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Datasheet for the decision of 27 November 2013

Case Number: T 0054/11 - 3.3.06

Application Number: 03003737.8

Publication Number: 1323888

IPC: E21B43/26

Language of the proceedings: EN

Title of invention:
Method of fracturing a subterranean formation

Patent Proprietor:
Schlumberger Technology Corporation

Opponent:
Akzo Nobel N.V.

Headword:
Fracturing with viscoelastic fluid/SCHLUMBERGER

Relevant legal provisions:
EPC Art. 52(1), 54, 56, 76(1), 84, 100(b), 100(c), 114(2), 123(2)
RPBA Art. 12(4), 13(1), 13(3)

Keyword:
Experimental report filed with statement of grounds of appeal - admitted (no)
Claims request filed at oral proceedings - admitted (yes)
Inventive step - (yes) non-obvious alternative

Decisions cited:

Catchword:

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Case Number: T 0054/11 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 27 November 2013

Appellant: (Opponent)	Akzo Nobel N.V. Velperweg 76 NL-6824 BM Arnhem (NL)
Representative:	Alferink, Petrus J.T. Akzo Nobel N.V. Intellectual Property Dept. P.O. Box 9300 6800 SB Arnhem (NL)
Respondent: (Patent Proprietor)	Schlumberger Technology Corporation 110 Schlumberger Drive Sugarland, Texas 77478 (US)
Representative:	Hendrick, P.A.M. FRESHFIELDS BRUCKHAUS DERINGER PO Box 75299 1070 AG Amsterdam (NL)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 3 November 2010 concerning maintenance of the European Patent No. 1323888 in amended form.**

Composition of the Board:

Chairman: B. Czech
Members: P. Ammendola
U. Lokys

Summary of Facts and Submissions

I. This appeal of the opponent is from the interlocutory decision of the opposition division concerning maintenance of European patent No. 1 323 888 in amended form. The patent in suit was granted on a divisional application of the international application published as WO 98/56497 A1 (below **parent application**).

II. The patent in suit had been opposed on the grounds of Articles 100(a), (b) and (c) EPC. The documents considered in the opposition proceedings include the following:

D1 = US-A-5,009,799;

D3 = WO 92/14907;

D8 = US-A-5,551,516;

D9 = EP-A-0 342 786;

D10 = US-A-5,700,766

and

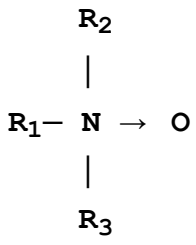
D11 = "Fluid Mechanics" in Ullman's Encyclopedia of Industrial Chemistry, 5th Ed., VCH Verlaggesellschaft mbH, 1990, pages 5-32 to 5-45.

III. Claim 1 according to the main request filed at the oral proceedings on 7 December 2009 and held allowable by the opposition division reads as follows (features added to claim 1 as granted highlighted by the board):

"*1. A method of* ***fracturing*** *a subterranean formation comprising the step of pumping a viscoelastic fluid through a wellbore* ***into a subterranean formation at a pressure sufficient to fracture the formation,*** *wherein said viscoelastic fluid comprises:*

a) an aqueous medium;
b) a surfactant selected from the group consisting of amphoteric surfactants, zwitterionic surfactants, and mixtures thereof; and
c) a member selected from the group consisting of organic acids, organic acid salts, inorganic salts, and combinations of one or more organic acids or organic acid salts with one or more inorganic salts; wherein said fluid exhibits the property of viscoelasticity,

wherein, if said zwitterionic surfactant is an amine oxide, the surfactant is selected from surfactants having the formula:



wherein R_1 represents a hydrophobic moiety of alkyl, alkylarylalkyl, alkoxyalkyl, alkylaminoalkyl and alkylamidoalkyl, wherein alkyl represents a group that contains from 16 to 22 carbon atoms which may be branched or straight chained and which may be saturated or unsaturated and R_2 and R_3 are independently an aliphatic chain having from 1 to 30 atoms.".

IV. As regards said request, the opposition division found in the decision under appeal
- that the requirements of Articles 123(2) and 76(1) EPC were met,
- that the invention was sufficiently disclosed,
- that the claimed subject-matter was novel vis-à-vis the prior art described in documents D1 and D3, and
- that it was not obvious for a skilled person starting from the prior art disclosed in document D8 and aiming to provide a **method** for **f**racturing subterranean formations using a **v**isco**e**lastic **f**luid (below **FVEF met**hod) as claimed wherein the **v**isco**e**lastic **fluid** (below **VE fluid**) had "enhanced viscosity and stability at formation temperatures above 225°F (107°C)" (see paragraph 19 of the decision under appeal).

V. On 10 January 2011 the appellant (opponent) filed notice of appeal and paid the appeal fee on the same day. With its statement setting out the grounds of appeal received at the EPO on 11 March 2011, the appellant filed two documents labelled D12 and D13 and an experimental report labelled "D14". It maintained objections under Articles 100(a),(b) and (c) EPC against the claims held allowable by the opposition division.

VI. In its response, the respondent (proprietor of the patent) rebutted the objections raised by the appellant and held that document D14 should not be admitted to the proceedings. Under cover of the same letter, it also filed two further references labelled D15 and D16 as well as several amended sets of claims as auxiliary requests.

VII. The parties were summoned to oral proceedings.

VIII. In response to the summons, the appellant submitted in writing *inter alia* objections regarding lack of clarity, insufficiency of the disclosure, added matter and lack of novelty and inventive step against all the requests on file.

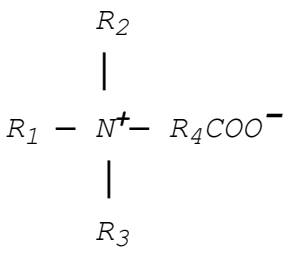
IX. The respondent responded to the summons by re-iterating and further detailing why D14 should not be admitted to the proceedings, and providing further comments on documents D1 and D8. Moreover, it filed replacement auxiliary requests.

With three later letters it filed additional comments and repeatedly changed its claims requests. In reply to an invitation by the board to clarify its pending requests, the respondent filed, by fax of 25 November 2013, eight sets of amended claims as main request and auxiliary requests 1 to 7.

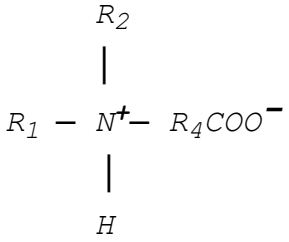
X. At the oral proceedings held before the board on 17 November 2013, following a debate on formal issues regarding the requests on file, the respondent filed as its sole final request one set of amended claims labelled "Main Request". The issues addressed in respect of this request were the admissibility of the request, the allowability of the amended claims under Articles 84 and 76(1)/123(2) EPC, sufficiency of disclosure, novelty and inventive step.

XI. Claim 1 according to the request filed at the oral proceedings differs from claim 1 held allowable by the opposition division in that the features "*wherein, if said zwitterionic surfactant is an amine oxide, the surfactant is selected from surfactants having the formula ..... from 1 to 30 atoms*" (see above Section III) are replaced by the following features:

"*wherein said surfactant is represented by formula (I):*



or the formula (II):



wherein R_1 represents a hydrophobic moiety of alkyl or alkyamidopropyl wherein alkyl represents a group that contains from 12 to 24 carbon atoms which may be branched or straight chained and which may be saturated or unsaturated; R_2 and R_3 are independently methyl, ethyl, benzyl, hydroxyethyl, hydroxypropyl, acetate or propionate; and R_4 is a hydrocarbyl radical with a chain length of 1 to 4."

XII. The parties' arguments regarding the respondent's Main Request can be summarised as follows:

The **appellant**, at the oral proceedings before the board, did not object to the late filing of the respondent's Main Request into the appeal proceedings and explicitly confirmed to have been given enough time to deal with this request.

It held that the experimental report D14 was admissible

since although it had only been filed with the statement of grounds of appeal, the data presented therein merely confirmed what the skilled reader of document D1 would expect as to the viscoelastic behaviour of the fluids disclosed in the examples of D1. It rebutted the criticisms of the respondent as to the absence in D14 of sufficient experimental details by observing that the report contained an unambiguous statement that the examples of the prior art had been reproduced by following the exact instructions of document D1.

The appellant furthermore held that claim 1 at issue was objectionable under Article 84 EPC 1973 and/or Article 123(2) EPC in view of the difference between formula (II) of this claim and formula VI contained in the description of the application as filed, and still present in the description of the patent in suit.

Moreover, the subject-matter of claim 1 at issue defined subject-matter which was not originally disclosed since it resulted from "singling out" some of the VE fluids disclosed in the parent application and in combining these selections with the method of fracturing only defined in general terms e.g. in claim 45 of the parent application as filed.

Regarding sufficiency of disclosure the appellant argued that paragraph [0008] of the patent in suit provided a definition of the term "*viscoelastic*" that was vague. In any case, the latter definition was much broader than that implied by the disclosure in paragraph [0011] of the patent in suit mentioning two of the methods that could be used to verify the viscoelastic nature of a fluid. In particular, a skilled person facing a negative result when using any

of these two methods could not exclude that the tested fluid could nevertheless be found to be viscoelastic within the broadest meaning of the term when using another method suitable for determining this property. Hence, the skilled person was not able to identify those VE fluids which were needed for carrying out the invention.

The appellant considered the disclosure of document D1 to be novelty-destroying for claim 1 at issue despite the fact that D1 did not explicitly qualify as viscoelastic the fluids disclosed therein. In the opinion of the appellant, the implicit viscoelastic nature of such fluids was not only proven by the experimental report D14 but was also apparent from their rheological properties as described in D1, e.g. the reversible shear thinning effect apparent from the Table of Example 3 of document D1, and from the fact that the fluids (e.g. of Examples 1 to 3) of document D1 were in accordance with all remaining features of claim 1 at issue, in particular with formula (I).

Similarly, ingredients of the VE fluid as defined in claim 1 at issue were also present in the compositions suitable for fracturing formations described in document D3 (e.g. Examples 1 to 3). This justified the conclusion that also these fracturing compositions had to be implicitly viscoelastic. Hence, document D3 also anticipated the subject-matter of present claim 1.

As to the issue of inventive step, the appellant stressed that only the viscosity *vs.* temperature data in Table 3 of the patent in suit were relevant with regard to the subject-matter of present claim 1. In its opinion the comparison between these data and those reported in the Table of Example 2 of document D8 for a

VE fluid comprising a different surfactant, did not prove that the viscosities of the VE fluids of the invention were more stable or enhanced otherwise vis-à-vis the prior art.
Hence, the sole technical problem credibly solved by the subject-matter of claim 1 was the provision of a further FVEF method, i.e. of an alternative to the prior art methods. Since documents D9 and D10 disclosed VE compositions containing surfactants falling under the formulae in present claim 1, the claimed FVEF method was obvious in view of the combination of document D8 with any of D9 or D10.

According to the **respondent**, its (final) Main Request was filed at the oral proceedings in reaction to objections that the appellant only raised at the hearing.

It held that experimental report D14 should not be admitted into the appeal proceedings, not only because it could and should have been filed with the grounds of opposition rather then with the grounds of appeal, but also because it appeared of very limited probative value due to the absence of sufficiently detailed indications concerning the experiments actually carried out. Thus, D14 not only had been filed unacceptably late but was also not of high *prima facie* relevance.

The respondent held that formula (II) contained in claim 1 at issue depicted exactly the same class of compounds as originally used formula VI. Since these formulas were equivalent, the appellant's formal objections (lack of support and/or clarity, added subject matter) were unfounded.

The respondent stressed that amended claim 1 at issue

found a basis at page 3, lines 5 to 9, of the parent application as filed, where it was stated that the "*inventive viscoelastic fluid*" (i.e. any thereof) could be used for fracturing, i.e. in a method according to claim 45 of said parent application). Moreover, the two formulae in present claim 1 corresponded to the original formulae I and VI in the parent application, for which the general and preferred meanings of "R_1" to "R_4" were defined from page 6, line 29 to page 7, line 23, thereof. The definition provided in present claim 1 did not amount to some "singling out" from the original definitions already because it gave the broadest original definition for "R_4" and for the "*alkyl*" alternative for "R_1". The additional option given in claim 1 for "R_1" was that of the whole group of "*alkylamidopropyl*" explicitly disclosed as being "*representative*" at page 7, lines 3 to 5. The seven specific alternatives now listed in claim 1 for the "R_2" and "R_3" corresponded instead to the complete list of the "*preferred*" variants for such groups indicated in the parent application at page 7, lines 16 to 20.

The respondent rebutted as manifestly unfounded the appellant's objection regarding sufficiency of disclosure based on the absence in the patent in suit of a precise definition of the term "*viscoelastic*". The meaning of "*viscoelastic fluid*" was well established and supported by ample common general knowledge resumed in many textbooks, encyclopedias, etc.

On the issue of novelty the respondent argued, *inter alia,* that the possible presence in the fluids or compositions described in documents D1 or D3 of ingredients possibly falling under the definitions of the ingredients of the presently claimed FVEF method,

were insufficient to conclude that any of these fluids of the prior art had also to be viscoelastic. Nor would any sound conclusion as to the viscoelastic nature of the fluids disclosed in document D1 be justified simply because of the alleged ability of these fluids of the prior art to display reversible shear thinning effects.

As to the assessment of inventive step for the FVEF method of claim 1 at issue starting from Example 2 of document D8, the respondent considered that the opposition division had correctly identified the technical problem solved. The differences between the data reported in Table 3 of the patent in suit and those reported in the Table of example 2 of document D8, demonstrated that upon increasing the temperature, the viscosity decrease of the VE fluid according to the invention was less pronounced.
In any case, the subject-matter of claim 1 at issue could not possibly be rendered obvious by the combination of document D8 with any of documents D9 or D10, since none of the latter related to VE fluids suitable for fracturing subterranean formations.

Reasons for the Decision

Procedural issues

1. Admissibility of the respondent's Main Request

1.1 The board accepts that the filing of this request during oral proceedings represents a reaction to new objections that the appellant only raised at the hearing. Moreover, the filing of this request did not introduce issues that the appellant or the board could not be expected to deal with without adjournment of the

oral proceedings. Accordingly, the appellant did not object to the admissibility of this request in view of its filing at the oral proceedings. It explicitly confirmed at the hearing to have been given enough time to deal with this request.

1.2 The board therefore decided to admit the respondent's request into the proceedings despite its late filing (Article 114(2) EPC and Articles 13(1),(3) RPBA).

2. Admissibility of the late-filed evidence

2.1 The experimental report D14 was filed with the statement setting out the grounds of appeal.

2.1.1 The filing of this item of evidence represents an attempt to corroborate an argument already presented with the grounds of opposition, namely that the fluids described in document D1 were also "*viscoelastic*" within the meaning of the patent in suit, which argument had been rejected by the patent proprietor.

Hence, the board accepts that that the experimental report D14 could have been presented in the first instance proceedings, as pointed out by the respondent. This was not - as such - disputed by the appellant.

2.1.2 Article 12(4) RPBA stipulates that the board has the power "*to hold inadmissible facts, evidence or* requests *which could have been presented or were not admitted in the first instance proceedings*". A criterion normally used by the Boards of Appeal in exercising this discretionary power is the *prima facie* relevance of the late-filed facts, evidence or requests.

In this respect, it is to be noted that the experimental report D14 merely states that the fluids tested were prepared according to "the exact instructions" in Examples 1 and 2 of document D1, without providing further information on the experimental details.

For the board such a statement is manifestly insufficient in respect of those aspects of the oxyalkylation reaction whose repetition exactly as described in Example 1 of document D1 appears very cumbersome, if not impossible. In particular, it is to be noted that the author of document D1 explicitly indicated in said Example 1:

- that the tallow amine used as starting reagent had a certain average molecular weight, and

- that the reaction was continued until the analysis of the resulting product provided certain specified results.

D14 is, however, silent as to the average molecular weight of the tallow amine actually used to replicate the prior art examples, and as to the results of the chemical analysis presumably carried out before stopping the reaction.

2.1.3 The absence of these experimental details alone already leads the board to the conclusion that the late-filed evidence does not permit to determine whether or not the tested fluids were a fair reproduction of those described in the Examples of document D1. Thus, for the board, experimental report D14 is *prima facie* not of high relevance.

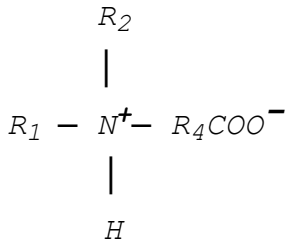
2.1.4 Taking into account all the circumstances addressed above, the board decided not to admit the late-filed experimental report D14 into the proceedings (Article 114(2) EPC and Articles 12(4) RPBA).

2.2 Documents D12, D13, D15 and D17 were only filed by the parties in the course of the appeal proceedings. However, since they were not relied upon at the oral proceedings, no need arose to decide on their admissibility.

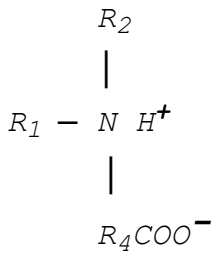
Main request - Formal allowability of the claims

3. Clarity and support by the description

3.1.1 The only objection under Article 84 EPC 1973 maintained by the Appellant in respect of the amended claims according to the request at issue concerns the difference between formula (II) contained in claim 1 at issue (see above Section X of Facts and Submissions) which reads:



and formula VI as appearing in paragraph [0021] of the description of the patent in suit, which paragraph remained unamended in the version of the patent held allowable by the opposition division. This formula VI reads:



3.2 Said formula (II) was already contained in claim 12 as granted. Any objection under Article 84 EPC directed to the presence of this formula in claim 1 at issue can thus hardly be considered as arising from the amendment consisting of the formula into claim 1. Therefore the board has strong reservations concerning the possibility to call into question the allowability of claim 1 at issue under Article 84 EPC in the context of the present opposition appeal proceedings.

3.3 For the board it is, however, beyond doubt that these formulae (II) and VI both clearly depict, in two different but conventional and equivalent ways, one and the same class of chemical compounds, i.e. the class of compounds (as present e.g. in an acid aqueous environment) in which a nitrogen atom is bonded to the three rests "R_1", "R_2" and "R_4COO^-" and also binds a proton via its lone electron pair.

3.4 In the board's judgement, the fact that the currently pending description still contains (in paragraph [0021]) said formula VI neither amounts to a lack of clarity of claim 1, neither to a lack of support for the claimed alternative making use of surfactants of formula (II).

The claims at issue are thus not objectionable under Article 84 EPC 1973.

4. No added subject-matter

4.1 In their submissions concerning this issue the parties only referred to claim 45 and to passages of the description of the published parent application.

4.2 Claim 45 of the parent application is identical to claim 1 of the divisional European patent application as filed from which the patent in suit originates. The passages of the description of the parent application cited by the parties are also present in the description of the divisional application. This was not in dispute.

Thus, in the following analysis of the compliance of the claims at issue with the requirements stipulated in Article 76(1), 123(2) and 100(c) EPC, the board also merely refers to the relevant passages of the published parent application.

4.3 The appellant argued that the difference between formula (II) present in claim 1 and the originally disclosed formula VI was also objectionable under Article 100(c) EPC.

Since, as discussed above, these two formulae are equivalent, this objection is considered unfounded.

4.4 Moreover, the appellant held that present claim 1 was objectionable since it resulted from "singling out" some of the VE fluids disclosed in the parent application and in combining these selections with the method of fracturing defined in general terms e.g. in claim 45 of the parent application.

4.4.1 However, the parent application not only provides in claim 45 a general definition of the FVEF method substantially identical to the portion of claim 1 at issue preceding the definition of the two formulae, but also discloses:

- at page 3, lines 5 to 9, that the "*inventive viscoelastic fluid*" (i.e. any thereof) can be used for fracturing;

and

- at page 6 and 8 the two original surfactant formulae (I) and VI (the latter being equivalent to formula (II) according to claim 1 at issue); the general and preferred meanings of "R_1" to "R_4" thereof being defined on page 6, line 29, to page 7, line 23.

4.4.2 The board is thus satisfied that it is directly and unambiguously derivable from both the parent and the divisional applications as filed that the method as referred to in said claim 45 can - according to certain embodiments - be implemented using surfactant ingredients (b) having these two originally disclosed alternative formulae.

4.4.3 Claim 1 at issue only differs from such disclosure in that it refers only to some of the alternatives originally disclosed for "R_1" to "R_3".

However, the subject-matter of present claim 1 represents no "singling out" from the above identified more general definitions given in the parent application already because the former embraces the broadest possible definitions for "R_4" (given at page 7,

lines 21 to 23, of the parent application) and for the "*alkyl*" alternative of "R_1" (given in the passage at page 6, lines 29 to 34, of the parent application that reads "*wherein R_1 represents a hydrophobic moiety of alkyl, alkylarylalkyl, alkoxyalkyl, alkylaminoalkyl and alkylamidoalykl, wherein alkyl represents a group that contains from about 12 to about 24 carbon atoms which may be branched or straight chained and which may be saturated or unsaturated*").

For the board, the fact that claim 1 at issue also allows for "R_1" the alternative meaning of the "*alkylamidopropyl*" group (explicitly disclosed at page 7, lines 3 to 5 as the only example "*representative*" of the broader "*alkyamidoalkyl*" group), and leaves out the three remaining alternative group definitions (i.e. "*alkylarylalkyl, alkoxyalkyl, alkylaminoalkyl*") originally disclosed for "R_1" in the cited passage of the parent application, does not represent a "singling out" either.

Present claim 1 and the general definition of the relevant formulae in the parent application also differ in that seven specific alternative rests are now listed in claim 1 as the definition of "R_2" and "R_3".

However, these alternatives correspond to the complete list of the "*preferred*" meanings disclosed for these substituents on page 7, lines 16 to 20 of the parent application. Thus, each of these seven alternatives are presented as being of general applicability in combination with any of the alternatives originally disclosed for the other "*R*" substituents in the two formulae according to present claim 1.

4.4.4 Accordingly, the board comes to the conclusion that the

subject-matter of claim 1 at issue is directly and unambiguously derivable from the above cited parts of the parent application as filed and from the identically worded parts of the divisional application as filed.

4.5 Hence, in the board's judgement, the claims are not objectionable under Articles 100(c)/76(1)/123(2) EPC.

Main request - Patentability of the claimed method

5. Sufficiency of disclosure

5.1 As pointed out by the appellant, paragraph [0008] of the patent in suit provides a broad definition for the term "*viscoelastic*" and paragraph [0011] thereof describes two specific methods that could be used to verify the viscoelastic nature of a given fluid to be used in the FVEF method of claim 1.

5.1.1 The appellant did not, however, submit any evidence corroborating its allegation that the skilled person facing a negative result obtained using one of these two methods could not exclude that the same fluid could, nevertheless, be found to be viscoelastic when using another conventional testing method.

5.1.2 It is, moreover, undisputed that the term "*viscoelastic fluid*" is conventional and that there are textbooks, handbooks and sections of technical encyclopedias devoted to the characterization of this sort of materials (see e.g. in D11 the whole section "4.3 Viscoelastic Fluid Mechanics" from p.5-33 to page 5-44). In addition, neither the general definition given in paragraph [0008] nor the two conventional methods disclosed in paragraph [0011] of the patent in

suit have been alleged, let alone demonstrated, to be in contradiction with the meaning normally attributed to the term under consideration by a skilled person.

5.2 Thus, the board has no reason to consider that a skilled person, taking into account common general knowledge and the whole content of the patent in suit , would not be able to differentiate between a viscoelastic VE fracturing fluid and a fluid that is not viscoelastic. Hence, on the contrary, the board has no doubts that the skilled person would be able to identify ingredients suitable for carrying out the method of the invention.

5.3 Accordingly, the appellant's objection regarding an alleged insufficiency of disclosure is not convincing. In the board's judgement, the invention as claimed is thus not objectionable under Articles 100(b)/83 EPC 1973.

6. Novelty

6.1 The appellant disputed the novelty of the method according to claim 1 in view of the disclosure in document D1 concerning the possibility of using the fluids disclosed therein (e.g. in Example 3) for fracturing subterranean formations (D1: column 5, lines 44 to 59). Acknowledging that this document is silent as to the viscoelastic nature of the fluids disclosed therein, the Appellant considered that this property was implied by the fact that the ingredients used e.g. in Example 3 were in accordance with the definitions of the ingredients given in present claim 1 (see in particular formula (I) for the surfactant component) and because the data e.g. in Table I of document D1

proved that the fluid of Example 3 exhibited a reversible shear thinning effect.

6.1.1 The appellant did not, however, dispute the statement of the respondent that the occurrence of reversible shear thinning in the fluid of Example 3 not necessarily implied that it had to be a VE fluid. Nor did the appellant present any evidence that viscoelastic behavior was a property of any fluid having a chemical composition as defined by the remaining requirements in claim 1 at issue.

Therefore, for the board, document D1 comprises no element of information necessarily implying that e.g. the fluid of Example 3 thereof had to be a VE fluid.

6.1.2 Hence, in the board's judgement, the appellant did not convincingly show that document D1 directly and unambiguously discloses subject-matter falling within the terms of claim 1 at issue.

6.2 The appellant also considered the use of the fracturing foam compositions disclosed in document D3 to anticipate the subject-matter of claim 1 at issue. In particular, it referred to Examples 1 to 3 in Table 1 of D3 which related to a cocobetaine that appeared to be accordance with formula (I) according to claim 1 at issue. In its opinion, the assumption that these compositions of the prior art were VE fluids was justified by the fact that they complied with all the compositional requirements of claim 1 and that only an express mention of their viscoelastic nature had been omitted.

6.2.1 As already mentioned above, the appellant did not, however, present evidence rendering plausible that

viscoelastic behaviour was a property of any fluid having a composition as defined by the remaining requirements of claim 1 at issue.

Hence, document D3 comprises no teaching either that e.g. the fluids of examples 1 to 3 thereof must also be VE fluids.

6.2.2 If only for this reason, the appellant has also not succeeded in convincing the board that document D3 directly and unambiguously discloses subject-matter according to claim 1 at issue.

6.3 In the board's judgement, the subject-mater of claim 1 at issue and consequently, the subject-matters of claims 2 to 10 dependent thereon, are thus novel (Articles 52(1) and 54(1),(2) EPC 1973).

7. Inventive step

7.1 The invention

7.1.1 The invention relates to a method for fracturing a subterranean formation by pumping a viscoelastic fluid comprising a surfactant into it (see paragraph [0001] and claim 1 of the patent in suit).

7.1.2 The patent in suit (see paragraphs [0003] and [0004]) addresses the issues of mechanically or chemically induced degradation, and of the high toxicity and the very low biodegradability of some of the ingredients previously used to generate viscous suspensions of solid particles.

7.2 Closest prior art

7.2.1 For the board, document D8 (see e.g. Example 2 in combination with claim 3) represents the closest prior art since it is the only one among the prior art documents relied upon which also relates to a method for fracturing subterranean formations using a fracturing fluid that is explicitly qualified as viscoelastic.

It was also common ground between the parties that in view of these similarities D8 represented the most suitable starting point for the assessment of inventive step.

7.2.2 It is also undisputed that the surfactants used according to D8 differ from the ones according to any of the two formulae in present claim 1.

7.3 Technical problem allegedly solved

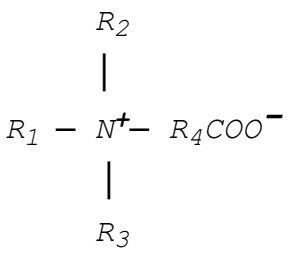
7.3.1 In the decision under appeal the opposition division considered that the (then) claimed subject-matter solved vis-à-vis the prior art disclosed in document D8 the technical problem of providing a FVEF method wherein the VE fluid exhibits "enhanced viscosity and stability at formation temperatures above 225°F (107°C)".

7.3.2 With respect to claim 1 at issue, the respondent maintained that the method according to claim 1 solved the problem of achieving stability of viscosity at high temperatures of the used fluid.

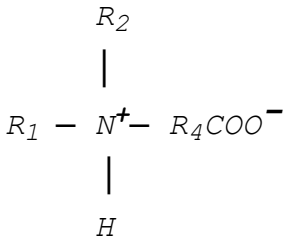
7.4 Solution

As a solution to this technical the patent in suit proposes the method according to claim 1 at issue which is characterised in particular in that the aqueous VE fluid used for fracturing comprises

"*a surfactant selected from the group consisting of amphoteric surfactants, zwitterionic surfactants, and a mixture thereof ....*
wherein said surfactant is represented by formula (I):



or the formula (II):



wherein R_1 represents a hydrophobic moiety of alkyl or alkyamidopropyl wherein alkyl represents a group that contains from 12 to 24 carbon atoms which may be branched or straight chained and which may be saturated or unsaturated; R_2 and R_3 are independently methyl, ethyl, benzyl, hydroxyethyl, hydroxypropyl, acetate or propionate; and R_4 is a hydrocarbyl radical with a chain length of 1 to 4."

7.5 Alleged success of the solution

7.5.1 As regards to the stability of viscosity at high temperatures that the respondent alleged to be apparent when comparing the viscosity *vs.* temperature data disclosed in the patent in suit and those reported in document D8, the following is noted:

- The patent in suit contains no express indication that an enhanced stability of the viscosity at high temperatures was one of the goals to be achieved by the present invention.

- Examples 7 to 10 of the patent in suit are not in accordance with the narrower definition of the invention as given in claim 1 at issue, since they relate to aminoxide surfactants no longer encompassed among the surfactants to be used in the claimed FVEF method.

- Hence, the only data in the patent in suit that relate to the differences in viscosity observed upon increasing the temperature to values higher than e.g. 180 or 200°F (82.2 or 93.3°C) for the VE fluids to be used in the claimed method, are those given in Table 3 (which refer exclusively to a VE fluid wherein the surfactant is according to formula I).

- The viscosity *vs.* temperature data in Table 3 of the patent in suit show for a surfactant concentration of 4%, a drop of the viscosity at a shear rate of 100 sec^{-1}, when increasing the temperature from 82° to 129°, 189°, 239° and 288°F, i.e. a trend qualitatively similar to the trend observed e.g. in the Table of Example 2 of

document D8 at the different surfactant concentration of 5% and under the different shear rate of 170 sec^{-1}, for the viscosity measured at the different temperatures of 130°, 150°, 180°, 200° and 225°F.

- The substantial influence of, *inter alia*, the surfactant concentration onto the extent of viscosity decrease with increasing temperature for a given fluid is apparent from the differences among the three columns of viscosity data at 130°, 150° and 180°F reported in the Table of Example 1 of document D8.

7.5.2 From the above, the board concludes that the extent of the viscosity decrease reported in Table 3 of the patent in suit and that reported in the Table of Example 2 of document D8 appear to depend to a substantial degree at least on the different concentrations of the surfactant ingredient used and possibly also on other differences in the rheological measurement conditions. In other words, it cannot be safely excluded that any differences in the extent of viscosity decrease upon temperature increase might also be due to compositional or experimental differences rather than (merely) to the nature of the surfactant component used.

7.5.3 Hence, the board comes to the conclusion that the comparison between the viscosity *vs.* temperature data disclosed in the patent in suit and those reported in document D8 do not allow to determine whether or not the viscosity the VE fluid as defined in claim 1 at issue is indeed less responsive to temperature increases than the viscosity of the fluids used according to the closest prior art D8.

7.5.4 If only for this reason, the board finds that no sound conclusion as to an implicit technical advantage of the invention can possibly be derived from the comparison between the patent in suit and the closest prior art.

7.5.5 Consequently the board does not accept that the technical problem invoked by the respondent is indeed successfully solved, let alone over the full scope of claim 1 at issue.

7.6 Moreover, the patent in suit does not even contain an allegation that the VE fluids to be used according to in claim 1 at issue are particularly resistant to degradation or particularly low toxicity, let alone in comparison to the fluids disclosed in D8.

7.7 Reformulation of the technical problem

Considering the above findings the technical problem must be reformulated in a less ambitious manner. In the light of the closest prior art disclosed in document D8, it can be seen in the provision of a further method for fracturing subterranean formation.

7.8 Success of the solution

Not least in view of the experimental results reported in examples 1 to 6 and Figures 1 to 5, the board accepts that said less technical ambitious problem is credibly solved by the provision of the method according to claim 1 at issue. This was not in dispute.

7.9 Obviousness

7.9.1 Thus, it remains to be assessed whether the claimed solution was obvious in the light of the prior art

relied upon by the appellant.

7.9.2 The appellant argued that it was obvious for the skilled person to solve the posed technical problem (point 7.7 *supra*) by replacing the surfactants in the VE fluid disclosed e.g. in Example 2 of document D8 with any of the surfactants previously used in VE fluids, for instance those disclosed in documents D9 or D10 which are in accordance with one or the other of the two formulae given in present claim 1. Hence, the skilled person would arrive in an obvious manner at a FVEF method according to claim 1 at issue by combining the teachings of document D8 with those of document D9 or of document D10.

7.9.3 However, the appellant provided no evidence of common general knowledge supporting the allegation implicit in its reasoning that a skilled person would presume that any surfactant previously used in preparing VE fluids would also be suitable for forming VE fluids to be used in methods for fracturing subterranean formations. Nor does document D8 contain such information.

7.9.4 On the contrary, the board considers that that a skilled person would rather expect that VE fluids have to possess certain very specific properties in order to qualify as being suitable for fracturing applications. For instance, it is undisputed among the parties and apparent from the discussion of the prior art e.g. in document D8 (see the paragraph bridging columns 1 and 2) or in paragraph [0002] of the patent in suit, that VE fluids to be used to fracture subterranean formations are normally required to form stable suspensions of solid particles.

7.9.5 None of documents D9 and D10 relates to VE fluids that form stable suspensions of solid particles, let alone to fluids for fracturing purposes. More particularly, D9 (claim 1) relates to viscoelastic thickened cleaning compositions and D10 (column 1, lines 4 to 7; claim 1) to the use of specific amphoteric surfactants for reducing the flow resistance between a solid surface and a water-based liquid friction-reduction applications.

The board is convinced that the skilled person searching for an alternative to the FVEF method described in document D8 would not even consider the contents of prior art documents from technical fields as remote as the ones to which documents D9 and D10 belong. But even assuming he would do so, D9 and D10 do not contain elements of information suggesting the suitability of the surfactants disclosed therein as components of VE fluids for fracturing methods.

7.10 Accordingly, the board is not convinced that the FVEF method claimed in present claim 1 was obvious in the light of the prior art relied upon by the appellant.

7.11 Hence, in the board's judgement, the subject-matters of claim 1 and, consequently, of 2 to 10 depending thereon, involve an inventive step as required by Articles 52(1) and 56 EPC.

Order

For these reasons it is decided that:

The case is remitted to the department of first instance with the order to maintain the patent on the basis of the claims according to the Main Request submitted during oral proceedings and a description and figures to be adapted where appropriate.

The Registrar: The Chairman:

D. Magliano B. Czech

Decision electronically authenticated