 7 of D6 reached a plateau corresponding to the maximum friction reduction. As this argument was clearly present in the statement of grounds of appeal, the respondent wishing to provide counter-evidence (such as D15) should have filed it with their rejoinder to the statement of grounds of appeal at the latest. For the

same reason its filing cannot be regarded as a reaction to the Board's communication, since this merely followed the appellant's objection raised in opposition and maintained at the onset of the appeal proceedings. In view of this, the Board recognises no exceptional circumstances that would justify filing D15 after the Board's preliminary opinion.

1.5 The respondent argued that D15 was used merely to support their contention put forward in the rejoinder to the statement of grounds of appeal that the friction reduction values of D6 were not the maximum friction reduction. In other words, the respondent considered that D15 should not be seen as an amendment of their case which would imply that the Board would have no discretion not to admit D15 into the proceedings.

1.6 This is not convincing. While it is true that the respondent initially briefly alleged that D6 did not disclose the maximum friction reduction (see rejoinder to the statement of grounds of appeal, page 10, first and second paragraph), it was not explained why the friction reduction values at 3 minutes reported in D6 could not be seen as the maximum friction reduction (as argued by the appellant). It was only in their letter dated 14 March 2025 that the appellant contended that four measurements (as done in D6) would be insufficient to measure the maximum friction reduction and provided D15 in support for this allegation of fact. Therefore, the Board is presented with new facts and evidence which go beyond the initial line of argument of the respondent as put forward in their rejoinder. It follows that D15 and any argument linked thereto constitute an amendment of the respondent's case, the admittance of which is subject to the discretion of the Board.

1.7 Under these circumstances and in the absence of exceptional circumstances, document D15 and any argument based thereon are not taken into account (Article 13(2) RPBA).

Main request (patent as maintained by the opposition division)

2. Inventive step

In the decision under appeal (point 9.3 of the Reasons), the opposition division found that the subject-matter of claim 1 of the main request involved an inventive step starting from document D6 as the closest prior art. This finding is contested by the appellant.

2.1 Closest prior art

It was not disputed between the parties that D6 and in particular its sample N of example 3 could be considered as the closest prior art for the subject-matter of operative claim 1. The Board has no reason to depart from that view.

As regards the additional documents filed by the parties in appeal proceedings in the context of inventive step, there was agreement that only document D15 was relevant, whereas D16 and D17 were not (see page 2, sixth paragraph, of the minutes of the oral proceedings). Thus the Board did not need to address admittance of the latter documents into the proceedings.

2.2 Distinguishing features

2.2.1 According to the appellant (statement of grounds of appeal, page 30, second to last paragraphs), example 3 of D6 disclosed a process of treating a subterranean formation, comprising

- providing a water in oil emulsion of at least one water-soluble polymer, said emulsion comprising at least one inverting agent and at least one emulsifying agent;

- inverting the water in oil emulsion by adding it into a brine comprising 247 000 ppm of salts fluid to form an injection fluid and

- introducing the injection fluid into a portion of the subterranean formation.

However, the mass ratio R of the total amount of inverting agent to the total amount of emulsifying agent (hereinafter "ratio R") in example 3 of D6 ranged from 0.73 (for sample H) to 1.33 (for sample N) instead of at least 3.5 in the case of a brine comprising comprising from 200.000 ppm to 250.000 ppm of salts. Ratio R was therefore the sole distinguishing feature between claim 1 and sample N of D3.

2.2.2 The respondent disagreed with the appellant's contention and argued that D6 did not disclose the following features (rejoinder, page 13, last paragraph; letter dated 14 March 2025, page 9, third and fourth paragraph; minutes of the oral proceedings before the Board, page 3, last paragraph):

(i) a ratio R;
(ii) a ratio R which varies as a function of salinity;

(iii) a water soluble polymer with a molecular weight between 1 and 30 million g/mol;

(iv) a ratio R of at least 3.5 for a brine comprising from 200.000 ppm to 250.000 ppm of salts (corresponding to the distinguishing feature identified by the appellant).

2.2.3 The Board is not convinced that features (i) to (iii) can be seen as distinctive for the following reasons:

Feature (i): the respondent stated that D6 did not mention a ratio R. However, contrary to the respondent's view, D6 does not have to explicitly mention a ratio R to disclose one, as long as this is unambiguously derivable from the explicit disclosure. It is not disputed that example 3 of D6 discloses water-in-oil emulsions containing a fixed concentration of emulsifying agent (1.5 w%) combined with an inverting agent at increasing concentrations ranging from 1.1 to 2.0 w% (see table 5 of D6). Based on the amounts of these compounds in sample N (which comprises 2.0 w% of inverting agent), a ratio R of 1.33 can be calculated and is therefore implicitly disclosed.

Feature (ii): the respondent considered that the prior art must disclose that the ratio R should vary depending on the brine salinity. This is, however, not a process step of present claim 1 which only requires that the R ratio is within a certain range which depends on the brine salinity. Indeed, operative claim 1 merely specifies the following:

"- when the aqueous fluid of step b. is fresh water or a brine comprising up to 30.000 ppm of salts, R ratio is above 1.2,

- when the aqueous fluid of step b. is a brine comprising from 30.000 ppm to 70.000 ppm of salts, R ratio is above 1.8,
- when the aqueous fluid of step b. is a brine comprising from 70.000 ppm to 100.000 ppm, R ratio is above 2,
- when the aqueous fluid of step b. is a brine comprising from 100.000 ppm to 150.000 ppm of salts, R ratio is above 2.5,
- when the aqueous fluid of step b. is a brine comprising from 150.000 ppm to 200.000 ppm of salts, R ratio is above 3,
- when the aqueous fluid of step b. is a brine comprising from 200.000 ppm to 250.000 ppm of salts, R ratio is above 3.5, and
- when the aqueous fluid of step b.is a brine comprising more than 250.000 ppm of salts, R ratio is above 4."

In the Board's view, to anticipate claim 1 of the main request, it is sufficient that, for a given aqueous fluid with a specific salt content, the ratio R is within the corresponding range. In the present case, it would therefore be sufficient that D6 discloses a ratio R of above 3.5 to 10 for a brine comprising comprising from 200.000 ppm to 250.000 ppm of salts. An active adaptation of the ratio R to the brine salinity is not a process feature of claim 1 and is therefore not required.

Feature (iii): as the appellant noted in the statement of grounds of appeal (second half of page 29), D6 discloses that the molecular weight of the water-soluble polymer present in the water-in-oil emulsion is typically between 2 and 30 million g/mol, thus anticipating feature (iii) (see D6, paragraph [0058]).

2.2.4 Accordingly, the Board considers that the subject-matter of claim 1 differs from example 3, sample N of D6 only in that:

> the water in oil emulsion is characterised by a ratio R superior to 3.5 and inferior to 10 (instead of 1.33 in sample N of D6 for a brine with a salt content of 247,000 ppm).

2.3 Problem to be solved

2.3.1 The appellant considered that the examples of the patent failed to show that the specified ratio R consistently improved friction reduction across different salt concentrations. They re-plotted the experimental data of the patent (see D14), demonstrating that the maximum friction reduction was not obtained at lower ratio endpoints, indicating that these values were chosen arbitrarily. Additionally, friction reduction did not reliably increase with higher R values, and no data had been provided for certain salt concentration ranges. The appellant also noted that friction reduction depended on the type of inverting agent used, further suggesting that the defined R and salt concentration ranges were not consistently effective. Accordingly, in the absence of evidence that any improvement was obtained over the whole scope of claim 1, the objective technical problem to be solved should be formulated as the provision of an alternative (statement of grounds of appeal, pages 16 to 18, point 2.). The appellant further criticised that, for a salt content comprised between 200,000 ppm to 250,000 ppm, no technical effect could be observed between R values of 3.4 and R values above 3.5 (letter dated 7 May 2025, page 8, third to fifth paragraph).

2.3.2 The respondent argued that the claimed invention provided an improvement of the friction-reducing properties of a water-in-oil polymer emulsion by enabling the polymer to be released efficiently, even at high salinity levels. Experimental data in the patent demonstrated that the polymer release time and friction reduction rate varied with salinity. However, the appellant only considered maximum friction reduction ("Max FR") across different R values and salinity levels, overlooking the time to reach the maximum friction reduction ("Time to Max FR"). The respondent emphasised that both "Max FR" and "Time to Max FR" needed to be analysed together, as the invention aimed at optimising both the speed and degree of friction reduction, rather than increasing friction reduction alone (rejoinder, page 7, first to seventh paragraph). In addition, the present invention made it possible to increase friction reduction by a factor of 5 or 7, compared with the ratio R (1.33) of D6. For a ratio R of 3.9, the friction reduction was equal to 26.28 and 24.50, whereas it was only of the order of 5.08 and 3.45 for a ratio R of 1.5 (letter dated 14 March 2025, page 9, table).

2.3.3 With regard to the experimental evidence provided in the opposed patent, the Board agrees with the respondent that the maximum friction reduction ("Max FR") increases when the ratio R increases and crosses the lower limits of the ranges defined in claim 1. As a matter of example, in the presence of sea water, the Max FR is below 24 % for a ratio R of 1.06 or 1.5 while it is at least 34 % for a ratio R of at least 2.25 (see table 2 of the opposed patent). Claim 1 of the main request requires a ratio of at least 1.8 if the brine comprises from 30.000 ppm to 70,000 ppm of salts (such

as sea water) and the examples of table 2 make it credible that an improvement of the friction reduction can be achieved in the range defined. The same trend is observed with different brines and different inverting agents as shown in tables 2 to 5 of the patent. Notwithstanding the above, as noted by the appellant (letter dated 7 May 2025, bridging paragraph between pages 8 and 9), the friction reduction in example 3, sample N of D6 is already at a high level (about 71%) and in particular above the friction reductions obtained in the examples of the patent which culminate at about 53 % (see opposed patent, table 5). It follows that a multiplication of the friction reduction by a factor of 5 or 7 as alleged by the respondent would not be physically possible starting from sample N of D6 as the closest prior art (as the friction reduction cannot be above 100%).

In view of all the reasons above, the Board can recognise a positive effect of ratio R on the maximum friction reduction, but not at the level alleged by the respondent.

2.3.4 The appellant further criticised that the experimental data provided in the patent did not cover all possible brines defined in claim 1.

According to established case law (Case Law of the Boards of Appeal, 11th edition 2025, in the following "Case Law", I.D.9.9.3), a technical problem may be regarded as being solved only if it is credible that substantially all claimed embodiments exhibit the technical effects upon which the invention is based.

In the present case, the Board notes that the examples of the patent were carried out with brines having salt

contents ranging from less than 30,000 ppm to 220,000 ppm and with different inverting agents (see opposed patent, paragraphs [0095] to [0098]). In all cases an improvement of the friction reduction was observed. On this basis, it is at least credible that this improvement can be achieved over the whole scope of claim 1, even if some data points are missing.

2.3.5 The appellant also contended that no significant change in friction reduction would be observed at the lower endpoints of the ratios defined in claim 1 (statement of grounds of appeal, page 16, final paragraph). In the Board's view, however, this statement is speculative and not supported by Tables 2 to 5 of the opposed patent. What is relevant instead is that the friction reduction is better for R values above the chosen lower limit for each range than for R values below it.

2.3.6 The respondent stated that an improvement of "Time to Max. FR" should also be acknowledged. In that respect the Board notes that the time needed to obtain the maximum friction reduction is not always reduced when increasing the R value, as shown in table 2, last column of the opposed patent. Accordingly, this partial problem is not solved over the whole scope of claim 1 and must therefore be ignored.

2.3.7 Consequently, on the basis of the experimental evidence provided in the patent, the Board is of the opinion that the objective technical problem to be solved should be formulated as the provision of a method of treating a portion of a subterranean formation with increased maximum friction reduction of the injection fluid.

2.4 Obviousness

2.4.1 It remains to be evaluated whether it was obvious for a skilled person wishing to improve the maximum friction reduction of the injection fluids of D6 to increase ratio R above 3.5 (starting from example 3 of D6, in which brines containing between 200,000 ppm and 250,000 ppm of salts are used).

2.4.2 The appellant contended that D6 would provide direct evidence of the effect of ratio R on the friction reduction thereby providing a clear incentive to increase that ratio (statement of grounds of appeal, page 24, second to last paragraph).

2.4.3 The respondent argued that the appellant's contention — that friction reduction improved as ratio R increased — was incorrect. While theoretically, a higher amount of inverting agent might speed up the polymer's release into the injection fluid, this did not necessarily enhance the maximum friction reduction. Furthermore, D6 only examined friction reduction at specific time points (e.g. 30 seconds, 1, 2, or 3 minutes), but not the maximum friction reduction achievable. The respondent further pointed out that the best result demonstrated in D6 was obtained in Table 2 with emulsion B (72% friction reduction after 3 minutes) and for a ratio R of 0.93. In addition, contrary to the appellant's view, D6 did not suggest increasing ratio R with the salt concentration (rejoinder, page 10, first to third paragraph; letter dated 14 March 2025, page 9, last paragraph to page 10, last paragraph).

2.4.4 The first point of dispute between the parties is whether document D6 discloses the maximum friction reduction or merely the friction reduction at certain time points. In that regard the Board agrees with the

appellant that table 7 of D6 shows that the friction reduction for samples M and N increases with time to reach a plateau (statement of grounds of appeal, page 23, second graph). Indeed the friction reduction achieved after 3 minutes can be regarded as the maximum friction reduction, as no further increase is observed between 2 and 3 minutes. Furthermore, as noted by the appellant, it is not apparent that the opposed patent discloses that the maximum friction reduction should be evaluated differently than by measuring the friction reduction as a function of time until a plateau is reached. The Board is therefore of the opinion that D6 discloses the maximum friction reduction (which is the friction reduction reached after 3 minutes in case of samples M and N).

2.4.5 The second point of dispute is whether the skilled person would derive from the disclosure of D6 that the maximum friction reduction can be increased by increasing the ratio R. In that respect, the Board takes the view that table 7 of D6 clearly shows that at a given amount of emulsifying agent the maximum friction reduction increases with the inverting agent content and therefore with the ratio R of the two amounts. Indeed, sample N contains 2 wt.% inverting agent and is characterised by an increased friction reduction compared to sample M which differs from sample N only in that it contains 1.5 wt.% inverting agent. The same trend is observed in table 6 of D6. Therefore, in view of these experimental results, the skilled person would recognise that by further increasing the inverting agent content (and thus ratio R) a further improvement of the friction reduction would be expected. It follows that increasing ratio R from 1.33 (in sample N) to any higher value such a value above 3.5 (as required by claim 1) is considered

to be obvious for a skilled person wishing to improve the maximum friction reduction (obvious to try).

2.4.6 The respondent argued that sample B of D6 produced the best results in terms of friction reduction for a ratio R of 0.93. This contradicted the appellant's contention concerning the effect of this ratio (see D6, table 2). This is also not convincing. As noted by the appellant during the oral proceedings, the results reported in table 2 of D6 concern a brine with a lower salt concentration (165,000 ppm) than the brines used in Example 3 of D6 (206,000 ppm or 247,000 ppm) (see D6, paragraphs [0092], [0104] and [0106]). Therefore the result of sample B cannot be directly compared to those of example 3. In any case, even if sample B of D6 were considered a further solution to maximising friction reduction, it remains that increasing the amount of inverting agent and therefore the ratio R as one of the possible solutions available to the skilled person requires no particular skills and hence does not involve an inventive step.

2.4.7 In this context, it is further noted that, in cases involving an arbitrary choice among alternative solutions, the prior art does not need to provide a specific incentive for the skilled person to select the particular solution claimed (Case Law, I.D.9.21.9 a), in particular T 1862/15, Reasons 8.4). Rather, a relevant consideration could be whether the prior art contains any teaching that would discourage the skilled person from choosing the claimed solution — in the present case, increasing the ratio R above 3.5. However, the respondent has not identified any such discouraging teaching in D6.

2.4.8 Regarding the respondent's argument that D6 would not disclose that the ratio R should be increased with brine salinity, this point has already been addressed (point 2.2.3 of the reasons). As the method does not include a process step of active adaptation of the ratio R to the brine salinity, this is not a limiting feature of operative claim 1 and it is irrelevant whether or not D6 discloses this feature.

2.5 For these reasons, the subject-matter of claim 1 of the main request does not involve an inventive step starting from D6 as the closest prior art.

Auxiliary request 2

3. Inventive step

3.1 Claim 1 of auxiliary request 2 was amended with respect to claim 1 of the main request by specifying that:

(i) the inverting agent is selected from the group consisting of an ethoxylated nonylphenol; an ethoxy/propoxy alcohol; a tridecylic alcohol ethoxylated; and an ethoxy/propoxy fatty alcohol, and

(ii) the water-soluble polymer is either an anionic polymer having an anionicity comprised between 1 to 60 mol% or a cationic polymer having a cationicity comprised between 1 to 100 mol%.

3.2 The main point of dispute between the parties was whether features (i) and (ii) constituted additional distinguishing features between present claim 1 and

example 3, sample N of D6. The Board will therefore address these features separately in what follows.

3.3 Feature (i) (nature of the inverting agent)

3.3.1 The respondent stated that the inverting agent used in example 3 of D6 was a C_{12}–C_{14} 9-mole ethoxylate which was not mentioned in the list of inverting agents of present claim 1 (letter dated 14 March 2025, page 11, antepenultimate paragraph; D6, page 23, paragraph [0102]). For the first time during the oral proceedings before the Board, the respondent argued that this compound was not necessary an ethoxylated alcohol (emphases here and below added by the Board).

3.3.2 In that respect the Board agrees with the appellant that a C_{12}–C_{14} 9-mole ethoxylate corresponds to an ethoxy/propoxy fatty alcohol according to operative claim 1 (letter dated 7 May 2025, page 11, second full paragraph). It is indeed notorious, as stated by the appellant during oral proceedings, that this type of compounds are obtained by ethoxylating a C_{12}–C_{14} fatty alcohol. This is further supported by D6, page 15, paragraph [0067].

3.3.3 Therefore, feature (i) does not constitute an additional distinguishing feature between operative claim 1 and example 3, sample N of D6.

3.4 Feature (ii) (nature of the water-soluble polymer)

3.4.1 The appellant contended that the water soluble polymer of example 3 comprised 26.86 mol% of cationic units derived from acryloyloxyethyltrimethyl ammonium chloride (AETAC) and 2.89 mole % of anionic units derived from acrylic acid (AA). Therefore, this polymer

had the cationicity and the anionicity required by feature (ii) of present claim 1 (statement of grounds of appeal, page 41, penultimate paragraph; D6, page 23, paragraph [0102]).

3.4.2 The respondent argued that the polymer of example 3 was amphoteric but not anionic or cationic as required by operative claim 1. In that regard, the opposed patent made it clear that amphoteric polymers belong to a class different from the ones of anionic, cationic and nonionic polymers (see paragraph [0034]).

3.4.3 The Board cannot follow this line of argument. While it is true that the opposed patent discloses several options for the water-soluble polymer — anionic, nonionic, cationic and amphoteric — it is well known and not disputed that amphoteric polymers contain both anionic and cationic groups. In view of this, they can be considered, in this context, both anionic and cationic. Therefore, the polymer in example 3, which comprises both cationic and anionic groups, can be considered at the same time a cationic polymer and an anionic polymer (as well as an amphoteric one in view of the double functionality). In view of the fact that the cationicity of that polymer was calculated to be 26.86 mol%, the Board agrees with the appellant that this polymer corresponds to a cationic polymer having a cationicity between 1 and 100 mol% as required by feature (ii) of operative claim 1. Already for that reason, feature (ii) is not a distinguishing feature between operative claim 1 and example 3 of D6.

3.4.4 On the same token, the anionicity of the polymer of example 3 was calculated to be 2.89 mol% which means that this polymer also corresponds to an anionic

polymer having a anionicity between 1 and 60 mol% as required by feature (ii) of operative claim 1.

3.4.5 During the oral proceedings, the respondent further objected to the admittance of the data concerning the anionicity and cationicity of the polymer of example 3 of D6, which was provided by the appellant with the letter dated 7 May 2025 (see page 13, fourth paragraph to page 14, fourth paragraph). They argued that the limited time available between these submissions and the oral proceedings did not allow them to verify the appellant's calculations. As the Board did not need to rely on the submissions of 7 May 2025 for the present assessment of feature (ii), a decision on their admittance was unnecessary. As previously noted, the Board relied on the calculation set out in the statement of grounds of appeal (page 41, penultimate paragraph). This specific calculation was not contested by the respondent and the Board has no reason to doubt its validity.

3.4.6 For these reasons, the Board concludes that feature (ii) does not constitute an additional distinguishing feature between operative claim 1 and example 3, sample N of D6.

3.5 Since none of the new features of claim 1 of auxiliary request 2 constitutes an additional distinguishing feature over claim 1 of the main request, the previous finding of lack of inventive step of the main request applies *mutatis mutandis* to auxiliary request 2 (see point 2. of the reasons).

Auxiliary request 5

4. Inventive step

4.1 Claim 1 of auxiliary request 5 differs from claim 1 of auxiliary request 2 in that the minimum R ratio is increased as follows:

- when the aqueous fluid of step b. is fresh water or a brine comprising up to 30.000 ppm of salts, R ratio is above 2.5,
- when the aqueous fluid of step b. is a brine comprising from 30.000 ppm to 70.000 ppm of salts, R ratio is above 3,
- when the aqueous fluid of step b. is a brine comprising from 70.000 ppm to 100.000 ppm, R ratio is above 3.5,
- when the aqueous fluid of step b. is a brine comprising from 100.000 ppm to 150.000 ppm of salts, R ratio is above 4,
- when the aqueous fluid of step b. is a brine comprising from 150.000 ppm to 200.000 ppm of salts, R ratio is above 4.2,
- when the aqueous fluid of step b. is a brine comprising from 200.000 ppm to 250.000 ppm of salts, R ratio is above 4.5, and
- when the aqueous fluid of step b.is a brine comprising more than 250.000 ppm of salts, R ratio is above 5.

4.2 Distinguishing features

As explained previously (see points 2.2.4 and 3.5 of the reasons), the Board considers that the sole distinguishing feature between example 3, sample N of D6 and claim 1 of the main request and auxiliary request 2 is the value of the ratio R. The same applies to auxiliary request 5 with the difference that the minimum ratio R is further increased. Hence claim 1 of

auxiliary request 5 differs from example 3, sample N of D6 in that

> the water in oil emulsion is characterised by a ratio R superior to 4.5 and inferior to 10 (instead of 1.33 in sample N of D6 for a brine with a salt content of 247,000 ppm).

4.3 Problem to be solved

4.3.1 During the oral proceedings, the respondent argued that tables 4 and 5 of the opposed patent showed that increasing the ratio R further led to a reduction in the time needed to reach maximum friction reduction.

4.3.2 As pointed out in the context of the main request (see point of 2.3.6 the reasons), the Board notes that the time needed to obtain the maximum friction reduction is not always reduced as shown in table 2, last column of the opposed patent. This point was not addressed by the respondent and the Board has no reason to come to a different conclusion as far as auxiliary request 5 is concerned.

4.3.3 Accordingly the problem to be solved remains the provision of a method of treating a portion of a subterranean formation with increased maximum friction reduction of the injection fluid.

4.4 Obviousness

4.4.1 It remains to be evaluated whether it was obvious for a skilled person wishing to improve the maximum friction reduction of the injection fluids of D6 to increase the ratio R above 4.5 (starting from example 3 of D6, in

which brines containing between 200,000 ppm and 250,000 ppm of salts are used).

4.4.2 During the oral proceedings, the respondent argued that D6 recommended using a ratio R of less than 1. Furthermore, the skilled person would have expected the emulsion to become unstable if this ratio were increased above 4.5.

4.4.3 This is not convincing. As noted previously, the ratio R of sample N is 1.33. It is therefore not credible that D6 would teach away of increasing ratio R above 1. As regards the statement that the emulsion would become unstable if the R ratio were greater than 4.5, this is not supported by any evidence and must therefore be disregarded as an unsubstantiated allegation.

4.4.4 In the context of the main request, the Board found that it was obvious for a skilled person wishing to improve the maximum friction reduction to increase ratio R to any level above 1.33 and in particular above 3.5 (see point 2.4.5 of the reasons). The same conclusion applies to a level of at least 4.5, insofar as the effect of that increase is the same and there was no technical prejudice preventing the skilled person from doing so.

4.5 For these reasons, the subject-matter of claim 1 of the auxiliary request 5 does not involve an inventive step starting from D6 as the closest prior art.

5. Since none of the requests meets the requirements of inventive step, the patent must be revoked. There is therefore no need to rule on other objections.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

D. Hampe D. Semino

Decision electronically authenticated