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(54) Title: DRILLING FLUID SYSTEMS WITH IMPROVED FLUID LOSS PROPERTIES

(57) Abstract

A drilling fluid system comprising a brine and a quantity of cationic copolymers comprising a ratio of acrylamide monomers to cationic derivatives of acrylamide monomers, wherein the quantity and the ratio are effective to maintain effective rheology and fluid loss control in said drilling fluid system at temperatures of at least about 250 °C for at least about 16 hours.

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TITLE: DRILLING FLUID SYSTEMS WITH IMPROVED FLUID LOSS PROPERTIES

Field of the Invention

The present invention relates to brine based drilling fluid systems with improved fluid loss control properties at high temperatures provided by cationic polymers.

Background of the Invention

Filtration control is one of the most important properties of a drilling fluid, particularly when drilling through permeable formations where the hydrostatic pressure exceeds the formation pressure. It is important for a drilling fluid to quickly form a filter cake which effectively minimizes fluid loss, but which also is thin and dispersible enough to allow product to flow into the wellbore during production.

Filtration control additives for brines typically are nonionic water soluble polymers, such as starches, derivatized starches, gums, derivatized gums, and cellulosics. These polymers have certain advantages, but suffer from the disadvantage that they have a relatively low hydration rate in brines--particularly in high density brines, where very little water actually is available to hydrate and swell the polymers.

Another disadvantage of nonionic water-soluble polymers is that they have limited temperature stability. As wells are drilled deeper, higher bottomhole temperatures are encountered. Today's drilling fluids need to maintain stable rheology and low filtration at temperatures above 300°F. Unfortunately, the nonionic water

soluble polymers currently in use are not stable at temperatures exceeding about 225°F with extended aging times.

Filtration control additives are needed which will quickly form a thin, dispersible filter cake, and which also have high temperature stability for prolonged periods of time.

Summary of the Invention

The present invention provides a drilling fluid system comprising a brine comprising a quantity of cationic copolymer comprising a ratio of acrylamide monomers to cationic derivatives of acrylamide monomers, wherein the quantity and the ratio are effective to maintain effective rheology and fluid loss control in the drilling fluid system at temperatures of at least about 250°F for at least about 16 hours.

Detailed Description of the Invention

The present invention provides a drilling fluid system, preferably for use as a drill-in or completion fluid, which quickly forms a thin, dispersable filter cake and which is stable for prolonged periods of time at high temperatures.

The drilling fluid system comprises an aqueous brine, preferably a "high density brine" (defined below), a viscosifier, a bridging agent, a pH stabilizer, and one or more fluid loss control additive(s). A preferred fluid loss control additive comprises cationic copolymers.

The cationic copolymers of the present invention may be used as an additive in

substantially any aqueous brine drilling fluid system. However, not all types of drilling fluid systems encounter extremely high temperatures. Because of this, a preferred use for the drilling fluid system of the present invention is as a drill-in or completion fluid--fluids which are more likely to be exposed to higher downhole temperatures for prolonged periods of time.

Preferred drill-in and completion fluids are brines having a density of at least about 9 lb/gal, most preferably "high density brines," defined herein to mean brines having a density of at least about 12-17 lb/gal. The brines may contain substantially any suitable salts, including, but not necessarily limited to salts based on metals, such as calcium, magnesium, sodium, potassium, cesium, zinc, aluminum, and lithium. Salts of calcium and zinc are preferred. The salts may contain substantially any anions, with preferred anions being less expensive anions including, but not necessarily limited to chlorides, bromides, formates, acetates, and nitrates. Most preferred salts are calcium bromide and zinc bromide.

For purposes of the present invention, the term "cationic copolymers" is defined to refer to cationic copolymers which provide effective rheology and filtration control at temperatures greater than about 250° F, preferably about 300°F, most preferably about 325°F, for about 16 hours, preferably for about 48 hours or more. For purposes of the present application, effective rheology is defined to mean structure which is sufficient to suspend bridging agents but not excessive so as to cause high equivalent circulating densities. Effective filtration control is defined to mean control which provides a low filtration rate with a thin, dispersable filter cake.

Preferred cationic copolymers include, but are not necessarily limited to copolymers comprising, and preferably consisting essentially of monomers of acrylamide and monomers of a cationic derivative of acrylamide. Preferred cationic derivatives of acrylamide for use in such copolymers are quaternary salts of N,N-dialkylaminoacrylamide wherein the size of the alkyl groups is limited by solubility to about 5, preferably about 4, most preferably about 1-3 carbon atoms. A preferred cationic quaternary salt is quaternary methyl N, N-dimethylaminoethylmethacrylamide. The copolymers preferably comprise a ratio of from about 3:1 to about 1:1 of the cationic monomer.

Cationic copolymers suitable for use in the present invention are commercially available from Fritz Industries, Inc., Dallas, Texas, under the name EXP-8 EMULSION POLYMER. In order to achieve the desired rheological stability and filtration control, the fluid should contain from about 1 lb/bbl to about 10 lb/bbl of a 35% active solution of the cationic copolymer in a suitable carrier, such as oil, which translates to about 0.35 to about 3.5 lb/bbl active cationic copolymer.

The cationic copolymers can be used alone or used in conjunction with a different type of fluid loss additive, preferably a 2-amino-2-methyl propane sulfonic acid (AMPS) additive, such as KEM SEAL PLUS®, available from Baker Hughes INTEQ. Where a combination of cationic copolymer and another fluid loss additive is used, the ratio of cationic copolymer to the other fluid loss additive preferably is about 2:1 to about 1:2, most preferably about 1:1.

The system preferably includes bridging agents to bridge the pores in the

formation. Suitable bridging agents include, but are not necessarily limited to ground marble or calcium carbonate particles, such as MIL-CARB®, available from Baker Hughes INTEQ. Preferred calcium carbonate particles have a mean particle size of about 30 microns. Calcium carbonate has the advantage that it is acid soluble, and therefore can be removed from the formation by acid flushing. If calcium carbonate is used as the bridging agent, about 50 pounds should be used per barrel of brine.

The system also preferably includes a viscosifier, such as SALT WATER GEL®, available from Baker-Hughes INTEQ, Houston, Texas. A preferred viscosifier is EXP-77, a cellulosic blend, also available from Baker Hughes INTEQ.

Finally, the system includes a suitable material for adjusting the pH of the system to from about 9 to about 10. Suitable materials include, but are not necessarily limited to hydrous oxides of divalent cations. A preferred material is MgO.

A preferred basic formulation for a drilling fluid system according to the present invention is given in the following table:

Component/Product	Quantity
Brine (12-17 lb/gal density)	38-39 gal
EXP-77	5-15 lb/bbl
MIL-CARB®	50 lb/bbl
MgO	3-5 lb/bbl
Cationic Copolymer (35% active)	1-10 lb/bbl
KEM SEAL PLUS®	0-4 lb/bbl

The invention will be more clearly understood with reference to the following examples, which are illustrative only and should not be construed as limiting the

present invention.

EXAMPLE I

Tests were conducted to determine fluid properties of two fluids having the following compositions:

COMPONENT	CONCENTRATION (g)	
	Fluid 1	**Fluid 2**
$CaCl_2/CaBr_2$ Brine (13.5 lb/gal density)	510.5	508
EXP-77	10	10
MIL-CARB®	50	50
MgO	3	3
Cationic Copolymer (35 % active)	5.7	5.7
KEM SEAL PLUS®	--	2

In order to prepare the fluids, the brine was placed in a 1000 ml. beaker and a Silverson L4RT Mixer shaft with a small hole sleeve was inserted. The speed of the mixer was adjusted to 7000 rpm. The EXP-77 was added to the brine and the fluid was mixed for 5 minutes. The MIL-CARB® and MgO were added, and mixing was continued for 5 minutes at 5000 rpm. The cationic copolymer then was added, and the resulting fluid was mixed at 5000 rpm for another 5 minutes. Rheology tests were run immediately. The fluids exhibited the following properties:

Properties				
	Fluid 1		Fluid 2	
Fann 35 @ 120□F	Initial	After Hot Rolling 16 hr @ 325□F	Initial	After Hot Rolling 16 hr @ 325□F
Fann 600 rpm	155	117	148	114
Fann 300 rpm	87.5	64	83.5	63
Fann 200 rpm	62.5	48.5	60	48
Fann 100 rpm	35	31.5	33.5	32
Fann 6 rpm	3.5	10	3	10.5
Fann 3 rpm	2.5	8.5	2.5	8.5
pH (10% disp.)	9.3	9.3	9.1	9.4
API Fluid Loss, ml.	0.0		0.0	
HTHP Fluid Loss, ml. x 2*		16.0		10.0

*325☜F, 500 psi, 0.5 hr, paper disc

Fluid loss values measured for both of the foregoing fluids were less than the values typically achievable using biopolymers. Because the fluid containing KEM-SEAL PLUS® achieved a fluid loss of only 10.0 ml., it was concluded that a preferred system is a combination of the cationic copolymer and KEMSEAL PLUS®.

EXAMPLE II

Tests were conducted on a fluid having the following composition to determine fluid properties:

COMPONENT	CONCENTRATION (g)
$CaCl_2/CaBr_2$ Brine (13.5 lb/gal density)	508
EXP-77	10
MIL-CARB®	50
MgO	3
Cationic Copolymer (35% active)	5.7
KEM SEAL PLUS®	2

The fluid exhibited the following properties:

Properties			
Fann 35 @ 120□F	**Initial**	**After Hot Rolling 16 hrs @ 325□F**	**After Hot Rolling 48 hrs @ 325□F**
Fann 600 rpm	148	114	98
Fann 300 rpm	83.5	63	62
Fann 200 rpm	60	48	47
Fann 100 rpm	33.5	32	32
Fann 6 rpm	3	10.5	10.5
Fann 3 rpm	2.5	8.5	9
pH (10% disp.)		9.4	8.9
API Fluid Loss, ml.	0.0		
HTHP Fluid Loss, ml. x 2*		10.0	14.8

*325□F, 500 psi, 0.5 hr, paper disc

The combination of cationic copolymers with KEM SEAL PLUS® was tested

after hot rolling for 16 hours, and after hot rolling for 48 hours. A 10.0 ml. fluid loss was obtained at 16 hours, increasing to 14.8 ml. after 48 hours. Both fluid loss values are better than those achievable using biopolymers as filtration control additives under similar conditions.

Many modifications and variations may be made to the embodiments described herein without departing from the spirit of the present invention. The embodiments described herein are illustrative only should not be construed as limiting the scope of the present invention.

We claim:

1. A drilling fluid system comprising a brine comprising a quantity of cationic copolymer comprising a ratio of acrylamide monomers to cationic derivatives of acrylamide monomers, wherein said quantity and said ratio are effective to maintain effective rheology and fluid loss control in said drilling fluid system at temperatures of at least about 250°F for at least about 16 hours.

2. The drilling fluid system of claim 1 wherein said brine comprises

a viscosifier;

a bridging agent; and

a density of about 9 lb/gal or greater.

3. A drilling fluid system comprising a brine comprising about 0.35 to about 3.5 lb/bbl of active cationic copolymer comprising a ratio of acrylamide monomers to cationic derivatives of said acrylamide monomers of from about 3:1 to about 1:1.

4. The drilling fluid system of claim 3 wherein said brine comprises

a viscosifier;

a bridging agent; and

a density of about 9 lb/gal or greater.

5. The drilling fluid system of claim 1 wherein said cationic derivatives of acrylamide monomers comprise quaternary salts of N,N-dialkylaminoacrylamide.

6. The drilling fluid system of claim 2 wherein said cationic derivatives of said acrylamide monomers comprise quaternary salts of N,N-dialkylaminoacrylamide.

7. The drilling fluid system of claim 3 wherein said cationic derivatives of said acrylamide monomers comprise quaternary salts of N,N-dialkylaminoacrylamide.

8. The drilling fluid system of claim 4 wherein said cationic derivatives of said acrylamide monomers comprise quaternary salts of N,N-dialkylaminoacrylamide.

9. The drilling fluid system of claim 5 wherein said quarternary salts comprise quaternary alkyl salts of N,N-dialkylaminoalkylmethacrylamide.

10. The drilling fluid system of claim 6 wherein said quarternary salts comprise quaternary alkyl salts of N,N-dialkylaminoalkylmethacrylamide.

11. The drilling fluid system of claim 7 wherein said quarternary salts comprise quaternary alkyl salts of N,N-dialkylaminoalkylmethacrylamide.

12. The drilling fluid system of claim 8 wherein said quarternary salts

comprise quaternary alkyl salts of N,N-dialkylaminoalkylmethacrylamide.

13. The drilling fluid system of claim 5 wherein said quarternary salts comprise quaternary methyl N, N-dimethylaminoethylmethacrylamide.

14. The drilling fluid system of claim 6 wherein said quarternary salts comprise quaternary methyl N, N-dimethylaminoethylmethacrylamide.

15. The drilling fluid system of claim 8 wherein said quarternary salts comprise quaternary methyl N, N-dimethylaminoethylmethacrylamide.

16. A drilling fluid system comprising a brine comprising about 0.35 to about 3.5 lb/bbl of active cationic copolymer comprising a ratio of acrylamide monomers to quaternary methyl N, N-dimethylaminoethylmethacrylamide monomers of from about 3:1 to about 1:1.

17. The drilling fluid system of claim 1 wherein said ratio is from about 3:1 to about 1:1.

18. The drilling fluid system of claim 13 wherein said ratio is from about 3:1 to about 1:1.

19. The drilling fluid system of claim 14 wherein said ratio is from about 3:1 to about 1:1.

20. The drilling fluid system of claim 1 wherein
said brine comprises a density of about 9.0 lb/gal or greater; and,
said brine further comprises another fluid loss control additive comprising 2-amino-2-methyl propane sulfonic acid.

21. The drilling fluid system of claim 20 wherein said cationic polymer and said fluid loss control additive are present in said drilling fluid system at a ratio of from about 2:1 to about 1:2.

22. The drilling fluid system of claim 20 wherein said cationic polymer and said fluid loss control additive are present in said drilling fluid system at a ratio of about 1:1.

23. The drilling fluid system of claim 16 wherein
said brine comprises a density of about 9.0 lb/gal or greater; and,
said brine further comprises another fluid loss control additive comprising 2-amino-2-methyl propane sulfonic acid.

24. The drilling fluid system of claim 23 wherein said cationic polymer and

said fluid loss control additive are present in said drilling fluid system at a ratio of from about 2:1 to about 1:2.

25. The drilling fluid system of claim 23 wherein said cationic polymer and said fluid loss control additive are present in said drilling fluid system at a ratio of about 1:1.

26. The drilling fluid system of claim 16 wherein said brine has a density of at least about 9 lb/gal.

27. The drilling fluid system of claim 1 wherein said brine has a density of from about 12 to about 17 lb/gal.

28. The drilling fluid system of claim 3 wherein said brine has a density of from about 12 to about 17 lb/gal.

29. The drilling fluid system of claim 16 wherein said brine has a density of from about 12 to about 17 lb/gal.

30. A method for treating a drilling fluid system comprising a brine to control fluid loss properties comprising adding to said drilling fluid system a quantity of cationic copolymers comprising a ratio of acrylamide monomers to cationic

derivatives of acrylamide monomers, wherein said quantity and said ratio are effective to maintain effective rheology and fluid loss control in said drilling fluid system at temperatures of at least about 250°F for at least about 16 hours.

31. The method of claim 30 wherein said drilling fluid system comprises

a viscosifier;

a bridging agent; and

a density of about 9 lb/gal or greater.

32. A method for treating a drilling fluid system comprising to control fluid loss properties comprising adding to said drilling fluid system about 0.35 to about 3.5 lb/bbl of active cationic copolymer comprising a ratio of acrylamide monomers to cationic derivatives of said acrylamide monomers of from about 3:1 to about 1:1.

33. The method of claim 30 wherein said cationic derivatives of acrylamide monomers comprise quaternary salts of N,N-dialkylaminoacrylamide.

34. The method of claim 31 wherein said cationic derivatives of said acrylamide monomers comprise quaternary salts of N,N-dialkylaminoacrylamide.

35. The method of claim 32 wherein said cationic derivatives of said acrylamide monomers comprise quaternary salts of N,N-dialkylaminoacrylamide.

36. The method of claim 33 wherein said quarternary salts comprise quaternary alkyl salts of N,N-dialkylaminoalkylmethacrylamide.

37. The method of claim 34 wherein said quarternary salts comprise quaternary alkyl salts of N,N-dialkylaminoalkylmethacrylamide.

38. The method of claim 35 wherein said quarternary salts comprise quaternary alkyl salts of N,N-dialkylaminoalkylmethacrylamide.

39. A method for treating a drilling fluid system comprising a brine to control fluid loss properties comprising adding to said drilling fluid system from about 0.35 to about 3.5 lb/bbl of cationic copolymer comprising a ratio of acrylamide monomers to quaternary methyl N, N-dimethylaminoethylmethacrylamide monomers of from about 3:1 to about 1:1.

40. The method of claim 30 wherein

said brine comprises a density of about 9 lb/gal or greater; and,

said method further comprises adding to said drilling fluid system a portion of a fluid loss control additive comprising 2-amino-2-methyl propane sulfonic acid which is effective to reduce fluid loss in said drilling fluid system to an amount less than fluid loss achieved using said cationic copolymer, alone.

41. The method of claim 40 wherein said quantity of said cationic copolymer is at a ratio of from about 2:1 to about 1:2 to said amount of said fluid loss control additive.

42. The method of claim 40 wherein said quantity of said cationic copolymer is at a ratio of about 1:1 to said amount of said fluid loss control additive.

43. The method of claim 39 wherein

said brine comprises a density of about 9 lb/gal or greater; and,

said method further comprises adding to said drilling fluid system a portion of a fluid loss control additive comprising 2-amino-2-methyl propane sulfonic acid which is effective to reduce fluid loss in said drilling fluid system to an amount less than fluid loss achieved using said cationic copolymer, alone.

44. The method of claim 43 wherein said quantity of said cationic copolymer is at a ratio of from about 2:1 to about 1:2 to said amount of said fluid loss control additive.

45. The method of claim 43 wherein said quantity of said cationic copolymer is at a ratio of about 1:1 to said amount of said fluid loss control additive.

46. The method of claim 39 wherein said brine has a density of at least about 9 lb/gal.

47. The method of claim 30 wherein said brine has a density of from about 12 to about 17 lb/gal.

48. The method of claim 32 wherein said brine has a density of from about 12 to about 17 lb/gal.

49. The method of claim 39 wherein said brine has a density of from about 12 to about 17 lb/gal.

INTERNATIONAL SEARCH REPORT

Int ional Application No
PCT/US 99/26135

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C09K7/02 E21B21/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C09K E21B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 826 311 A (SHERWOOD N ET AL) 30 July 1974 (1974-07-30) column 1, line 5 -column 2, line 55; claims 1-7; examples 1,2	3,4,11, 12, 23-26, 28,32, 38,39, 43-46, 48,49
Y	— -/—	7,8,15, 16,35

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 February 2000	03. 03. 00

Name and mailing address of the ISA	Authorized officer
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Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	WO 90 14403 A (ALLIED COLLOIDS LTD) 29 November 1990 (1990-11-29) page 1, line 4 - line 14 page 3, line 31 - line 34 page 4, line 26 -page 5, line 4 page 7, line 7 - line 34; claims 1-3,12	3,4,7,8, 11,12, 15,16, 23-26, 28,30, 32,35, 38,39, 43-46, 48,49
X	US 4 970 260 A (LUNDBERG ROBERT D ET AL) 13 November 1990 (1990-11-13) abstract; examples 1-3	3,4,11, 12, 23-26, 28,32, 38, 43-46, 48,49
Y		7,8,15, 16,35,39
X	US 4 517 333 A (LUNDBERG ROBERT D ET AL) 14 May 1985 (1985-05-14) abstract; claims 1-4; examples 1-4	3,4,11, 12, 23-26, 28,32, 38, 43-46, 48,49
Y		7,8,15, 16,35,39
X	US 4 409 110 A (BORCHARDT JOHN K ET AL) 11 October 1983 (1983-10-11) column 3, line 19 -column 8, line 46; claims 1-3,6,8-13	3,4,7,8, 11,12, 23-26, 28,32, 35,38, 43-46, 48,49
Y		15,16,39
X	US 4 395 524 A (EMMONS WILLIAM D ET AL) 26 July 1983 (1983-07-26) column 3, line 43 - line 44; claims 1-17	3,4,11, 12

-/—

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	"Encyclopedia of Polymer Science and Engineering, Vol 10: Oil Field Applications" 1987 , JOHN WILEY & SONS , NEW YORK XP002129993 page 328 -page 369	3,4,7,8, 11,12, 15,16, 23-28, 32,35, 38,39, 43-46, 48,49

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 99/26135

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 1,2,5-6,9-10,13-14,17-22,27,29-31,33-34,36-37,40-42,47
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 1,2,5-6,9-10,13-14,17-22,27,29-31,33-34,36-37,40-42,47

Claims 1, 2, 5-6, 9-10, 13-14, 17-22, 27 and 29 are claims to a physical entity, i.e. a product. Said claims seek to define the invention by reference to features relating to the entitys' use. In the present case the claims not only define the entity itself but also specifies its relationship to a second entity which is not part of the claimed entity (...maintain...fluid loss control....). Fluid loss control is related to the conditions in a bore hole, such as the permeability of the soil, the presence, thickness and composition of a filter cake. A certain drilling fluid system may therfore fulfill the requirement of "maintaining fluid loss control" in one bore hole and not in the other one simply because the permeabilities of the soil are different.

The "quantity" and "ratio" defined in the claimed entity are also related to the maintenance of "effective rheology". Said feature is arbitrary and relative rendering the claimed subject-matter obscure. The conditions under which the rheology may be considered to be "effective" may vary over a broad range. Said conditions are related to the final composition (range) of the system, the environmental condions, the drilling equipment and even the personal judgement of a skilled worker.

Claims 30-31, 33-34, 36-37, 40-42 and 47 are claims to an activity, i.e. a method. The most essential process characteristic of the claimed method is that a drilling fluid system is "added". It is to be noted that whatever "method for treating" is meant by the applicant, said method of treating is only characterised by the process step "adding". The most essential restricting (limiting) feature of said claims is the composition of said drilling fluid. As set out in the two above paragraphs the claimed products are obscure. Since said obscure product is added in the claimed method, the addition as such is obscure rendering the scope of the indicated process claims obscure.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

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