

Señores
DIVISIÓN DE NUEVAS CREACIONES
SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
Bogotá, D.C.

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 09-078181-00003-0000

Fecha: 2009-09-29 09:48:43 Dep.: 2020 NUECREACIONES
Tra. 2 PATENTES Eve: 1 REGDEPOSITO
Act. 444 RESPUESTAREQUE Folios: 112

Re.: Código 02-01-444
Expediente No. 09-78.181
Solicitud de Patente
SCHLUMBERGER TECHNOLOGY B.V.

En relación con el expediente de la referencia y dando cumplimiento a la última providencia recaída sobre este asunto por medio del presente escrito me permito manifestarles lo siguiente:

1. Acompaño el documento que acredita la cesión de los inventores Arthur MILNE – Manuel Jose LASTRE VUELVAS a la sociedad solicitante, debidamente legalizado y oficialmente traducido.
2. Adjunto una copia certificada y traducida de la solicitud de patente estadounidense No. 61/137,183 de la cual se reclama prioridad.
3. Adjunto una copia certificada y traducida de la solicitud de patente estadounidense No. 12/459,042 de la cual se reclama prioridad.
4. Igualmente acompaño el comprobante de pago por concepto de exceso de reivindicaciones por valor de \$225.000.00, recibo No. 73,065

Renuncio al termino faltante de traslado, y les solicito ordenar la publicación del extracto.

De Ustedes Atentamente,

LUIS FELIPE CASTILLO GIBSONE
T.P. No. 68.995 del C.S.J.

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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 09-078181- -00003-0000

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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

NIT : 800176089-2

CERTIFICACION DE EXCEDENTE : 09 - 73,065

FECHA : SEPTIEMBRE 29 DE 2009

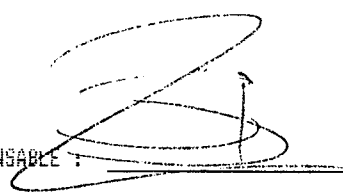
***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
CASTILLO GRAU Y ASOCIADOS	CONSIGNACION	BANCO DE BOGOTA	062754387	53838223	29/09/2009	225,000.00

***** CONCEPTO *****

CANT.	RENTISTICO	CONCEPTO	TOTAL CONCEPTO
1	50005-01-09	OTROS SERVICIOS DE PROPIEDAD I	99 OTROS SERVICIOS ADMINISTRATIVOS
			TOTAL : \$ 225,000.00

SON: DOSCIENTOS VEINTICINCO MIL PESOS

RESPONSABLE : 

RECIBO DE CAJA APLICADO AL EXPEDIENTE No. _____

ESTA CERTIFICACION DE EXCEDENTE DE PAGO SOLO PODRA SER UTILIZADA
COMO PARTE DE LA CANCELACION DE UNA TARIFA VIGENTE Y NO PODRA SER
SUSTITUIDA POR NINGUN RECIBO.



The State of Texas

Secretary of State

Not for use within the United States of America.

This Apostille only certifies the signature, the capacity of the signer and the seal or stamp it bears. It does not certify the content of the document for which it was issued.

APOSTILLE

(Convention de La Haye du 5 Octobre 1961)

1. Country: United States of America

This public document

2. has been signed by KATHRYNE ROSE YZAGUIRRE

3. acting in the capacity of Notary Public, State of Texas

4. and bears the seal/stamp of KATHRYNE ROSE YZAGUIRRE, Notary Public, State of Texas, Commission Expires: 12-14-10

CERTIFIED

5. at Austin, Texas

6. on August 20, 2009

7. by the Secretary of State of Texas

8. Certificate No. N-710679

9. Seal

10. Signature:



A handwritten signature in cursive script, appearing to read "Hope Andrade".

Hope Andrade
Secretary of State
ST/MR

Assignment of Patent Application

Schlumberger Technology Corporation, assignee of the entire interest in United States patent application:

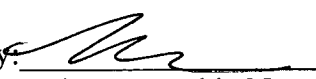
Serial No. 61/137183 filed July 28, 2008, titled "USE OF VES TO INCREASE THE VISCOSITY OF CROSSLINKED POLYMER FLUIDS"

Serial No. 12/459,042 filed June 25, 2009, titled "METHOD AND COMPOSITION TO INCREASE VISCOSITY OF CROSSLINKED POLYMER FLUIDS"

Serial No. 12/507,899 filed July 23, 2009, titled "METHOD AND COMPOSITION TO INCREASE VISCOSITY OF CROSSLINKED POLYMER FLUIDS"

hereby assigns the priority rights and the entire interest in said invention and application, and to any confirmation, divisional, continuation, continuation-in-part or substitute application which may be filed on said invention or may claim priority on said application in Colombia unto:

Schlumberger Technology B.V.
Parkstraat 83-89
2514 JG The Hague
The Netherlands

By: 
Assignor – Robin Nava
Schlumberger Technology Corporation


Assignee – David Cate
Schlumberger Technology B.V.

Date: 8-4-09.

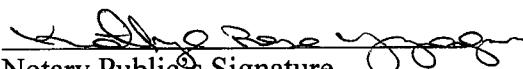
Date: 8-4-09.

State of Texas
Country of Ft. Bend

Before me, a notary public, on this day personally appeared Robin Nava and David Cate, known to me to be the persons whose name is subscribed to the foregoing document and, being by me first duly sworn, declared that the statements therein contained are true and correct.

Given under my hand and seal of office this 4 day of August, 2009.

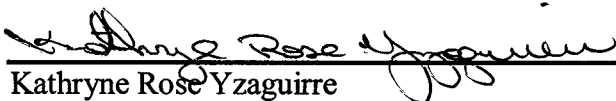



Notary Public's Signature

State of Texas

County of Ft. Bend

On this August 17, 2009, I certify that the preceding or attached document and the duplicate retained by me as a notarial record, are true, exact, complete, and unaltered photocopies made by me and that, to the best of my knowledge, the photocopies document is neither a public record nor has been publicly recorded, certified copies of which are not available from an official source other than a notary public.



Kathryne Rose Yzaguirre
Notary Public

Expires: December 14, 2010



ASSIGNMENT

WHEREAS, we,

Arthur Milne, a citizen of the United Kingdom, whose post office address is Plaza San Martin Suites, Apartment 502, Suipacha 1092, Buenos Aires, Argentina; and

Manuel Jose Lastre Buelvas, a citizen of Colombia, whose post office address is CR 68A #23B int 01-302, Bogota, Colombia.

hereinafter referred to as the "Inventors" have invented certain new and useful improvements in

USE OF VES SURFACTANTS TO INCREASE THE VISCOSITY OF HYDROPHILIC POLYMER FLUIDS

for which we have described and set forth in an application for Letters Patent of the United States of America:

- ☒ for which an application for a United States patent was executed on July 28, 2008 under Docket Number 56.1205 and assigned Serial Number 61/137,183

WHEREAS, **Schlumberger Technology Corporation**, hereinafter referred to as the "said COMPANY", a corporation duly organized, incorporated and existing under the laws of the State of Texas and having a place of business at 110 Schlumberger Drive, Sugar Land, Texas 77478 is desirous of acquiring or confirming its acquisition of the entire right, title and interest in and to said invention, inventions or improvements, and in and to said application, and in and to any and all patents, both of the United States and of all foreign countries, that may be obtained therefore;

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN, BE IT KNOWN, that we the Inventors, for good and valuable considerations, the receipt and sufficiency of which we hereby acknowledge, have sold, assigned, transferred and conveyed, and by this assignment do sell, assign, transfer and convey, unto said COMPANY, its successors and assigns, the entire right, title and interest throughout the world, in and to the invention, inventions or improvements described or set forth in said application, in any form or embodiment thereof, and in and to said application, and in and to any applications filed in any foreign country based thereon, including the right to file foreign applications under the provisions of any convention or treaty; and in and to any confirmation, divisional, continuation, continuation-in-part, or substitute application which may be filed on said invention, inventions or improvements in the United States or in any foreign country; and in and to any and all patents, certificates, utility models, reissues, extensions, additions or confirmations thereof which may be granted in the United States or in any foreign country upon said invention, inventions or improvements;

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TO HAVE AND TO HOLD the same to the full end of the term or terms for which any and all such United States and foreign patents and grants may be issued on said invention, inventions or improvements;

AND WE DO HEREBY AUTHORIZE and request the issuing authority to issue any and all of said United States and foreign patents on said application or applications to said COMPANY, its successors and assigns, as the assignee of the entire right, title and interest in and to the same, for the sole use and benefit of said COMPANY, its successors and assigns;

AND WE DO HEREBY COVENANT AND WARRANT that we have full right to convey the entire right, title and interest herein assigned free and clear of all licenses, encumbrances and liens whatsoever, and that we have not executed and will not execute any instruments in conflict herewith;

AND WE, FOR THE CONDITIONS AFORESAID, DO HEREBY COVENANT and agree to and with the said COMPANY, its successors and assigns, that we, my executors or administrators, will execute and deliver any and all other instruments in writing, and any and all further applications, papers, powers, affidavits, assignments, disclaimers and other documents, which in the opinion of counsel for said COMPANY, its successors and assigns, may be required or necessary in this or in any foreign country more effectually to secure to and vest in said COMPANY, its successors and assigns, the entire right, title and interest in and to said invention, inventions or improvements, application or applications, patents, rights, titles, benefits, privileges, and advantages hereby sold, assigned, confirmed, transferred and conveyed.

IN TESTIMONY WHEREOF, I have duly executed this Assignment on this 31 day of August, 2008.

A. Milne
(Arthur Milne)

WITNESSES:

Signature [Signature]
Name: GUSTAVO A. TORRES AGUIAR
Address: BOQUE SAQUE PENA, 1149, P.30
13 CARLOS, BUENOS AIRES
ARGENTINA

Date: 21/09/2008

Signature [Signature]
Name: Fernanda Carranza
Address: Rincon Club de Campo #134
Nazque, Provincia Neuquen
8300. ARGENTINA

Date: 2/09/08

IN TESTIMONY WHEREOF, I have duly executed this Assignment on this 01 day of September, 2008.

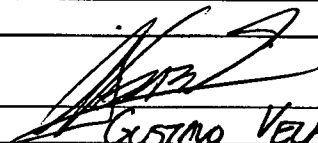

(Manuel Jose Lastre Buelvas)

8

WITNESSES:


Signature _____
Name: Herbert G6mez A.
Address: _____

Date: SEP 1st 2008


Signature _____
Name: GUSTAVO VELASCO
Address: _____

Date: SEP 1st, 2008

ASSIGNMENT

WHEREAS, we,

1. **Arthur Milne**, a citizen of the United Kingdom, whose post office address is 1939 Lavalle, 1640 Martinez, Buenos Aires DC, Argentina; and
2. **Manuel Jose Lastre Buevas**, a citizen of Colombia, whose post office address is Cr 68A #23B-53 int 01-302, Bogota, Colombia;

hereinafter referred to as the "Inventors" have invented certain new and useful improvements in

METHOD AND COMPOSITION TO INCREASE VISCOSITY OF CROSSLINKED POLYMER FLUIDS

for which we have described and set forth in an application for Letters Patent of the United States of America:

☒ for which an application for a United States patent was executed on June 25, 2009 under Docket No. 56.1202 and assigned Serial No. 12/459,042.

WHEREAS, **Schlumberger Technology Corporation**, hereinafter referred to as the "said COMPANY", a corporation duly organized, incorporated and existing under the laws of the State of Texas and having a place of business at 110 Schlumberger Drive, Sugar Land, Texas 77478 is desirous of acquiring or confirming its acquisition of the entire right, title and interest in and to said invention, inventions or improvements, and in and to said application, and in and to any and all patents, both of the United States and of all foreign countries, that may be obtained therefore;

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN, BE IT KNOWN, that we the Inventors, for good and valuable considerations, the receipt and sufficiency of which we hereby acknowledge, have sold, assigned, transferred and conveyed, and by this assignment do sell, assign, transfer and convey, unto said COMPANY, its successors and assigns, the entire right, title and interest throughout the world, in and to the invention, inventions or improvements described or set forth in said application, in any form or embodiment thereof, and in and to said application, and in and to any applications filed in any foreign country based thereon, including the right to file foreign applications under the provisions of any convention or treaty; and in and to any confirmation, divisional, continuation, continuation-in-part, or substitute application which may be filed on said invention, inventions or improvements in the United States or in any foreign country; and in and to any and all patents, certificates, utility models, reissues, extensions, additions or confirmations thereof which may be granted in the United States or in any foreign country upon said invention, inventions or improvements,

TO HAVE AND TO HOLD the same to the full end of the term or terms for which any and all such United States and foreign patents and grants may be issued on said invention, inventions or improvements.

AND WE DO HEREBY AUTHORIZE and request the issuing authority to issue any and all of said

United States and foreign patents on said application or applications to said COMPANY, its successors and assigns, as the assignee of the entire right, title and interest in and to the same, for the sole use and benefit of said COMPANY, its successors and assigns.

AND WE DO HEREBY COVENANT AND WARRANT that we have full right to convey the entire right, title and interest herein assigned free and clear of all licenses, encumbrances and liens whatsoever, and that we have not executed and will not execute any instruments in conflict herewith.

AND WE, FOR THE CONDITIONS AFORESAID, DO HEREBY COVENANT and agree to and with the said COMPANY, its successors and assigns, that we, my executors or administrators, will execute and deliver any and all other instruments in writing, and any and all further applications, papers, powers, affidavits, assignments, disclaimers and other documents, which in the opinion of counsel for said COMPANY, its successors and assigns, may be required or necessary in this or in any foreign country more effectually to secure to and vest in said COMPANY, its successors and assigns, the entire right, title and interest in and to said invention, inventions or improvements, application or applications, patents, rights, titles, benefits, privileges, and advantages hereby sold, assigned, confirmed, transferred and conveyed.

IN TESTIMONY WHEREOF, I have duly executed this Assignment on this

11 day of August, 2009.

A. Milne

Arthur Milne

Witnesses:

Signature

Name:

Address:

GUSTAVO CHARTOLI

Date:

11- AUGUST- 2009.

Schlumberger
AV. Roque SAENZ PENA 1149
Buenos Aires Argentina

Signature

Name:

Address:

PARIZO VACA
Schlumberger
AV. Roque SAENZ PENA 1149
Buenos Aires Argentina

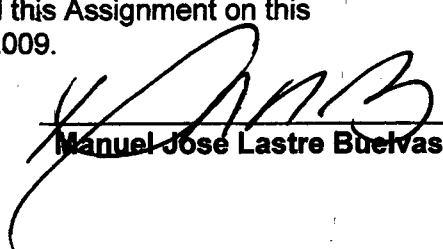
Date:

11 / AUGUST / 2009

11

IN TESTIMONY WHEREOF, I have duly executed this Assignment on this

30th day of July, 2009.


Manuel Jose Lastre Buelvas

Witnesses:

Signature

Name:

Address:



Eusebio Rodriguez

CALLE 100 # 13-21.

Bogota, Colombia

Date:

JULY 30th, 2009

Signature

Name:

Address:



Darwin Florez

Calle 21 G8D #58

Bogota, Colombia

Date:

July 30th, 2009.

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ASSIGNMENT

WHEREAS, we,

1. **Arthur Milne**, a citizen of the United Kingdom, whose post office address is 1939 Lavalle, 1640 Martinez, Buenos Aires DC, Argentina; and
2. **Manuel Jose Lastre Buelvas**, a citizen of Colombia, whose post office address is Cr 68A #23B-53 int 01-302, Bogota, Colombia;

hereinafter referred to as the "Inventors" have invented certain new and useful improvements in

METHOD AND COMPOSITION TO INCREASE VISCOSITY OF CROSSLINKED POLYMER FLUIDS

for which we have described and set forth in an application for Letters Patent of the United States of America:

☒ for which an application for a United States patent was executed on July 23, 2009 under Docket No. 56.1205 and assigned Serial No. 12/507,899.

WHEREAS, **Schlumberger Technology Corporation**, hereinafter referred to as the "said COMPANY", a corporation duly organized, incorporated and existing under the laws of the State of Texas and having a place of business at 110 Schlumberger Drive, Sugar Land, Texas 77478 is desirous of acquiring or confirming its acquisition of the entire right, title and interest in and to said invention, inventions or improvements, and in and to said application, and in and to any and all patents, both of the United States and of all foreign countries, that may be obtained therefore;

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN, BE IT KNOWN, that we the Inventors, for good and valuable considerations, the receipt and sufficiency of which we hereby acknowledge, have sold, assigned, transferred and conveyed, and by this assignment do sell, assign, transfer and convey, unto said COMPANY, its successors and assigns, the entire right, title and interest throughout the world, in and to the invention, inventions or improvements described or set forth in said application, in any form or embodiment thereof, and in and to said application, and in and to any applications filed in any foreign country based thereon, including the right to file foreign applications under the provisions of any convention or treaty; and in and to any confirmation, divisional, continuation, continuation-in-part, or substitute application which may be filed on said invention, inventions or improvements in the United States or in any foreign country; and in and to any and all patents, certificates, utility models, reissues, extensions, additions or confirmations thereof which may be granted in the United States or in any foreign country upon said invention, inventions or improvements,

TO HAVE AND TO HOLD the same to the full end of the term or terms for which any and all such United States and foreign patents and grants may be issued on said invention, inventions or improvements.

AND WE DO HEREBY AUTHORIZE and request the issuing authority to issue any and all of said

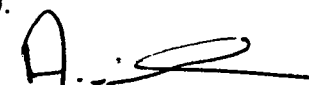
United States and foreign patents on said application or applications to said COMPANY, its successors and assigns, as the assignee of the entire right, title and interest in and to the same, for the sole use and benefit of said COMPANY, its successors and assigns.

AND WE DO HEREBY COVENANT AND WARRANT that we have full right to convey the entire right, title and interest herein assigned free and clear of all licenses, encumbrances and liens whatsoever, and that we have not executed and will not execute any instruments in conflict herewith.

AND WE, FOR THE CONDITIONS AFORESAID, DO HEREBY COVENANT and agree to and with the said COMPANY, its successors and assigns, that we, my executors or administrators, will execute and deliver any and all other instruments in writing, and any and all further applications, papers, powers, affidavits, assignments, disclaimers and other documents, which in the opinion of counsel for said COMPANY, its successors and assigns, may be required or necessary in this or in any foreign country more effectually to secure to and vest in said COMPANY, its successors and assigns, the entire right, title and interest in and to said invention, inventions or improvements, application or applications, patents, rights, titles, benefits, privileges, and advantages hereby sold, assigned, confirmed, transferred and conveyed.

IN TESTIMONY WHEREOF, I have duly executed this Assignment on this

11 day of August, 2009.



Arthur Milne

Witnesses:

Signature

Name:

Address:


GUSTAVO CAVAILLON
Schlumberger
Av. Roque Saenz Peña 1149
Buenos Aires Argentina

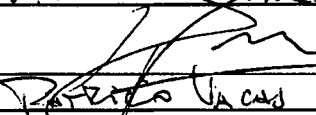
Date:

11- AUGUST - 2009.

Signature

Name:

Address:

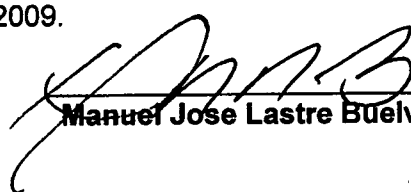

Roberto Vacas
Schlumberger
Av. Roque Saenz Peña 1149
Buenos Aires Argentina

Date:

11 / AUGUST / 2009

14

IN TESTIMONY WHEREOF, I have duly executed this Assignment on this
30th day of July, 2009.


Manuel Jose Lastre Buelvas

Witnesses:

Signature

Name:

Address:



Eusebio Rodriguez

CALLE 100 #13-21

Bogota, Colombia

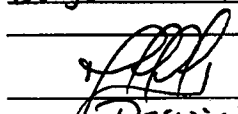
Date:

JULY 30th, 2009

Signature

Name:

Address:



Darwin Florez

Calle 21 - 68D #58

Bogota, Colombia.

Date:

July 30th, 2009.

15
TRADUCCION NO. 11.468 DE UN DOCUMENTO ESCRITO EN INGLÉS, HECHA POR MARIA MERCEDES URICOECHEA T. TRADUCTORA/INTÉRPRETE OFICIAL SEGÚN RES. 10607 DEL 31 DE DBRE81, DEL MINISTERIO DE JUSTICIA. Bogotá, 14 DE SEPTIEMBRE DE 2009.

CESIÓN PATENTE A SCHLUMBERGER TECHNOLOGY CORPORATION.
Legalizaciones subsiguientes.

CESION

POR CUANTO, nosotros,

Arthur Milne, ciudadano estadounidense, cuya dirección postal es: Plaza San Martin Suites, Apartment 502, Suipacha 1092, Buenos Aires, Argentina; y

Manuel José Lastre Buelvas, ciudadano colombiano, cuya dirección postal es: Cra 68A # 23B Int. 01-302, Bogotá, Colombia

referidos en adelante como los “Inventores”, hemos inventado ciertas mejoras nuevas y útiles en

USO DE SURFACTANTES VES PARA AUMENTAR LA VISCOSIDAD DE FLUIDOS DE POLÍMERO HIDROFÍLICO

[USE OF VES SURFACTANTS TO INCREASE THE VISCOSITY OF HYDROPHYLIC POLYMER FLUIDS]

☒ para la cual se radicó una solicitud de patente estadounidense el 28 de julio de 2008, bajo el No. 56.1205 y a la cual se le asignó el No. de Serie 61/137,183.

POR CUANTO, Schlumberger Technology Corporation, referida en adelante como “dicha COMPAÑÍA”, una compañía debidamente constituida, organizada y existente de conformidad con las leyes del Estado de Texas y con principal lugar de negocios situado en 110 Schlumberger Drive, Sugar Land, Texas 77478 desea adquirir o confirmar su adquisición de todo el derecho, título e interés en dicha invención, invenciones o mejoras, y en dicha solicitud, y en cualquiera y todas las patentes, tanto de los Estados Unidos como de otros países que se puedan obtener por ella;

AHORA, POR CONSIGUIENTE, A TODOS A QUIENES INTERESE, HÁGASE SABER, que los suscritos Inventores, por pago bueno y oneroso, cuyo recibo y suficiencia

Maria Mercedes Uricoechea T
Traductora Juramentada
Resolución 10607/81 Minjusticia

16

se acusan aquí, hemos vendido, cedido, transferido y traspasado, y mediante esta cesión vendemos, cedemos, transferimos y traspasamos a dicha COMPAÑÍA a sus sucesores y cesionarios, todo el derecho, título e interés en todo el mundo, en la invención descrita, invenciones o mejoras que se describe o establecen en dicha solicitud, en cualquier forma o realización de la misma y en dicha solicitud y en cualquier solicitud radicada en cualquier país extranjero con base en las mismas, incluido el derecho de radicar solicitudes extranjeras de acuerdo con las disposiciones de cualquier convenio o tratado; y en cualquier confirmación, división, continuación, continuación en parte o solicitud sustituta que pueda radicarse sobre dicha invención, invenciones o mejoras en los Estados Unidos o en cualquier otro país; y en cualquiera y todas las patentes, certificados, modelos de utilidad, re-expediciones, extensiones, adiciones o confirmaciones de las mismas que puedan otorgarse en los Estados Unidos o en cualquier otro país en dicha invención, invenciones o mejoras,

PARA QUE TENGA Y MANTENGA la misma hasta el término de la vigencia o vigencias para las cuales dichas Patentes estadounidenses o extranjeras o concesiones puedan expedirse sobre dicha invención, invenciones o mejoras.

Y POR LA PRESENTE AUTORIZAMOS y solicitamos a la autoridad expedidora que expida cualquiera y todas las patentes estadounidenses y extranjeras sobre dicha solicitud o solicitudes a dicha COMPAÑÍA, a sus sucesores y cesionarios, como los cesionarios de todo el derecho, título e interés en la misma, para uso y beneficio exclusivo de dicha COMPAÑÍA, sus sucesores y cesionarios.

Y POR LA PRESENTE DICHOS INVENTORES CONVENIMOS Y GARANTIZAMOS que tenemos el pleno derecho de traspasar el entero derecho, título e interés que cedemos aquí, libre y neto de todas licencias, gravámenes y prendas de cualquier clase, y que ninguno de dichos Inventores han suscrito ni suscribirán ningún documento que entre en conflicto con lo anterior.

Y NOSOTROS, POR LAS CONDICIONES ANTES MENCIONADAS, POR LA PRESENTE CONVENIMOS y acordamos con dicha COMPAÑÍA, sus sucesores y cesionarios, que cada Inventor, sus albaceas, administradores u otros representantes

María Mercedes Uricoechea T
Traductora Juramentada
Resolución 10607/81 Minjusticia



personales, harán todos los actos y cosas legales, tomarán los juramentos de rigor, y harán y entregarán cualquier otro instrumento por escrito y las demás solicitudes, documentos poderes, declaraciones juramentadas, cesiones, renunciaciones y cualquier otro documento que en opinión de los abogados de dicha COMPAÑÍA, sus sucesores y cesionarios puedan ser requeridos o necesarios en este país o en cualquier otro país para asegurar e invertir en dicha COMPAÑÍA, sus sucesores y cesionarios, el entero derecho, título e interés en dicha invención, invenciones o mejoras, solicitud o solicitudes, patentes, derechos, títulos, beneficios, privilegios y ventajas que por la presente se venden, ceden, confirman transfieren o traspasan.

EN TESTIMONIO DE LO CUAL, firmo esta Cesión hoy 31 de agosto de 2008.

(Firma) Arthur Milne

(FIRMA DE DOS TESTIGOS) (2 de septiembre de 2008)

EN TESTIMONIO DE LO CUAL, firmo esta Cesión hoy 01 de septiembre de 2008.

(Firma) Manuel José Lastre Buelvas

(FIRMA DE DOS TESTIGOS) (1 de septiembre de 2008)

CESION

POR CUANTO, nosotros,

Arthur Milne, ciudadano estadounidense, cuya dirección postal es: Plaza San Martin Suites, Apartment 502, Suipacha 1092, Buenos Aires, Argentina; y

Manuel José Lastre Buelvas, ciudadano colombiano, cuya dirección postal es: Cra 68A # 23B Int: 01-302, Bogotá, Colombia

referidos en adelante como los "Inventores", hemos inventado ciertas mejoras nuevas y útiles en

MÉTODO Y COMPOSICIÓN PARA AUMENTAR VISCOSIDAD DE FLUIDOS DE POLÍMERO DE ENLACE CRUZADO

[METHOD AND COMPOSITION TO INCREASE VISCOSITY OF CROSSLINKED POLYMER FLUIDS]

☒ para la cual se radicó una solicitud de patente estadounidense el 25 de junio de 2009, bajo el No. 56.1202 y a la cual se le asignó el No. de Serie 12/459,042.

POR CUANTO, Schlumberger Technology Corporation, referida en adelante como "dicha COMPAÑÍA", una compañía debidamente constituida, organizada y existente de conformidad con las leyes del Estado de Texas y con principal lugar de negocios situado en 110 Schlumberger Drive, Sugar Land, Texas 77478 desea adquirir o confirmar su adquisición de todo el derecho, título e interés en dicha invención, invenciones o mejoras, y en dicha solicitud, y en cualquiera y todas las patentes, tanto de los Estados Unidos como de otros países que se puedan obtener por ella;

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PARA QUE TENGA Y MANTENGA la misma hasta el término de la vigencia o vigencias para las cuales dichas Patentes estadounidenses o extranjeras o concesiones puedan expedirse sobre dicha invención, invenciones o mejoras.

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EN TESTIMONIO DE LO CUAL, firmo esta Cesión hoy 11 de agosto de 2009.

(Firma) Arthur Milne

(FIRMA DE DOS TESTIGOS) (11 de agosto de 2009)

EN TESTIMONIO DE LO CUAL, firmo esta Cesión hoy 30 de julio de 2009.

(Firma) Manuel José Lastre Buelvas

(FIRMA DE DOS TESTIGOS) (30 de julio de 2009)

CESION

POR CUANTO, nosotros,

Arthur Milne, ciudadano estadounidense, cuya dirección postal es: Plaza San Martin Suites, Apartment 502, Suipacha 1092, Buenos Aires, Argentina; y

Manuel José Lastre Buelvas, ciudadano colombiano, cuya dirección postal es: Cra 68A # 23B Int. 01-302, Bogotá, Colombia

referidos en adelante como los "Inventores", hemos inventado ciertas mejoras nuevas y útiles en

MÉTODO Y COMPOSICIÓN PARA AUMENTAR VISCOSIDAD DE FLUIDOS DE POLÍMERO DE ENLACE CRUZADO

[METHOD AND COMPOSITION TO INCREASE VISCOSITY OF CROSSLINKED POLYMER FLUIDS]

☒ para la cual se radicó una solicitud de patente estadounidense el 23 de julio de 2009, bajo el No. 56.1205 y a la cual se le asignó el No. de Serie 12/507,899.

POR CUANTO, Schlumberger Technology Corporation, referida en adelante como "dicha COMPAÑÍA" una compañía debidamente constituida, organizada y existente de conformidad con las leyes del Estado de Texas y con principal lugar de negocios situado en 110 Schlumberger Drive, Sugar Land, Texas 77478 desea adquirir o confirmar su adquisición de todo el derecho, título e interés en dicha invención, invenciones o mejoras, y en dicha solicitud, y en cualquiera y todas las patentes, tanto de los Estados Unidos como de otros países que se puedan obtener por ella;

AHORA, POR CONSIGUIENTE, A TODOS A QUIENES INTERESE, HÁGASE SABER, que los suscritos Inventores, por pago bueno y oneroso, cuyo recibo y suficiencia se acusan aquí, hemos vendido, cedido, transferido y traspasado, y mediante esta cesión vendemos, cedemos, transferimos y traspasamos a dicha COMPAÑÍA a sus sucesores y cesionarios, todo el derecho, título e interés en todo el mundo, en la invención descrita, invenciones o mejoras que se describe o establecen en dicha solicitud, en cualquier forma o realización de la misma y en dicha solicitud y en cualquier solicitud radicada en cualquier país extranjero con base en las mismas, incluido el derecho de radicar solicitudes

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extranjeras de acuerdo con las disposiciones de cualquier convenio o tratado; y en cualquier confirmación, división, continuación, continuación en parte o solicitud sustituta que pueda radicarse sobre dicha invención, invenciones o mejoras en los Estados Unidos o en cualquier otro país; y en cualquiera y todas las patentes, certificados, modelos de utilidad, re-expediciones, extensiones, adiciones o confirmaciones de las mismas que puedan otorgarse en los Estados Unidos o en cualquier otro país en dicha invención, invenciones o mejoras,

PARA QUE TENGA Y MANTENGA la misma hasta el término de la vigencia o vigencias para las cuales dichas Patentes estadounidenses o extranjeras o concesiones puedan expedirse sobre dicha invención, invenciones o mejoras.

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Y NOSOTROS, POR LAS CONDICIONES ANTES MENCIONADAS, POR LA PRESENTE CONVENIMOS y acordamos con dicha COMPAÑÍA, sus sucesores y cesionarios, que cada Inventor, sus albaceas, administradores u otros representantes personales, harán todos los actos y cosas legales, tomarán los juramentos de rigor, y harán y entregarán cualquier otro instrumento por escrito y las demás solicitudes, documentos poderes, declaraciones juramentadas, cesiones, renunciaciones y cualquier otro documento que en opinión de los abogados de dicha COMPAÑÍA, sus sucesores y cesionarios puedan ser requeridos o necesarios en este país o en cualquier otro país para asegurar e invertir en dicha COMPAÑÍA, sus sucesores y cesionarios, el entero derecho, título e interés en dicha

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EN TESTIMONIO DE LO CUAL, firmo esta Cesión hoy 11 de agosto de 2009.

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(Firma) Manuel José Lastre Buelvas

(FIRMA DE DOS TESTIGOS) (30 de julio de 2009)

Cesión de Solicitud de Patente

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Schlumberger Technology Corporation, cesionaria del interés total en la solicitud de patente estadounidense

Serie No. 61/137183 radicada el 28 de julio de 2008, titulada **USO DE SURFACTANTES VES PARA AUMENTAR LA VISCOSIDAD DE FLUIDOS DE POLÍMERO HIDROFÍLICO** [*USE OF VES SURFACTANTS TO INCREASE THE VISCOSITY OF HYDROPHYLIC POLYMER FLUIDS*]

Serie No. 12/459,042 radicada el 25 de junio de 2009, titulada **MÉTODO Y COMPOSICIÓN PARA AUMENTAR VISCOSIDAD DE FLUIDOS DE POLÍMERO DE ENLACE CRUZADO** [*METHOD AND COMPOSITION TO INCREASE VISCOSITY OF CROSSLINKED POLYMER FLUIDS*]

Serie No. 12/507,899 radicada el 23 de julio de 2009, titulada **MÉTODO Y COMPOSICIÓN PARA AUMENTAR VISCOSIDAD DE FLUIDOS DE POLÍMERO DE ENLACE CRUZADO** [*METHOD AND COMPOSITION TO INCREASE VISCOSITY OF CROSSLINKED POLYMER FLUIDS*]

Por la presente cede los derechos de prioridad y el interés total en dicha invención y solicitud, y en toda confirmación división, continuación, continuación en parte o solicitud sustituta que pueda presentarse sobre dicha invención o pueda reclamar prioridad sobre dicha solicitud en Colombia a:

Schlumberger Technology B.V.

Parkstraat 83-89

2514G The Hague

The Netherlands

(Por) Cedente Robin Nava

(Por) Cesionaria

Schlumberger Technology Corporation

Schlumberger Technology B.V.

Fecha: 8-4-09

Fecha: 8-4-09

RECONOCIMIENTO NOTARIAL

ESTADO DE TEXAS

CONDADO DE FORT BEND

Ante mí, una Notaria Pública comparecieron en la fecha los señores Robin Nava y David Cate, quienes sé que fueron las personas que suscribieron el documento adjunto y quienes habiendo sido tomadas en juramento, declararon que las afirmaciones allí contenidas son verdaderas y correctas.

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HA

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Dado bajo mi firma y sello hoy 4 de agosto de 2009.

(FIRMA Y SELLO SECO) Kathryne Rose Yzaguirre. Mi comisión vence el 14 de diciembre de 2010 .

ESTADO DE TEXAS

CONDADO DE FORT BEND

En la fecha, 17 de agosto de 2009, Certifico que el documento anterior o adjunto y el duplicado que conservo en los archivos notariales, son fotocopias legítimas, exactas, completas e inalteradas que tomé yo, y que hasta donde tengo conocimiento, el documento en fotocopia no es un registro público, no tiene registro público, cuyas copias certificadas no se encuentran a disposición de una fuente oficial excepto de un notario público.

(FIRMA Y SELLO SECO) Kathryne Rose Yzaguirre. Mi comisión vence el 14 de diciembre de 2010 .

LEGALIZACIÓN

El Estado de Texas
Secretario de Estado

Para uso fuera de los Estados Unidos de América

Este Apostille solo certifica la firma, capacidad del firmante y sello que lleva. No certifica el contenido del documento para el cual fue expedido el Apostille

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Certificado

4. en Austin, Texas
6. hoy 20 de agosto de 2009
7. por el Secretario de Estado de Texas
8. No. N-710679


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Hope Andrade
Secretario de Estado

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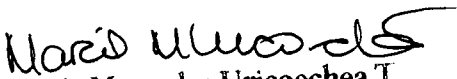
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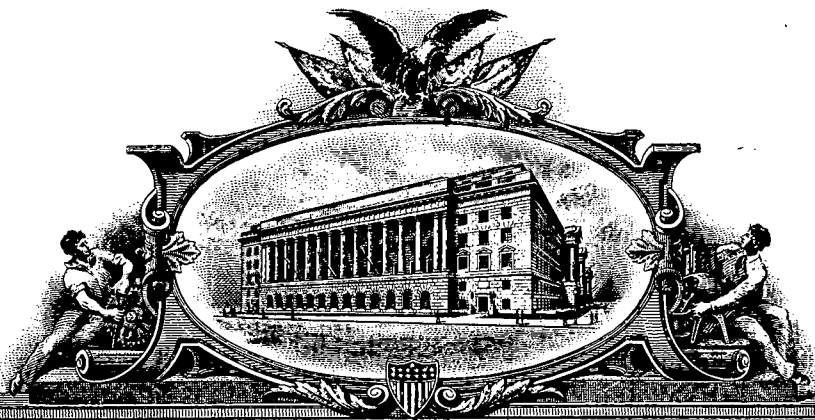
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TRADUCTORA/INTÉRPRETE OFICIAL

RES. 10607 DEL 31 DE DBRE/81, MINJUSTICIA

FIN DE LA TRADUCCIÓN OFICIAL NO. 11.468


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THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

August 12, 2009

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: 61/137,183

FILING DATE: July 28, 2008

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS US61/137,183

**By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office**




N. WILLIAMS
Certifying Officer

U.S. PTO

61/137183

07/28/2008 PTO/SB/16 (02-07)

Approved for use through 02/28/2007. OMB 0651-0032

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET – Page 1 of 2

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. EQ832038517

INVENTOR(S)

Given Name (first and middle (if any))	Family Name or Surname	Residence (City and either State or Foreign Country)
Arthur	Milne	Bogota, Columbia
Manuel Jose	Lastre Buelvas	Bogota, Columbia

Additional inventors are being named on the _____ separately numbered sheets attached hereto

TITLE OF THE INVENTION (500 characters max):

Use of Ves Surfactants to Increase the Viscosity of Hydrophilic Polymer Fluids

Direct all correspondence to:

CORRESPONDENCE ADDRESS☒ The address corresponding to Customer Number:

27452

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ENCLOSED APPLICATION PARTS (check all that apply)☐ Application Data Sheet. See 37 CFR 1.76☐ CD(s), Number of CDs _____☐ Drawing(s) Number of Sheets _____☐ Other (specify) _____☒ Specification (e.g. description of the invention) Number of Pages 16**Fees Due:** Filing Fee of \$200 (\$100 for small entity). If the specification and drawings exceed 100 sheets of paper, an application size fee is also due, which is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).**METHOD OF PAYMENT OF THE FILING FEE AND APPLICATION SIZE FEE FOR THIS PROVISIONAL APPLICATION FOR PATENT**☐ Applicant claims small entity status. See 37 CFR 1.27.☐ A check or money order is enclosed to cover the filing fee and application size fee (if applicable).☐ Payment by credit card. Form PTO-2038 is attached☒ The Director is hereby authorized to charge the filing fee and application size fee (if applicable) or credit any overpayment to Deposit

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This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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PROVISIONAL APPLICATION COVER SHEET
Page 2 of 2

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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.
☒ No.
☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

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SIGNATURE David Cate Date July 28, 2008

TYPED or PRINTED NAME David Cate REGISTRATION NO. 49,091
(if appropriate)

TELEPHONE 281-285-8606 Docket Number: 56.1205

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
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USE OF VES SURFACTANTS TO INCREASE THE VISCOSITY OF HYDROPHILIC POLYMER FLUIDS

DESCRIPTION

[0001] At the outset, it should be noted that in the development of any such actual embodiment, numerous implementation—specific decisions must be made to achieve the developer's specific goals, such as compliance with system related and business related constraints, which will vary from one implementation to another. Moreover, it will be appreciated that such a development effort might be complex and time consuming but would nevertheless be a routine undertaking for those of ordinary skill in the art having the benefit of this disclosure. In addition, the composition used/disclosed herein can also comprise some components other than those cited. In the summary of the invention and this detailed description, each numerical value should be read once as modified by the term "about" (unless already expressly so modified), and then read again as not so modified unless otherwise indicated in context. Also, in the summary of the invention and this detailed description, it should be understood that a concentration range listed or described as being useful, suitable, or the like, is intended that any and every concentration within the range, including the end points, is to be considered as having been stated. For example, "a range of from 1 to 10" is to be read as indicating each and every possible number along the continuum between about 1 and about 10. Thus, even if specific data points within the range, or even no data points within the range, are explicitly identified or refer to only a few specific, it is to be understood that inventors appreciate and understand that any and all data points within the range are to be considered to have been specified, and that inventors possessed knowledge of the entire range and all points within the range.

[0002] Embodiments described herein are novel techniques for installing sand control screens in a wellbore after drilling the wellbore with a synthetic/oil based mud.

[0003] Conventional crosslinked polymer fracturing fluids have several inherent characteristics. The viscosity of a fluid with a given polymer concentration (lbm/1000 gal) decreases with both time and/or temperature. Hence the polymer concentration is increased to a) in order to maintain a given / required viscosity for a longer period of time, and to achieve the required viscosity at

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higher temperatures. The fluid loss control of the fluid in a formation with a given permeability is dependent to great extent on the polymer concentration. Increasing the polymer concentration in general will improve the fluid loss control as the polymer creates a filter cake on the face of the formation. Increasing polymer concentrations in the fluid results in lower fracture conductivity and retained permeability in the fracture faces, due to damage by polymer residue. Both decrease the productivity of the final propped fracture.

[0004] Exposure to high shear tends to degrade the properties of the crosslinked fluid. To a lesser or greater degree the viscosity of the crosslinked fluid is reduced after it has been exposed to high shear (ca. 1000 / sec) which is common when displacing the fluid in a workstring to perforations. The time for the fluid to recover viscosity after being exposed to high shear may take minutes and it is during this time that the fluid/proppant is entering into the hydraulic fracture. The reduced viscosity of the fluid results in a narrower hydraulic fracture and increased risk of proppant screenout in the well bore.

[0005] Fracturing fluids with viscoelastic surfactants have the following characteristics. As a solids free fluid, VES fluids do not create residual damage in either the proppant pack or the faces of the fractures. As a solids free fluid, VES fluids have limited fluid loss control in high permeability formations. No filter cake is formed so the fluid loss is a function of the viscosity of the fluid, permeability of the formation and properties of the reservoir fluids. The ease with which one fluid can displace the other in the porous medium under reservoir conditions. High concentrations of surfactant are required to create a fluid with sufficient viscosity to create a hydraulic fracture in any formation with permeability greater than a few mD. The viscosity of a fluid with a given concentration sensitive to any change in temperature above 150 Deg F. Also, compatibility with formation crude can be a concern as the VES viscosity is very sensitive to the presence of surfactants or de-emulsifiers.

[0006] Embodiments disclosed herein are related to hybrid fluids which combine low concentration of VES with a crosslinked hydrophilic polymer fluid. The final fluid combines to some degree overcome disadvantages of traditional fluids. Some benefits include:

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56.1205 – Provisional Patent Application

Inventors: Milne, Lastre

Express Mail: EQ832038517

- a) Higher viscosity compared to a crosslinked guar (or other hydrophilic polymer based) fluid (with same polymer loading) without VES;
- b) Shear recovery of a crosslinked guar (or other hydrophilic polymer based) fluid is improved by the addition of VES;
- c) The temperature stability of the crosslinked guar (or other hydrophilic polymer based) fluid is improved by the addition of VES;
- d) Improved leakoff control;
- e) Ability to include high concentrations of surfactants / mutual solvents in the fluid without losing viscosity.

[0007] Further, inventors have observed that the use of crosslinked (borate or transition metal) guar or HPG polymer with no upper effective limit on polymer concentration is possible.

[0008] Claimed embodiments of the invention do not include those embodiments disclosed in US Pat Application Publication number 2005/0107503, which is included herein in its entirety. The hydrophilic polymers used herein do not contain pendant hydrophobic chains which are fully or partially saturated linear or branched hydrocarbon chains comprising preferably approximately 12 to 24 carbon atoms and including advantageously a cleavable or degradable group such as an acetal, an amide, an ether or an ester bond. Also, the hydrophilic polymers may not be the same as those described in US Pat Application Publication number 2005/0107503.

[0009] To illustrate some of the above benefits when fracturing or treating permeable formations in the 120 to 180 Deg F temperature range, the following measurements were noted by inventors:

- 1) Higher viscosity at a given temperature with lower polymer concentrations: subjected to 160 Deg F @ a shear rate of 100 /1 for 25 minutes at temperature gives 15 ppt guar in water (guar fluid) gives 130 cps while a hybrid fluid (5 gpt of a 40% by weight aqueous solution of erucic amidopropyl dimethyl betaine [VES] in the above guar fluid yielded 210 cps;

2) Improved fluid loss (static leakoff test in an 80 mD core @ 160 Deg F): guar fluid gave spurt loss (gal/100 sq ft) = 4.81, and C_w (ft/min^{1/2}) = 0.006088; while hybrid fluid yielded spurt loss (gal/100 sq ft) = 2.61, and C_w (ft/min^{1/2}) = 0.001598;

3) Improved shear recovery – viscosity @ 100 / sec after 2 minutes shear at 1000 / sec: guar fluid gave 100 cps while the hybrid fluid gave 175 cps;

4) Less sensitivity to presence of surfactants and de-emulsifiers.

[00010] The increased viscosity of a fluid system which combines low concentrations of a VES surfactant and a crosslinked hydrophilic guar polymer is shown below at three different temperatures. At 130 Deg F there is little difference in the rheology of the guar fluid and hybrid fluid. However, as further below, the fluid loss control/efficiency of a hybrid fluid is greatly improved (Figure 8) as is the shear recovery (Figure 2). At each temperature there would appear to be an optimum concentration of VES. For instance, 2.5 gpt VES to form the hybrid fluid, at 130 deg F provides improved fluid loss control; 5.0 gpt VES at 160 deg F provides improved fluid loss control and rheology; 7.5 gpt VES at 180 deg F provides improved fluid loss control and rheology. The follow graphs illustrate the above described improvements with a hybrid fluid. In all cases, the red curve is fluid temperature, yellow curve shear rate (1/s), green curve hybrid fluid viscosity, and blue curve guar fluid viscosity. In all cases, 5 gpt VES, 2 gpt of EZEFL0 surfactant and 1 gpt of non-emulsifying agent / surfactant blend comprise the hybrid fluid, unless otherwise noted.

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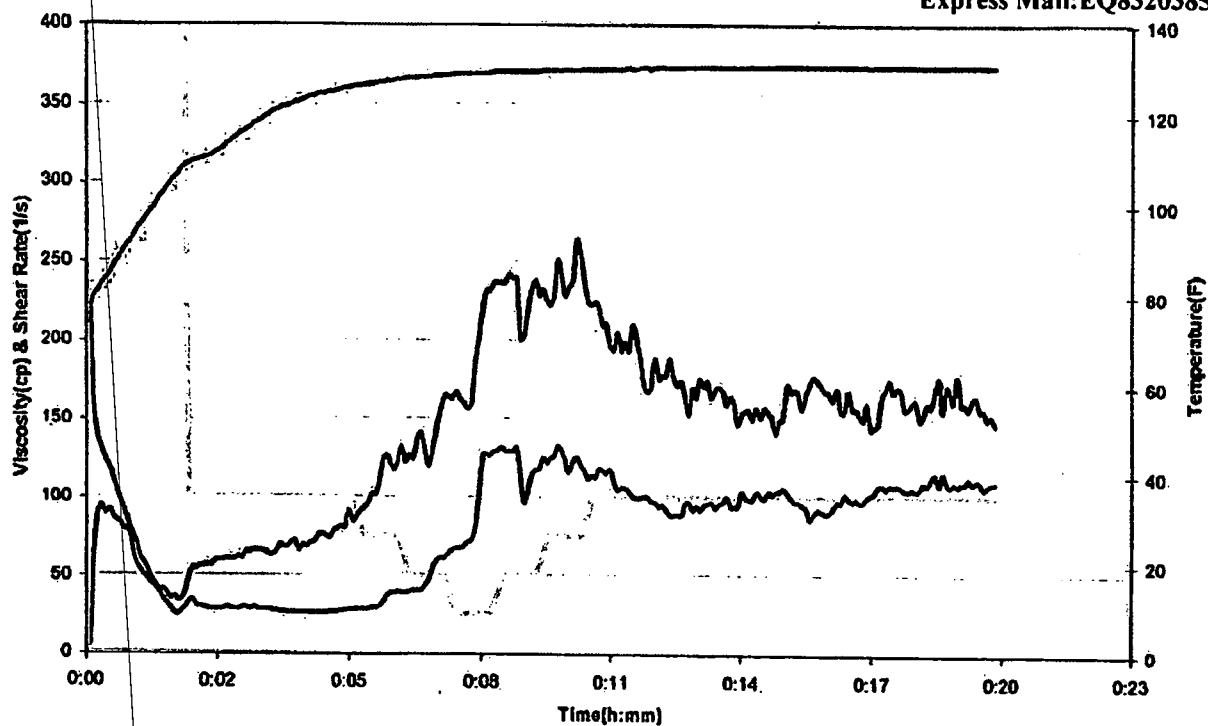


Figure 1 – Viscosity at 130 deg F

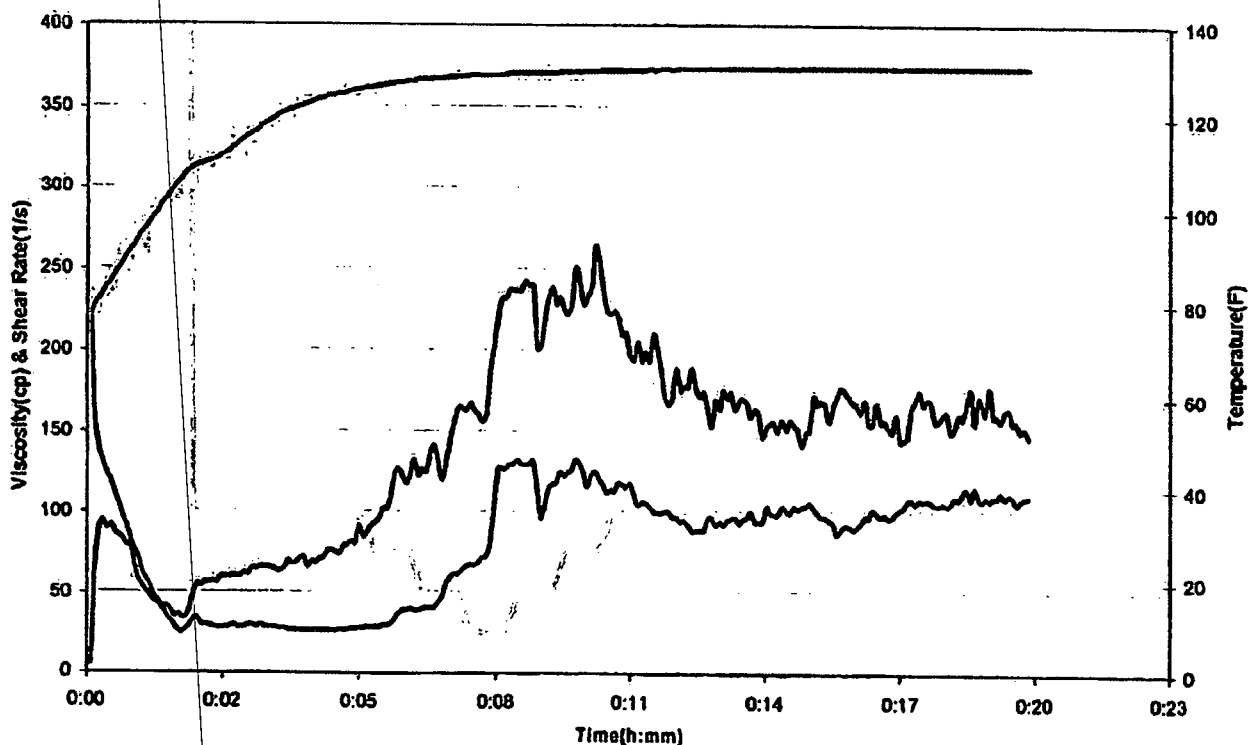


Figure 2 – Shear Recovery at 130 deg F

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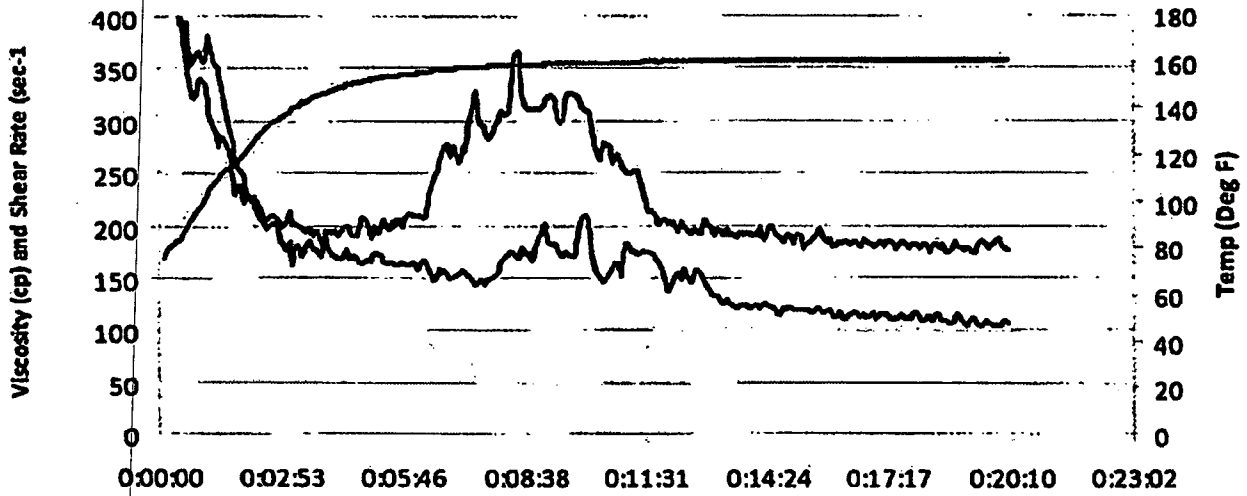


Figure 3 – Viscosity over time at 160 deg F

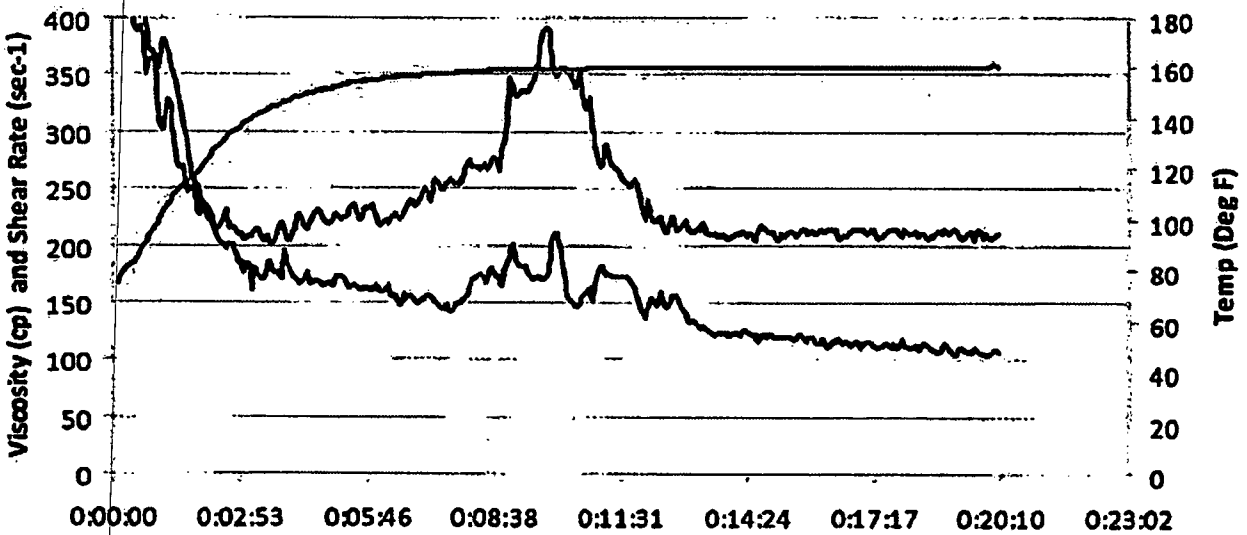


Figure 4 – Viscosity over time at 160 deg F: 7.5 gpt VES, 2 gpt of EZEFL0 surfactant and 1 gpt of non-emulsifying agent / surfactant blend comprise the hybrid fluid

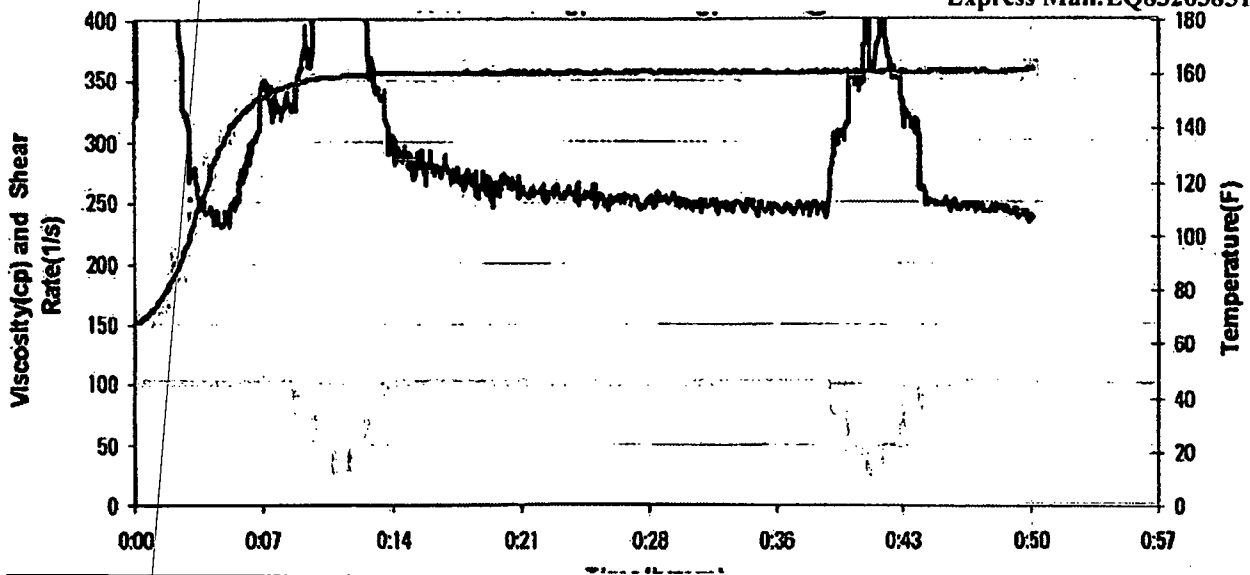


Figure 5 – Over time, Viscosity and Shear Rate for 7.5 gpt VES, 0 gpt of EZEFL0 surfactant and 5 gpt of non-emulsifying agent / surfactant blend comprise the hybrid fluid

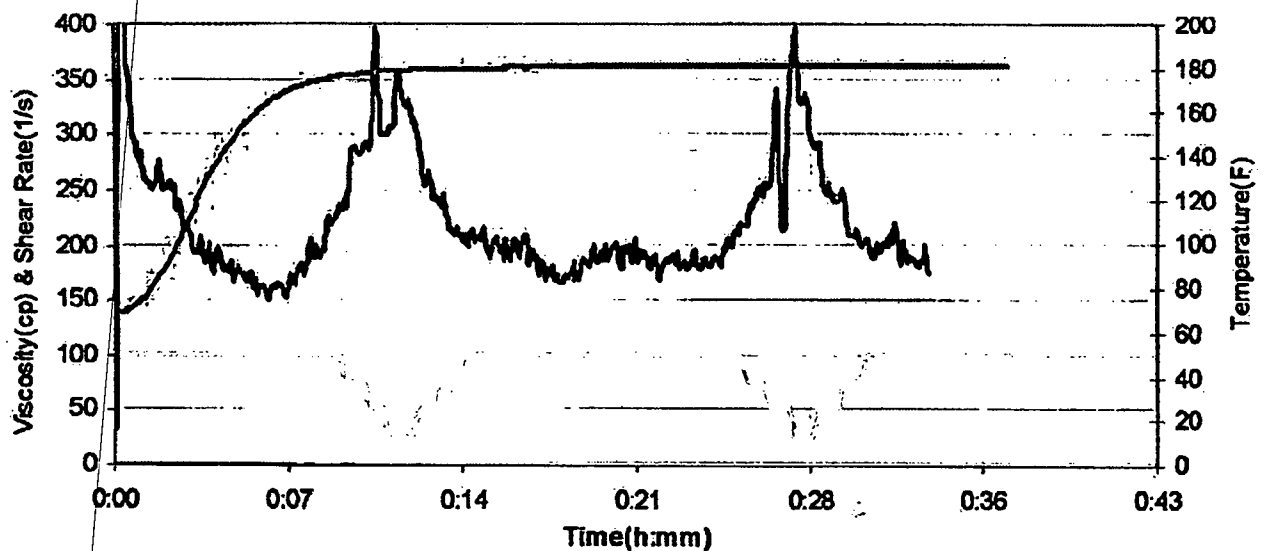


Figure 6 – 7.5 gpt VES, 0 gpt of EZEFL0 surfactant and 0 gpt of non-emulsifying agent / surfactant blend comprise the hybrid fluid

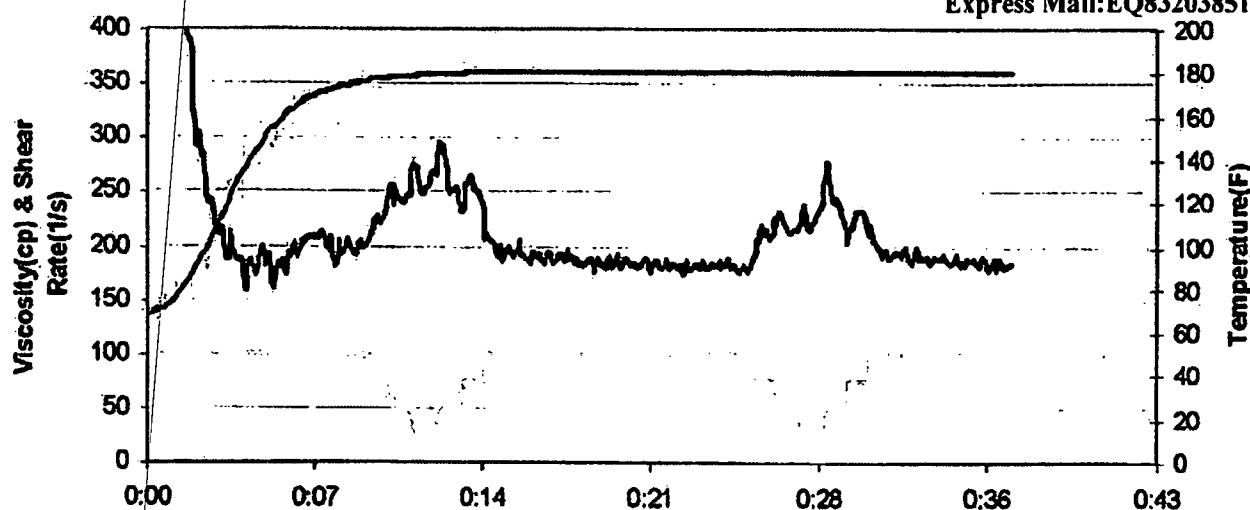


Figure 7 – Over time, Viscosity and Shear Rate for 7.5 gpt VES, 0 gpt of EZEFL0 surfactant and 5 gpt of non-emulsifying agent / surfactant blend comprise the hybrid fluid

[00011]

To evaluate improved fluid loss, tests were run at 160 Deg F as follows:

- 1) Establish baseline permeability to 2% KCl
- 2) Perform static leakoff test with fracturing fluid (30 in. 500 psi)
- 3) Measure retained permeability to 2% KCl at increasing differential pressure up to 250 psi.

A test was run with 2.5 gpt of VES in a core with an effective permeability to water of 18 mD (Figure 8). Despite the relatively high permeability the values of both spurt loss and C_w were much lower than what is observed for guar fluid @ 150 Deg F in a 1 mD core (Table 1).

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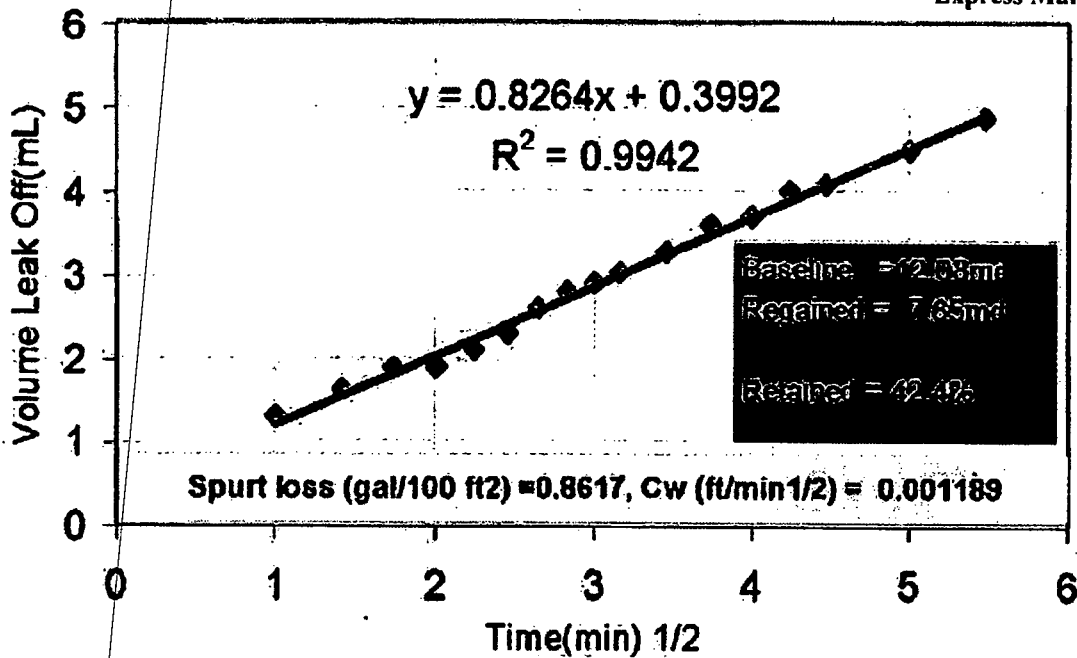


Figure 8 – 2.5 gpt VES, 0 gpt of EZEFL0 surfactant, 0 gpt of non-emulsifying agent / surfactant blend, and 0 gpt of methanol comprise the hybrid fluid

Temperature (degF [degC])	Permeability (md)	C_w (ft/min ^{1/2})	Spurt (galUS/100 ft ²)
100 (38)	0.76	0.0017	1.82
125 (52)	0.77	0.0018	0.15
150 (66)	0.73	0.0023	5.17

Table 1

[00012] Next a series of tests were run in a high permeability core - 85 mD with no VES (Fig 9), then 1 gpt VES (Fig 10), and then 5 gpt VES with 5 gpt methanol (Fig 11), all at 160 deg F. The results indicate that the fluid loss control of the fluid is improved with increasing concentrations of VES.

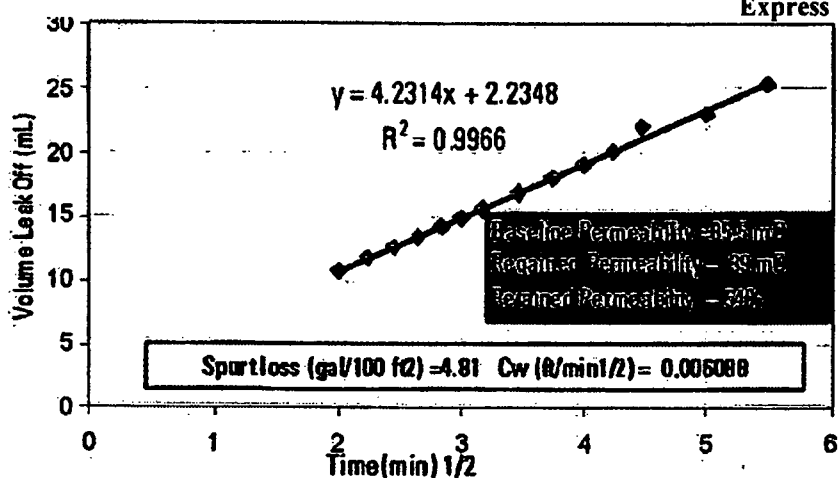


Figure 9

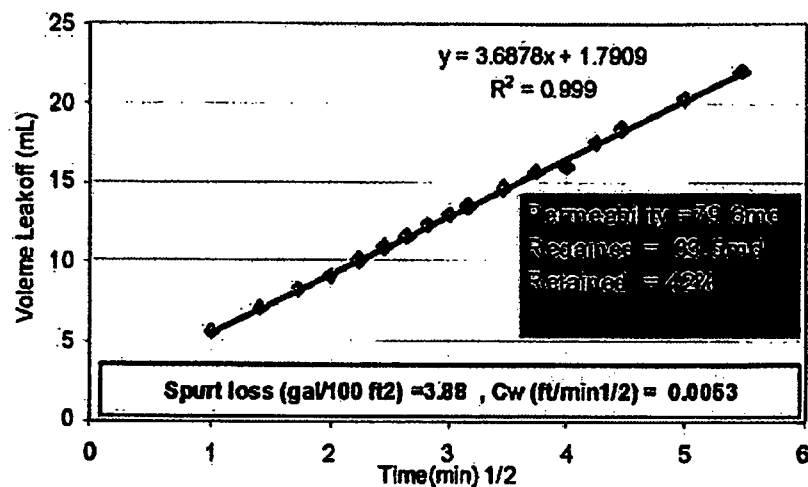


Figure 10

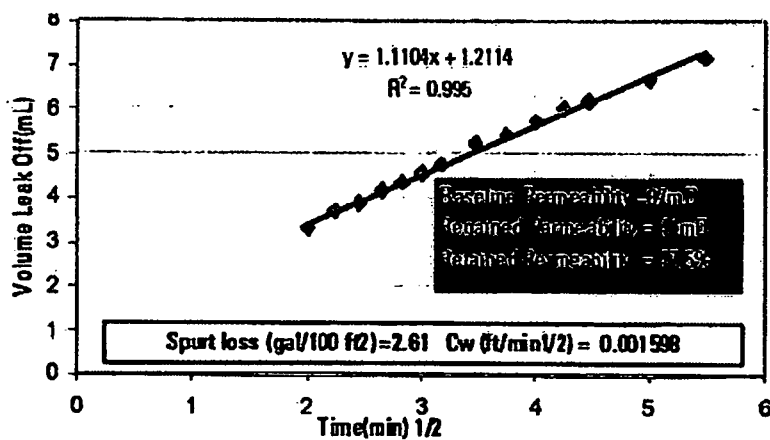


Figure 11

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[00013] As described above, the improved properties are provided by combining low concentrations of a VES surfactant and a hydrophilic polymer. By hydrophilic, it is meant any polymer which is not hydrophobically modified, not naturally hydrophobic, or are those polymers which have a strong affinity for aqueous medium.

[00014] The hydrophilic polymers include, but are not limited to, guar gums, high-molecular weight polysaccharides composed of mannose and galactose sugars, or guar derivatives such as hydroxypropyl guar (HPG), and the like. Cellulose derivatives such as hydroxyethylcellulose (HEC) or hydroxypropylcellulose (HPC) and carboxymethylhydroxyethylcellulose (CMHEC) may also be used. Any useful hydrophilic polymer may be used in either crosslinked form, or without crosslinker in linear form. Xanthan, diutan, and scleroglucan, three biopolymers, have been shown to be useful as viscosifying agents. Synthetic polymers such as, but not limited to, polyacrylamide and polyacrylate polymers and copolymers are used typically for high-temperature applications. The hydrophilic polymer viscosifier may be present at any suitable concentration. In various embodiments hereof, the hydrophilic polymer can be present in an amount of from about 10 to less than about 60 pounds per thousand gallons of liquid phase, or from about 15 to less than about 40 pounds per thousand gallons, from about 15 to about 35 pounds per thousand gallons, 15 to about 25 pounds per thousand gallons, or even from about 17 to about 22 pounds per thousand gallons. Generally, the gelling agent can be present in an amount of from about 10 to less than about 50 pounds per thousand gallons of liquid phase, with a lower limit of polymer being no less than about 10, 11, 12, 13, 14, 15, 16, 17, 18, or 19 pounds per thousand gallons of the liquid phase, and the upper limit being less than about 50 pounds per thousand gallons, no greater than 59, 54, 49, 44, 39, 34, 30, 29, 28, 27, 26, 25, 24, 23, 22, 21, or 20 pounds per thousand gallons of the liquid phase. In some embodiments, the polymers can be present in an amount of about 20 pounds per thousand gallons.

[00015] Nonlimiting examples of suitable viscoelastic surfactants useful for viscosifying some fluids include cationic surfactants, anionic surfactants, zwitterionic surfactants, amphoteric surfactants, nonionic surfactants, and combinations thereof. Also, associative polymers for which viscosity properties are enhanced by suitable surfactants and hydrophobically modified polymers

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can be used, such as cases where a a charged polymer in the presence of a surfactant having a charge that is opposite to that of the charged polymer, the surfactant being capable of forming an ion- pair association with the polymer resulting in a hydrophobically modified polymer having a plurality of hydrophobic groups, as described in published application U.S. 20040209780A1, Harris et. al. VES may be incorporated into fluids used in embodiments in an amount from about 0.2% to about 15% by weight of total weight of fluid, preferably from about 0.5% to about 15% by weight of total weight of fluid, more preferably from about 2% to about 10% by weight of total weight of fluid. The lower limit of VES should no less than about 0.2, 0.5, 0.7, 0.9, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 14 percent of total weight of fluid, and the upper limited being no more than about 15 percent of total fluid weight, specifically no greater than about 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 1, 0.9, 0.7, 0.5 or 0.3 percent of total weight of fluid.

[00016] In some embodiments, proppant (gravel) can be used. Such proppants (gravels) can be natural or synthetic, coated, or contain chemicals; more than one can be used sequentially or in mixtures of different sizes or different materials. Proppants and gravels in the same or different wells or treatments can be the same material and/or the same size as one another and the term "proppant" is intended to include gravel in this discussion. In general the proppant used will have an average particle size of from about 0.15 mm to about 2.5 mm, more particularly, but not limited to typical size ranges of about 0.25-0.43 mm, 0.43-0.85 mm, 0.85-1.18 mm, 1.18-1.70 mm, and 1.70-2.36 mm. Normally the proppant will be present in the slurry in a concentration of from about 0.12 kg proppant added to each L of carrier fluid to about 3 kg proppant added to each L of carrier fluid, preferably from about 0.12 kg proppant added to each L of carrier fluid to about 1.5 kg proppant added to each L of carrier fluid.

[00017] The aqueous medium used accordingly may be water or brine. In those embodiments of the invention where the aqueous medium is a brine, the brine is water comprising an inorganic salt or organic salt. Preferred inorganic salts include alkali metal halides, more preferably potassium chloride. The carrier brine phase may also comprise an organic salt more preferably sodium or potassium formate. Preferred inorganic divalent salts include calcium halides, more preferably calcium chloride or calcium bromide. Sodium bromide, potassium bromide, or cesium bromide may also be used. The salt is chosen for compatibility reasons i.e.

where the reservoir drilling fluid used a particular brine phase and the completion/ clean up fluid brine phase is chosen to have the same brine phase.

[00018] A fiber component may be included in the fluids to achieve a variety of properties including improving particle suspension, and particle transport capabilities, and gas phase stability. Fibers used may be hydrophilic or hydrophobic in nature, but hydrophilic fibers are preferred. Fibers can be any fibrous material, such as, but not necessarily limited to, natural organic fibers, comminuted plant materials, synthetic polymer fibers (by non-limiting example polyester, polyaramide, polyamide, novoloid or a novoloid-type polymer), fibrillated synthetic organic fibers, ceramic fibers, inorganic fibers, metal fibers, metal filaments, carbon fibers, glass fibers, ceramic fibers, natural polymer fibers, and any mixtures thereof. Particularly useful fibers are polyester fibers coated to be highly hydrophilic, such as, but not limited to, DACRON® polyethylene terephthalate (PET) Fibers available from Invista Corp. Wichita, KS, USA, 67220. Other examples of useful fibers include, but are not limited to, polylactic acid polyester fibers, polyglycolic acid polyester fibers, polyvinyl alcohol fibers, and the like. When used in fluids of the invention, the fiber component may be include at concentrations from about 1 to about 15 grams per liter of the liquid phase of the fluid, preferably the concentration of fibers are from about 2 to about 12 grams per liter of liquid, and more preferably from about 2 to about 10 grams per liter of liquid

[00019] Fluid used in embodiments may further contain other additives and chemicals that are known to be commonly used in oilfield applications by those skilled in the art. These include, but are not necessarily limited to, materials such as surfactants in addition to those mentioned hereinabove, breaker aids in addition to those mentioned hereinabove, oxygen scavengers, alcohols, scale inhibitors, corrosion inhibitors, fluid-loss additives, bactericides, and the like. Also, they may include a co-surfactant to optimize viscosity or to minimize the formation of stable emulsions that contain components of crude oil or a polysaccharide or chemically modified polysaccharide, polymers such as cellulose, derivatized cellulose, guar gum, derivatized guar gum, xanthan gum, or synthetic polymers such as polyacrylamides and polyacrylamide copolymers, oxidizers such as ammonium persulfate and sodium bromate, and biocides such as 2,2-dibromo-3-nitrilopropionamine.

[00020] Another embodiment of the invention includes the use of fluids for hydraulically fracturing a subterranean formation. Techniques for hydraulically fracturing a subterranean formation will be known to persons of ordinary skill in the art, and will involve pumping the fracturing fluid into the borehole and out into the surrounding formation. The fluid pressure is above the minimum in situ rock stress, thus creating or extending fractures in the formation. See Stimulation Engineering Handbook, John W. Ely, Pennwell Publishing Co., Tulsa, Okla. (1994), U.S. Patent No. 5,551,516 (Normal et al.), "Oilfield Applications", Encyclopedia of Polymer Science and Engineering, vol. 10, pp. 328-366 (John Wiley & Sons, Inc. New York, New York, 1987) and references cited therein, the disclosures of which are incorporated herein by reference thereto.

[00021] In most cases, a hydraulic fracturing consists of pumping a proppant-free viscous fluid, or pad, usually water with some fluid additives to generate high viscosity, into a well faster than the fluid can escape into the formation so that the pressure rises and the rock breaks, creating artificial fractures and/or enlarging existing fractures. Then, proppant particles are added to the fluid to form a slurry that is pumped into the fracture to prevent it from closing when the pumping pressure is released. The proppant suspension and transport ability of the treatment base fluid traditionally depends on the type of viscosifying agent added. The use of the aqueous energized fluids according to the invention diminishes the single dominance of the viscosifying agent on proppant suspension and transport ability, as well as improves proppant suspension and transport ability at elevated temperatures in excess of about 93 °C, and particularly at temperatures in excess of about 121 °C.

[00022] Methods of the invention may include such treatments as completion, stimulation (for example, hydraulic fracturing or matrix dissolution or matrix diversion), sand control (for example gravel packing, frac-packing, and sand consolidation), diversion, scale control, water control, and others.

[00023] In the fracturing treatment, fluids may be used in the pad treatment, the proppant stage, or both. The components of the liquid phase are preferably mixed on the surface. Alternatively, a the fluid may be prepared on the surface and pumped down tubing while the gas component could be pumped down the annular to mix down hole, or vice versa.

56.1205 – Provisional Patent Application

Inventors: Milne, Lastre
Express Mail:EQ832038517

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[00024] Yet another embodiment includes the use of fluids for cleanup. The term "cleanup" or "fracture cleanup" refers to the process of removing the fracture fluid (without the proppant) from the fracture and wellbore after the fracturing process has been completed. Techniques for promoting fracture cleanup traditionally involve reducing the viscosity of the fracture fluid as much as practical so that it will more readily flow back toward the wellbore. While breakers are typically used in cleanup as energized fluids, the fluids of the invention are inherently effective for use in cleanup operations, with or without a breaker.

[00025] Another embodiment relates to use of fluids for gravel packing a wellbore. As a gravel packing fluid, it preferably comprises gravel or sand and other optional additives such as filter cake clean up reagents such as chelating agents referred to above or acids (e.g. hydrochloric, hydrofluoric, formic, acetic, citric acid) corrosion inhibitors, scale inhibitors, biocides, leak-off control agents, among others. For this application, suitable gravel or sand is typically having a mesh size between 8 and 70 U.S. Standard Sieve Series mesh.

[00026] The preceding description has been presented with references to certain exemplary embodiments of the invention. Persons skilled in the art and technology to which this invention pertains will appreciate that alterations and changes in the described structures and methods of operation can be practiced without meaningfully departing from the principle, and scope of this invention. Accordingly, the foregoing description should not be read as pertaining only to the precise structures described herein. Instead, the scope of the application is to be defined by the appended claims, and equivalents thereof.

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CLAIMS

What is claimed is:

1. A method of treating a subterranean formation comprising:
 - a. providing a hybrid fluid comprising a viscoelastic surfactant, a hydrophilic polymer and an aqueous medium;
 - b. introducing the fluid into a wellbore penetrating the subterranean formation; and,
 - c. causing the fluid to contact the subterranean formation.
2. The method of claim 1 wherein concentration of the viscoelastic surfactant is less than or equal to 10 gallons per thousand of treatment fluid, and concentration of the hydrophilic polymer is greater than or equal to 15 gallons per thousand of treatment fluid.
3. The method of claim 1 wherein the hybrid fluid comprises a crosslinker selected from the group consisting of borates, zirconates, titanates, and any combination thereof.
4. The method of claim 1 wherein treating comprises one of more of completing, stimulating, gravel packing, frac-packing, sand consolidating,), diverting, scale control, water control, and the like.
5. The method of claim 1 provided the hybrid fluid does not comprise a hydrophobically modified polymer.

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ESTADOS UNIDOS DE AMÉRICA

A QUIENES LLEGUE EL PRESENTE, OS SALUDO

DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS

Oficina de Marcas y Patentes

12 de agosto de 2009

LA PRESENTE CERTIFICA QUE LA ADJUNTA ES UNA COPIA FIEL TOMADA DE LOS REGISTROS DE LA OFICINA DE MARCAS Y PATENTES DE LOS ESTADOS UNIDOS DE LOS DOCUMENTOS DE LA SOLICITUD DE PATENTE QUE SE IDENTIFICA ABAJO QUE CUMPLIÓ CON LOS REQUERIMIENTOS PARA QUE SE LE OTORGARA UNA FECHA DE RADICACIÓN CONFORME A LA SECCIÓN 111 DEL USC 35.

NÚMERO DE SOLICITUD: 61/137,183

FECHA DE RADICACIÓN: 28 de julio de 2008.

EL CÓDIGO DE PAÍS Y NÚMERO DE SU SOLICITUD DE PRIORIDAD QUE SERÁN UTILIZADOS PARA RADICACIONES EN EL EXTERIOR DE ACUERDO CON LA CONVENCION DE PARIS ES EL *US61/137,183*.

Por autoridad del

Sub Secretario de Comercio de Propiedad Intelectual y
Director de la Oficina de Marcas y Patentes de los
Estados Unidos.

(Firma) N. WILLIAMS. Funcionario que Certifica

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61/137183

07/28/2008 PTO/SB/16 (02.07)

De acuerdo con la Ley de Reducción de Trámites (*Paperwork Reduction Act*) de 1995 no se requiere responder a una recolección de información que muestre un número de control OMB válido

SOLICITUD PROVISIONAL PARA CUBIERTA DE PATENTE – Página 1 de 2

Esta es una solicitud para la presentación de una SOLICITUD PROVISIONAL DE PATENTE de acuerdo con 37 CFR 1.53(c)

Etiqueta de Correo Expreso No. EQ832038517

Nombre	Apellido	Residencia (Ciudad y Estado o País)
Arthur	Mine	Bogotá, Colombia
Manuel José	Lastre Buelvas	Bogotá, Colombia
TITULO DE LA INVENCION (máximo 500 caracteres)		
Uso de surfactantes VES para aumentar la viscosidad de fluidos de polímero hidrofílico		
Dirigir toda la correspondencia a: DIRECCIÓN DE CORRESPONDENCIA		
☒ La dirección correspondiente al Número de Cliente:		27452
☒		
☐ Firma o Nombre		
Dirección		
Ciudad	Estado	Zip
País	Teléfono	Email
PARTES ADJUNTAS DE LA SOLICITUD (marque lo que sea aplicable)		
☐ Hoja de Datos de la solicitud: Ver CFR 37 1.76		
☐ Dibujo(s) No. de hojas		
☒ Especificación (por ej: descripción de la invención – Número de páginas: 16		
Comisión: Comisión de Radicación de \$200 (\$100 para una firma pequeña). Si la descripción y los dibujos exceden de 100 hojas, la comisión también se aumenta a \$250 (\$125 para una entidad pequeña) por cada 50 hojas adicionales o fracción de las mismas. Ver CFR 35 U.S.C 41(a)(G) y CFR 37 1.16(s)		
MÉTODO DE PAGO DE LA COMISIÓN DE RADICACIÓN Y COMISIÓN DEL TAMAÑO DE LA SOLICITUD DE ESTA SOLICITUD DE PATENTE PROVISIONAL		
☐ El Solicitante reclama estatus de firma pequeña. Ver CFR 37 127.		210.00 TOTAL COMISION
☐ Se adjunta cheque u orden de pago para el pago de la comisión		
☐ Pago por tarjeta de crédito. se adjunta Forma PTO-2038		
☒ Se autoriza al Director cobrar la comisión de radicación y el tamaño de la solicitud (si fuere el caso) o acreditar cualquier suma al depósito		
Cuenta Número: 04-1579		
USO UNICAMENTE PARA RADICAR UNA SOLICITUD DE PATENTE PROVISIONAL		
Esta información se requiere según CFR 37 1.51. La información se requiere para obtener o retener un beneficio por el público que vaya a radicar una solicitud (y por USPTO para procesarla). La confidencialidad se rige por el U.S.C. 35 122 y CFR 37 1.11 y 1.14. Se estima que el recaudo de esta información tome 8 horas, incluida la recopilación, preparación y entrega del formulario de la solicitud diligenciado al USPTO. El tiempo variará dependiendo de cada caso. Cualquier comentario acerca del tiempo que usted requiere para diligenciar este formulario y/o sugerencias para reducir esta diligencia, debe enviarse al Director de Información, de la Oficina de Marcas y Patentes, Departamento de Comercio de los EE.UU., P.O. Box 1450, Alexandria, VA 22313-1450.		

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SOLICITUD PROVISIONAL PARA CUBIERTA DE PATENTE – Página 1 de 2

La invención fue hecha por una agencia del Gobierno de los Estados Unidos o bajo un contrato con una agencia del Gobierno de los Estados Unidos

☒ No

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(FIRMA) Nombre: David Cate

Teléfono: 281-285.8606

Fecha: 28 de julio de 2008

Registro No. 49.091

Número de Expediente: 56.1205

Declaración de la Ley de Privacidad

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La Ley de Privacidad de 1974 (P.L. 93-579) requiere que se le entregue a usted cierta información relacionada con la entrega de la forma adjunta referente a una solicitud de patente o patente. Por lo tanto, de acuerdo con lo dispuesto en la Ley, le informamos lo siguiente: (1) la autoridad general para el recaudo de esta información es U.S.C. 35 (2)(b)(2); (2) la entrega de la información solicitada es voluntaria; y (3) el propósito principal para el cual la Oficina de marcas y patentes utiliza la información es procesar y/o examinar su entrega relacionada con una solicitud de patente o patente. Si usted no entrega la información solicitada, la Oficina de Marcas y Patentes no podrá procesar y/o examinar sus documentos, lo cual podrá resultar en la terminación del proceso o en el abandono de la solicitud o vencimiento de la patente.

La información que ustedes suministran en esta forma estará sujeta a los siguientes usos rutinarios:

1. La información en esta forma será tratada como confidencial en la medida que se permita de acuerdo con la Ley de Libertad de la Información (*Freedom of Information Act*) (U.S.C 5, 552) y la Ley de Privacidad (U.S.C 5, 552(a)). Los registros de este sistema de registro podrán ser divulgados al Departamento de Justicia para establecer si la Ley de Libertad de la Información requiere la divulgación de dichos registros.
2. Como uso rutinario, se podrá divulgar un registro de este sistema de registros, en el curso de presentar evidencia a una corte, magistrado o tribunal administrativo, incluido lo que se divulgue al abogado de la otra parte en el curso de las negociaciones de conciliación.
3. Como uso rutinario, se podrá divulgar un registro de este sistema de registros, a un Miembro del Congreso que entregue una solicitud que involucre a una persona, a quien pertenece el registro, cuando la persona haya solicitado asistencia del Miembro con respecto al objeto materia del registro.
4. Como uso rutinario, se podrá divulgar un registro de este sistema de registros, a un contratista de la agencia que requiera la información con el fin de realizar un contrato. Los receptores de la información deben cumplir con los requerimientos de la Ley de Privacidad de 1974, y sus modificaciones, de acuerdo con U.S.C. 5, 552^a(m).
5. Como uso rutinario, se podrá divulgar un registro relacionado con una Solicitud Internacional radicada bajo el Tratado de Cooperación de Patentes, a la Oficina Internacional de la Organización Mundial de Propiedad Intelectual (*International Bureau of the World Intellectual Property Organization*), conforme al Tratado de Cooperación de Patentes.
6. Como uso rutinario, se podrá divulgar un registro de este sistema de registros, a otra agencia federal para propósitos de revisión de Seguridad Nacional (USC 35, 181), y para revisión de acuerdo con la Ley de Energía Atómica (*Atomic Energy Act*) (U.S.C 42, 218 (c)).
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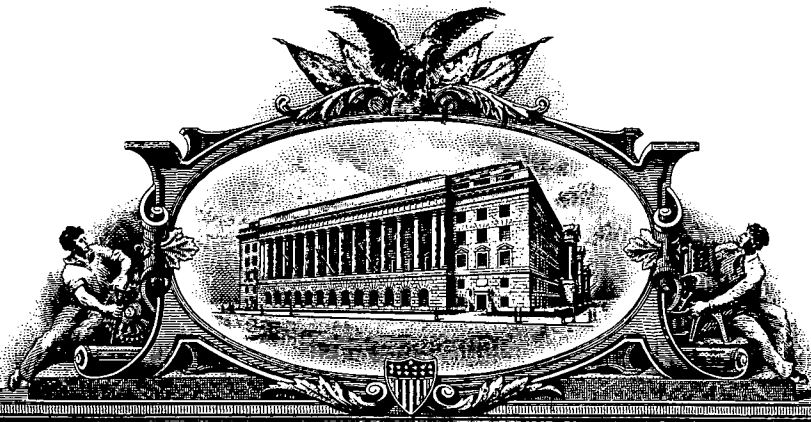
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REIVINDICACIONES

1. Un método para el tratamiento de una formación subterránea que comprende:
 - a) proveer un fluido híbrido que comprende un surfactante viscoelástico, un polímero hidrofílico y un medio acuoso;
 - b) introducir el fluido en un pozo penetrando la formación subterránea; y
 - c) hacer que el fluido entre en contacto con la formación subterránea.
2. El método de la reivindicación 1, en donde la concentración de surfactante viscoelástico es menor o igual a 10 galones por mil de fluido de tratamiento, y la concentración de del polímero hidrofílico es mayor o igual a 15 galones por mil de fluido de tratamiento.
3. El método de la reivindicación 1, en donde el fluido híbrido comprende un enlazador cruzado seleccionado del grupo compuesto por boratos, circonatos, titanatos y cualquier combinación de lo anterior.
4. El método de la reivindicación 1, en donde tratamiento comprende uno o más de completar, estimular, empaquetamiento de grava, empaquetamiento de fractura, consolidación de arena, desviación, control de escamas, control de agua y similares.
5. El método de la reivindicación 1, siempre y cuando que el fluido híbrido no comprenda un polímero modificado hidrofóticamente.



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August 13, 2009

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APPLICATION NUMBER: 12/459,042

FILING DATE: June 25, 2009

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS US12/459,042

**By Authority of the
Under Secretary of Commerce for Intellectual Property
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N. WILLIAMS
Certifying Officer



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Effective on 12/08/2004.

Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL
For FY 2009

Complete if Known

Application Number	
Filing Date	
First Named Inventor	Arthur Milne
Examiner Name	
Art Unit	
Attorney Docket No.	56.1202

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$) 1,298.00

METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 04-1579 Deposit Account Name: _____

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

Application Type	FILING FEES		SEARCH FEES		EXAMINATION FEES		Fees Paid (\$)
	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	
Utility	330	165	540	270	220	110	\$1090.00
Design	220	110	100	50	140	70	
Plant	220	110	330	165	170	85	
Reissue	330	165	540	270	650	325	
Provisional	220	110	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee (\$)	Small Entity Fee (\$)
Each claim over 20 (including Reissues)	52	26
Each independent claim over 3 (including Reissues)	220	110
Multiple dependent claims	390	195
Total Claims	Extra Claims	Fee (\$)
24 - 20 or HP = 4	x 52 =	\$208.00
HP = highest number of total claims paid for, if greater than 20.		
Indep. Claims	Extra Claims	Fee (\$)
- 3 or HP =	x =	
HP = highest number of independent claims paid for, if greater than 3.		

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$270 (\$135 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee (\$)	Fee Paid (\$)
- 100 =	/ 50 =	(round up to a whole number) x	=	

4. OTHER FEE(S)

Non-English Specification, \$130 fee (no small entity discount) Fees Paid (\$)
Other (e.g., late filing surcharge):

SUBMITTED BY	
Signature <i>Rachel E. Greene</i>	Registration No. 58,750
Name (Print/Type) Rachel Greene	Telephone 281-285-4925
	Date June 25, 2009

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Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL

For FY 2009

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$) 1,298.00

Complete if Known

Application Number _____
 Filing Date _____
 First Named Inventor Arthur Milne
 Examiner Name _____
 Art Unit _____
 Attorney Docket No. 56.1202

METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 04-1579 Deposit Account Name: _____

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

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Total Claims 24 - 20 or HP = 4 x 52 = \$208.00

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims 3 or HP = 3 x 220 = \$660.00

HP = highest number of independent claims paid for, if greater than 3.

3. APPLICATION SIZE FEE

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Total Sheets 100 - 100 = 0 / 50 = 0 (round up to a whole number) x \$270 = \$0.00

4. OTHER FEE(S)

Non-English Specification, \$130 fee (no small entity discount)

Other (e.g., late filing surcharge): _____

SUBMITTED BY

Signature Rachel E. Greene Registration No. (Attorney/Agent) 58,750 Telephone 281-285-4925
 Name (Print/Type) Rachel Greene Date June 25, 2009

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

NONPROVISIONAL PATENT APPLICATION**Title****METHOD AND COMPOSITION TO INCREASE VISCOSITY OF CROSSLINKED
POLYMER FLUIDS****Field of the Invention**

[0001] This invention relates to compositions and methods for treating subterranean formations penetrated by well bores. More particularly, the invention relates to enhance the production of oil or gas using a viscosifying agent based upon crosslinked polymer fluid showing increased viscosity.

Background

[0002] The statements in this section merely provide background information related to the present disclosure and may not constitute prior art.

[0003] Polymers are used in a wide variety of ways to enhance the production of oil or gas from underground formations. Usually the function of the polymer is to control the viscosity of the aqueous fluids which are injected into the formation. For example, in water flooding the efficiency of the water flood is improved by adding a water soluble polymer to the aqueous phase and thereby decreasing the mobility difference between the injected water and the oil in place. Polymers are also used in acidizing and/or fracture acidizing in which acidic compositions are used to stimulate production of hydrocarbon from underground formations by increasing the formation porosity. A water soluble or water dispersible polymer is incorporated to increase the viscosity of the fluid so that wider fractures can be developed and live acid can be forced farther into the formations. This increases the proppant carrying capacity of the acid solutions and permits better fluid loss control.

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[0004] Generally high molecular weight polymers or polymers with various gelling or crosslinking agents are used for this purpose. Most commercially available polymeric viscosifiers, however, are degraded by the hostile reservoir environment including high temperatures, acidity and extreme shear conditions, as well as by the electrolytes which are encountered in the oil recovery process. For example, hydrolyzed polyacrylamides fail in sea water solution at elevated temperatures due to precipitation of the polymer in the presence of calcium ions in the sea water. Xanthan polymers are insensitive to calcium ions but these polymers degrade at high temperatures and lose their viscosifying efficiency.

[0005] Also, conventional crosslinked polymer fracturing fluids have several inherent characteristics. The viscosity of a crosslinked polymer fluid with a given polymer concentration decreases with time and/or temperature. Hence the polymer concentration is increased in order to maintain a given or required viscosity for a longer period of time or to achieve the required viscosity at higher temperatures. The fluid loss control of the crosslinked polymer fluid in a formation with a given permeability is dependent to great extent on the polymer concentration. Increasing the polymer concentration in general will improve the fluid loss control as the polymer creates a filter cake on the face of the formation. Increasing polymer concentrations in the fluid result in lower fracture conductivity and retained permeability in the fracture faces. Both decrease the productivity of the final propped fracture. Exposure to high shear tends to degrade the properties of the crosslinked polymer fluid: to a lesser or greater degree the viscosity of the crosslinked fluid is reduced after it has been exposed to high shear (1000/s) which is common when displacing the fluid in a workstring to the perforations. The time for the fluid to recover viscosity after being exposed to high shear may take minutes and it is during this time that the fluid/proppant is entering into the hydraulic fracturing. The reduced viscosity of the fluid results in a narrower hydraulic fracture and so increase the risk of the proppant screening out in the well bore.

[0006] To combat these problems associated with polymeric gelling agents, some surfactants have been used as gelling agents. In particular cases, some surfactants, when mixed with an aqueous fluid having a certain ionic strength, are capable of forming a viscous fluid that has certain elastic properties, one of which may be shear thinning. Surfactant molecules (or ions) at specific conditions may form micelles (e.g., worm-shaped

micelles, rod-shaped micelles, etc.) in an aqueous fluid. Depending on, among other things, the surfactant concentration, and the ionic strength of the fluid, etc., these micelles may impart increased viscosity to the aqueous fluid, such that the fluid exhibits viscoelastic behavior due, at least in part, to the association of the surfactant molecules contained therein.

[0007] As a result, these treatment fluids exhibiting viscoelastic behavior may be used in a variety of subterranean treatments where a viscosified treatment fluid may be useful. Because the micelles may be sensitive to the pH and hydrocarbons, the viscosity of these treatment fluids may be reduced after introduction into the subterranean formation without the need for conventional gel breakers (e.g., oxidizers). This may allow a substantial portion of the treatment fluid to be produced back from the formation without the need for expensive remedial treatments.

[0008] In the same way, fracturing fluids with viscoelastic surfactants have also several inherent characteristics. As a solids free fluid, they may not create residual damage in either proppant pack or the faces of the fractures. As a solids free fluid, they may have limited fluid loss control in high permeability formations. No filter cake is formed so the fluid loss may be a function of the viscosity of the fluid, permeability of the formation and properties of the reservoir fluids. One fluid can easily displace the other in the porous medium under reservoir conditions. High concentrations of surfactant are required to create a fluid with sufficient viscosity to create a hydraulic fracture in any formation with permeability greater than a few millidarcy. The viscosity of a fluid with a given concentration is very sensitive to any change in temperature above 150 Deg F and in almost every case drops dramatically. Compatibility with formation crude as the VES viscosity is very sensitive to the presence of surfactants or demulsifiers.

[0009] The objective is to create a hybrid fluid which combines a low concentration of VES and a crosslinked polymer fluid. The final fluid will overcome to some degree the technical and economic disadvantages of crosslinked polymer and VES fluids taken separately.

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Summary

[0010] In an embodiment, a well treatment composition for use in a subterranean formation includes a carrier fluid, and a viscoelastic surfactant being present in a concentration of less than about 1.5% by weight. Optionally, the fluid comprises a crosslinked polymer in a thickening amount in the carrier fluid.

[0011] In another embodiment, the viscoelastic surfactant is present in a concentration of less than about 1% or less than about 0.8% by weight.

[0012] In a further embodiment, the crosslinked polymer may be one of polysaccharides, substituted galactomannans, guar gums, high-molecular weight polysaccharides composed of mannose and galactose sugars, guar derivatives, hydroxypropyl guar (HPG), carboxymethylhydroxypropyl guar (CMHPG), carboxymethyl guar (CMG), hydrophobically modified guar, guar-containing compounds, synthetic polymers and mixtures thereof. The composition may further contain a co-surfactant. The viscoelastic surfactant may be a zwitterionic surfactant. In one embodiment, the viscoelastic surfactant is betaine. The carrier fluid may be any suitable medium, such as, but not limited to, an aqueous based fluid.

[0013] In a further aspect, a method of treating a subterranean formation from a well includes providing a carrier fluid comprising a viscoelastic surfactant in a concentration of less than about 1.5% by weight based upon total fluid weight, and introducing the fluid into the well. Optionally, the fluid comprises a crosslinked polymer in a thickening amount in the carrier fluid.

[0014] In one embodiment, the method further involves contacting the fluid and the subterranean formation. In a second embodiment, the method further includes fracturing the subterranean formation.

[0015] The fluid may have proppant. In another embodiment, the viscoelastic surfactant is present in a concentration of less than about 1% or less than about 0.8% by weight, based upon total fluid weight.

[0016] In a further aspect, a method to increase the viscosity of a fluid includes providing a fluid comprising a thickening amount of a crosslinked polymer, adding a viscoelastic

surfactant at a given concentration to the fluid, adjusting the fluid to a given temperature, defining a viscosity profile of the fluid depending of the concentration and the temperature, comparing said viscosity profile to a viscosity profile of the crosslinked polymer fluid alone, and defining an optimum concentration of the viscoelastic surfactant for each temperature.

[0017] In an embodiment, the given temperature is between 45degC and 95degC.

Brief Description of the Drawings

[0018] The following figures form part of the present specification and are included to further demonstrate certain aspects of the present invention. The invention may be better understood by reference to one or more of these figures in combination with the detailed description of specific embodiments presented herein. The components in the figures are not necessarily to scale, with the emphasis instead being placed upon clearly illustrating principles of the present invention.

[0019] Figure 1 shows graph comparing viscosity of crosslinked polymer fluid alone and crosslinked polymer fluid and VES at 54.4 degC.

[0020] Figure 2 shows graph comparing viscosity of crosslinked polymer fluid alone and crosslinked polymer fluid and VES at 54.4 degC with shear 2 minutes at 1000/s.

[0021] Figure 3 shows graph comparing viscosity of crosslinked polymer fluid alone and crosslinked polymer fluid and VES at 71.1 degC.

[0022] Figure 4 shows graph comparing viscosity of crosslinked polymer fluid alone and crosslinked polymer fluid and VES for a different concentration at 71.1 degC.

[0023] Figure 5 shows graph of the viscosity of crosslinked polymer fluid and VES for a different concentration at 71.1 degC.

[0024] Figure 6 shows graph of the viscosity of crosslinked polymer fluid and VES at 82.2 degC.

[0025] Figure 7 shows graph of the viscosity of crosslinked polymer fluid and VES for a different concentration at 82.2 degC.

[0026] Figure 8 shows fluid loss of the composition according to one embodiment of the invention at 71.1 degC.

[0027] Figure 9, Figure 10 and Figure 11 show comparison of fluid loss control between composition of crosslinked polymer fluid alone and two compositions of crosslinked polymer fluid with different concentration of VES at 71.1 degC.

Detailed Description

[0028] At the outset, it should be noted that in the development of any actual embodiments, numerous implementation-specific decisions must be made to achieve the developer's specific goals, such as compliance with system- and business-related constraints, which can vary from one implementation to another. Moreover, it will be appreciated that such a development effort might be complex and time consuming but would nevertheless be a routine undertaking for those of ordinary skill in the art having the benefit of this disclosure.

[0029] The description and examples are presented solely for the purpose of illustrating the embodiments of the invention and should not be construed as a limitation to the scope and applicability of the invention. While the compositions of the present invention are described herein as comprising certain materials, it should be understood that the composition could optionally comprise two or more chemically different materials. In addition, the composition can also comprise some components other than the ones already cited. In the summary of the invention and this detailed description, each numerical value should be read once as modified by the term "about" (unless already expressly so modified), and then read again as not so modified unless otherwise indicated in context. Also, in the summary of the invention and this detailed description, it should be understood that a concentration range listed or described as being useful, suitable, or the like, is intended that any and every concentration within the range, including the end points, is to be considered as having been stated. For example, "a range of from 1 to 10" is to be read as indicating each and every possible number along the continuum between about 1 and about 10. Thus, even if specific data points within the range, or even no data points within the range, are explicitly identified or refer to only a few specific, it is to be understood that

inventors appreciate and understand that any and all data points within the range are to be considered to have been specified, and that inventors possession of the entire range and all points within the range.

[0030] The following definitions are provided in order to aid those skilled in the art in understanding the detailed description of the invention.

[0031] The term "fracturing" refers to the process and methods of breaking down a geological formation and creating a fracture, i.e. the rock formation around a well bore, by pumping fluid at very high pressures, in order to increase production rates from a hydrocarbon reservoir. The fracturing methods otherwise use conventional techniques known in the art.

[0032] The term "surfactant" refers to a soluble or partially soluble compound that reduces the surface tension of liquids, or reduces inter-facial tension between two liquids, or a liquid and a solid by congregating and orienting itself at these interfaces.

[0033] The term "viscoelastic" refers to those viscous fluids having elastic properties, i.e., the liquid at least partially returns to its original form when an applied stress is released.

[0034] The phrase "viscoelastic surfactant" or "VES" refers to that class of compounds which can form micelles (spherulitic, anisometric, lamellar, or liquid crystal) in the presence of counter ions in aqueous solutions, thereby imparting viscosity to the fluid. Anisometric micelles can be used, as their behavior in solution most closely resembles that of a polymer.

[0035] One embodiment is directed towards a well treatment composition for use in a subterranean formation comprising a carrier fluid; a crosslinked polymer; and a viscoelastic surfactant being present in a concentration of less than about 1.5% by weight.

[0036] The carrier fluid can generally be any liquid carrier suitable for use in oil and gas producing wells. One such liquid carrier is water. The liquid carrier can comprise water, can consist essentially of water, or can consist of water. Water will typically be a major component by weight of the fluid. The water can be potable or non-potable water. The water can be brackish or contain other materials typical of sources of water found in or near oil fields.

[0037] A salt may be present in the fluid carrier. The salt can be present naturally if brine

is used, or can be added to the fluid carrier. For example, it is possible to add to water; any salt, such as an alkali metal or alkali earth metal salt (NaCO_3 , NaCl , KCl , etc.). The salt is generally present in weight percent concentration between about 0.1% to about 5%, from about 1% to about 3% by weight. One useful concentration is about 2% by weight.

[0038] The crosslinked polymer can generally be any crosslinked polymers. The polymer viscosifier can be a metal-crosslinked polymer. Suitable polymers for making the metal-crosslinked polymer viscosifiers include, for example, polysaccharides such as substituted galactomannans, such as guar gums, high-molecular weight polysaccharides composed of mannose and galactose sugars, or guar derivatives such as hydroxypropyl guar (HPG), carboxymethylhydroxypropyl guar (CMHPG) and carboxymethyl guar (CMG), hydrophobically modified guar, guar-containing compounds, and synthetic polymers. Crosslinking agents based on boron, titanium, zirconium or aluminum complexes are typically used to increase the effective molecular weight of the polymer and make them better suited for use in high-temperature wells.

[0039] Other suitable classes of polymers effective as viscosifiers include polyvinyl polymers, polymethacrylamides; cellulose ethers, lignosulfonates, and ammonium, alkali metal, and alkaline earth salts thereof. More specific examples of other typical water soluble polymers are acrylic acid-acrylamide copolymers, acrylic acid-methacrylamide copolymers, polyacrylamides, partially hydrolyzed polyacrylamides, partially hydrolyzed polymethacrylamides, polyvinyl alcohol, polyalkyleneoxides, other galactomannans, heteropolysaccharides obtained by the fermentation of starch-derived sugar and ammonium and alkali metal salts thereof.

[0040] Cellulose derivatives are used to a smaller extent, such as hydroxyethylcellulose (HEC) or hydroxypropylcellulose (HPC), carboxymethylhydroxyethylcellulose (CMHEC) and carboxymethylcellulose (CMC), with or without crosslinkers. Xanthan, diutan, and scleroglucan, three biopolymers, have been shown to have excellent proppant-suspension ability even though they are more expensive than guar derivatives and therefore have been used less frequently, unless they can be used at lower concentrations.

[0041] In other embodiments, the crosslinked polymer is made from a crosslinkable, hydratable polymer and a delayed crosslinking agent, wherein the crosslinking agent comprises a complex comprising a metal and a first ligand selected from the group

consisting of amino acids, phosphono acids, and salts or derivatives thereof. Also the crosslinked polymer can be made from a polymer comprising pendant ionic moieties, a surfactant comprising oppositely charged moieties, a clay stabilizer, a borate source, and a metal crosslinker. Said embodiments are described in U.S. Patent Publications US2008-0280790 and US2008-0280788 respectively, each of which are incorporated herein by reference.

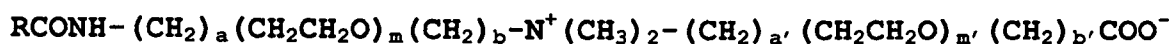
[0042] Linear (not cross-linked) polymer systems may be used. However, in some cases, may not achieve the full benefits because they may require more concentration, and may require a breaker. Any suitable crosslinked polymer system may be used, including for example, those which are delayed, optimized for high temperature, optimized for use with sea water, buffered at various pH's, and optimized for low temperature. Any crosslinker may be used, for example boron, titanium, zirconium, aluminum and the like. Suitable boron crosslinked polymers systems include by non-limiting example, guar and substituted guar crosslinked with boric acid, sodium tetraborate, and encapsulated borates; borate crosslinkers may be used with buffers and pH control agents such as sodium hydroxide, magnesium oxide, sodium sesquicarbonate, and sodium carbonate, amines (such as hydroxyalkyl amines, anilines, pyridines, pyrimidines, quinolines, and pyrrolidines, and carboxylates such as acetates and oxalates) and with delay agents such as sorbitol, aldehydes, and sodium gluconate. Suitable zirconium crosslinked polymer systems include by non-limiting example, those crosslinked by zirconium lactates (for example sodium zirconium lactate), triethanolamines, 2,2'-iminodiethanol, and with mixtures of these ligands, including when adjusted with bicarbonate. Suitable titanates include by non-limiting example, lactates and triethanolamines, and mixtures, for example delayed with hydroxyacetic acid. Any other chemical additives may be used or included provided that they are tested for compatibility with the viscoelastic surfactant. For example, some of the standard crosslinkers or polymers as concentrates usually contain materials such as isopropanol, n-propanol, methanol or diesel oil.

[0043] The viscoelastic surfactant can generally be any viscoelastic surfactant. The surfactant is present in a low weight percent concentration. Some suitable concentrations of surfactant are about 0.001% to about 1.5% by weight, from about 0.01% to about 0.75% by weight, or even about 0.25%, about 0.5% or about 0.75% by weight.

[0044] The VES may be selected from the group consisting of cationic, anionic, zwitterionic, amphoteric, nonionic and combinations thereof. Some non-limiting examples are those cited in U.S. Patents 6,435,277 (Qu et al.) and 6,703,352 (Dahayanake et al.), each of which are incorporated herein by reference. The viscoelastic surfactants, when used alone or in combination, are capable of forming micelles that form a structure in an aqueous environment that contribute to the increased viscosity of the fluid (also referred to as "viscosifying micelles"). These fluids are normally prepared by mixing in appropriate amounts of VES suitable to achieve the desired viscosity. The viscosity of VES fluids may be attributed to the three dimensional structure formed by the components in the fluids. When the concentration of surfactants in a viscoelastic fluid significantly exceeds a critical concentration, and in most cases in the presence of an electrolyte, surfactant molecules aggregate into species such as micelles, which can interact to form a network exhibiting viscous and elastic behavior.

[0045] Non-limiting examples of suitable viscoelastic surfactants useful for viscosifying some fluids include cationic surfactants, anionic surfactants, zwitterionic surfactants, amphoteric surfactants, nonionic surfactants, and combinations thereof.

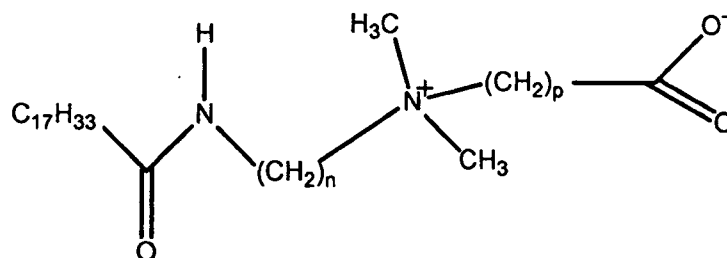
[0046] In general, particularly suitable zwitterionic surfactants have the formula:



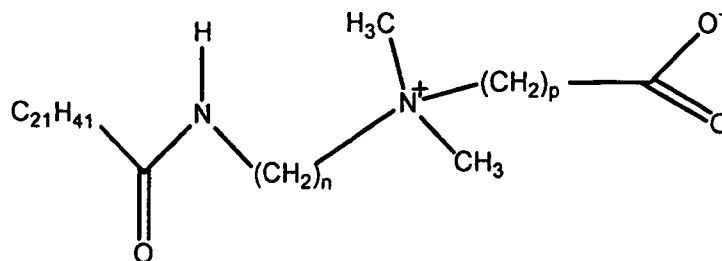
in which R is an alkyl group that contains from about 11 to about 23 carbon atoms which may be branched or straight chained and which may be saturated or unsaturated; a, b, a', and b' are each from 0 to 10 and m and m' are each from 0 to 13; a and b are each 1 or 2 if m is not 0 and (a + b) is from 2 to 10 if m is 0; a' and b' are each 1 or 2 when m' is not 0 and (a' + b') is from 1 to 5 if m' is 0; (m + m') is from 0 to 14; and CH₂CH₂O may also be OCH₂CH₂.

[0047] In an embodiment of the invention, a zwitterionic surfactants of the family of betaine is used. Two suitable examples of betaines are BET-O and BET-E. The surfactant in BET-O-30 is shown below; one chemical name is oleylamidopropyl betaine. It is designated BET-O-30 because as obtained from the supplier (Rhodia, Inc. Cranbury, New Jersey, U. S. A.) it is called Mirataine BET-O-30 because it contains an oleyl acid amide group (including a C₁₇H₃₃ alkene tail group) and contains about 30% active surfactant; the

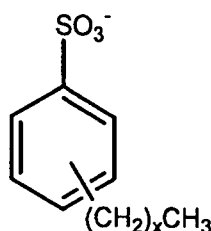
remainder is substantially water, sodium chloride, and propylene glycol. An analogous material, BET-E-40, is also available from Rhodia and contains an erucic acid amide group (including a $C_{21}H_{41}$ alkene tail group) and is approximately 40% active ingredient, with the remainder being substantially water, sodium chloride, and isopropanol. VES systems, in particular BET-E-40, optionally contain about 1 % of a condensation product of a naphthalene sulfonic acid, for example sodium polynaphthalene sulfonate, as a rheology modifier, as described in U. S. Patent Application Publication No. 2003-0134751. The surfactant in BET-E-40 is also shown below; one chemical name is erucylamidopropyl betaine. As-received concentrates of BET-E-40 were used in the experiments reported below, where they will be referred to as "VES". BET surfactants, and other VES's that are suitable for the embodiments according to the invention, are described in U. S. Patent No. 6,258,859. According to that patent, BET surfactants make viscoelastic gels when in the presence of certain organic acids, organic acid salts, or inorganic salts; in that patent, the inorganic salts were present at a weight concentration up to about 30%. Co-surfactants may be useful in extending the brine tolerance, and to increase the gel strength and to reduce the shear sensitivity of the VES-fluid, in particular for BET-O-type surfactants. An example given in U. S. Patent No. 6,258,859 is sodium dodecylbenzene sulfonate (SDBS), also shown below. Other suitable co-surfactants include, for example those having the SDBS-like structure in which $x = 5 - 15$; other co-surfactants are those in which $x = 7 - 15$. Still other suitable co-surfactants for BET-O-30 are certain chelating agents such as trisodium hydroxyethylethylenediamine triacetate. The rheology enhancers of the embodiments according to the invention may be used with viscoelastic surfactant fluid systems that contain such additives as co-surfactants, organic acids, organic acid salts, and/or inorganic salts.



Surfactant in BET-O-30 (when $n = 3$ and $p = 1$)



Surfactant in BET-E-40 (when $n = 3$ and $p = 1$)



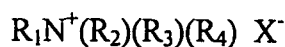
SDBS (when $x = 11$ and the counter-ion is Na^+)

[0048] Some embodiments use betaines; for example BET-E-40. Although experiments have not been performed, it is believed that mixtures of betaines, especially BET-E-40, with other surfactants are also suitable. Such mixtures are within the scope of embodiments of the invention.

[0049] Other betaines that are suitable include those in which the alkene side chain (tail group) contains 17 – 23 carbon atoms (not counting the carbonyl carbon atom) which may be branched or straight chained and which may be saturated or unsaturated, $n = 2 - 10$, and $p = 1 - 5$, and mixtures of these compounds. Some betaines are those in which the alkene side chain contains 17 – 21 carbon atoms (not counting the carbonyl carbon atom) which may be branched or straight chained and which may be saturated or unsaturated, $n = 3 - 5$, and $p = 1 - 3$, and mixtures of these compounds. These surfactants are used at a concentration of about 0.5 to about 10%, or from about 1 to about 5%, or even from about 1.5 to about 4.5%.

[0050] Exemplary cationic viscoelastic surfactants include the amine salts and quaternary amine salts disclosed in U.S. Patent Nos. 5,979,557, and 6,435,277 which have

a common Assignee as the present application and which are hereby incorporated by reference. Examples of suitable cationic viscoelastic surfactants include cationic surfactants having the structure:



[0051] in which R_1 has from about 14 to about 26 carbon atoms and may be branched or straight chained, aromatic, saturated or unsaturated, and may contain a carbonyl, an amide, a retroamide, an imide, a urea, or an amine; R_2 , R_3 , and R_4 are each independently hydrogen or a C_1 to about C_6 aliphatic group which may be the same or different, branched or straight chained, saturated or unsaturated and one or more than one of which may be substituted with a group that renders the R_2 , R_3 , and R_4 group more hydrophilic; the R_2 , R_3 and R_4 groups may be incorporated into a heterocyclic 5- or 6-member ring structure which includes the nitrogen atom; the R_2 , R_3 and R_4 groups may be the same or different; R_1 , R_2 , R_3 and/or R_4 may contain one or more ethylene oxide and/or propylene oxide units; and X^- is an anion. Mixtures of such compounds are also suitable. As a further example, R_1 is from about 18 to about 22 carbon atoms and may contain a carbonyl, an amide, or an amine, and R_2 , R_3 , and R_4 are the same as one another and contain from 1 to about 3 carbon atoms.

[0052] Cationic surfactants having the structure $R_1N^+(R_2)(R_3)(R_4) X^-$ may optionally contain amines having the structure $R_1N(R_2)(R_3)$. It is well known that commercially available cationic quaternary amine surfactants often contain the corresponding amines (in which R_1 , R_2 , and R_3 in the cationic surfactant and in the amine have the same structure). As received commercially available VES surfactant concentrate formulations, for example cationic VES surfactant formulations, may also optionally contain one or more members of the group consisting of alcohols, glycols, organic salts, chelating agents, solvents, mutual solvents, organic acids, organic acid salts, inorganic salts, oligomers, polymers, copolymers, and mixtures of these members. They may also contain performance enhancers, such as viscosity enhancers, for example polysulfonates, for example polysulfonic acids, as described in U. S. Patent No. 7,084,095 which is hereby incorporated by reference.

[0053] Another suitable cationic VES is erucyl bis(2-hydroxyethyl) methyl ammonium chloride, also known as (Z)-13 docosenyl-N-N- bis (2-hydroxyethyl) methyl ammonium chloride. It is commonly obtained from manufacturers as a mixture containing about 60

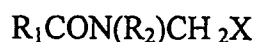
weight percent surfactant in a mixture of isopropanol, ethylene glycol, and water. Other suitable amine salts and quaternary amine salts include (either alone or in combination in accordance with the invention), erucyl trimethyl ammonium chloride; N-methyl-N,N-bis(2-hydroxyethyl) rapeseed ammonium chloride; oleyl methyl bis(hydroxyethyl) ammonium chloride; erucylamidopropyltrimethylamine chloride, octadecyl methyl bis(hydroxyethyl) ammonium bromide; octadecyl tris(hydroxyethyl) ammonium bromide; octadecyl dimethyl hydroxyethyl ammonium bromide; cetyl dimethyl hydroxyethyl ammonium bromide; cetyl methyl bis(hydroxyethyl) ammonium salicylate; cetyl methyl bis(hydroxyethyl) ammonium 3,4,-dichlorobenzoate; cetyl tris(hydroxyethyl) ammonium iodide; cosyl dimethyl hydroxyethyl ammonium bromide; cosyl methyl bis(hydroxyethyl) ammonium chloride; cosyl tris(hydroxyethyl) ammonium bromide; dicosyl dimethyl hydroxyethyl ammonium bromide; dicosyl methyl bis(hydroxyethyl) ammonium chloride; dicosyl tris(hydroxyethyl) ammonium bromide; hexadecyl ethyl bis(hydroxyethyl) ammonium chloride; hexadecyl isopropyl bis(hydroxyethyl) ammonium iodide; and cetylamino, N-octadecyl pyridinium chloride.

[0054] Many fluids made with viscoelastic surfactant systems, for example those containing cationic surfactants having structures similar to that of erucyl bis(2-hydroxyethyl) methyl ammonium chloride, inherently have short re-heal times and the rheology enhancers of the embodiments according to the invention may not be needed except under special circumstances, for example at very low temperature.

[0055] Amphoteric viscoelastic surfactants are also suitable. Exemplary amphoteric viscoelastic surfactant systems include those described in U.S. Patent No. 6,703,352, for example amine oxides. Other exemplary viscoelastic surfactant systems include those described in U.S. Patents Nos. 6,239,183; 6,506,710; 7,060,661; 7,303,018; and 7,510,009 for example amidoamine oxides. These references are hereby incorporated in their entirety. Mixtures of zwitterionic surfactants and amphoteric surfactants are suitable. An example is a mixture of about 13% isopropanol, about 5% 1-butanol, about 15% ethylene glycol monobutyl ether, about 4% sodium chloride, about 30% water, about 30% cocoamidopropyl betaine, and about 2% cocoamidopropylamine oxide.

[0056] The viscoelastic surfactant system may also be based upon any suitable anionic surfactant. In some embodiments, the anionic surfactant is an alkyl sarcosinate. The alkyl

sarcosinate can generally have any number of carbon atoms. Alkyl sarcosinates can have about 12 to about 24 carbon atoms. The alkyl sarcosinate can have about 14 to about 18 carbon atoms. Specific examples of the number of carbon atoms include 12, 14, 16, 18, 20, 22, and 24 carbon atoms. The anionic surfactant is represented by the chemical formula:



wherein R_1 is a hydrophobic chain having about 12 to about 24 carbon atoms, R_2 is hydrogen, methyl, ethyl, propyl, or butyl, and X is carboxyl or sulfonyl. The hydrophobic chain can be an alkyl group, an alkenyl group, an alkylarylalkyl group, or an alkoxyalkyl group. Specific examples of the hydrophobic chain include a tetradecyl group, a hexadecyl group, an octadecentyl group, an octadecyl group, and a docosenoic group.

[0057] To provide the ionic strength for the desired micelle formation, in some cases, the treatment fluids of the embodiments according to the invention may comprise a water-soluble salt. Adding a salt may help promote micelle formation for the viscosification of the fluid in some instances. In some embodiments, the aqueous base fluid may contain the water-soluble salt, for example, where saltwater, a brine, or seawater is used as the aqueous base fluid. Suitable water-soluble salts may comprise lithium, ammonium, sodium, potassium, cesium, magnesium, calcium, or zinc cations, and chloride, bromide, iodide, formate, nitrate, acetate, cyanate, or thiocyanate anions. Examples of suitable water-soluble salts that comprise the above-listed anions and cations include, but are not limited to, ammonium chloride, lithium bromide, lithium chloride, lithium formate, lithium nitrate, calcium bromide, calcium chloride, calcium nitrate, calcium formate, sodium bromide, sodium chloride, sodium formate, sodium nitrate, potassium chloride, potassium bromide, potassium nitrate, potassium formate, cesium nitrate, cesium formate, cesium chloride, cesium bromide, magnesium chloride, magnesium bromide, zinc chloride, and zinc bromide.

[0058] The composition also typically contains proppants. The selection of a proppant involves many compromises imposed by economical and practical considerations. Criteria for selecting the proppant type, size, and concentration is based on the needed dimensionless conductivity, and can be selected by a skilled artisan. Such proppants can be natural or synthetic (including but not limited to glass beads, ceramic beads, sand, and

bauxite), coated, or contain chemicals; more than one can be used sequentially or in mixtures of different sizes or different materials. The proppant may be resin coated, or pre-cured resin coated, provided that the resin and any other chemicals that might be released from the coating or come in contact with the other chemicals of the Invention are compatible with them. Proppants and gravels in the same or different wells or treatments can be the same material and/or the same size as one another and the term "proppant" is intended to include gravel in this discussion. In general the proppant used will have an average particle size of from about 0.15 mm to about 2.39 mm (about 8 to about 100 U. S. mesh), more particularly, but not limited to 0.25 to 0.43 mm (40/60 mesh), 0.43 to 0.84 mm (20/40 mesh), 0.84 to 1.19 mm (16/20), 0.84 to 1.68 mm (12/20 mesh) and 0.84 to 2.39 mm (8/20 mesh) sized materials. Normally the proppant will be present in the slurry in a concentration of from about 0.12 to about 0.96 kg/L, or from about 0.12 to about 0.72 kg/L, or from about 0.12 to about 0.54 kg/L. The fluid may also contain other enhancers or additives.

[0059] In other embodiments, the composition may further comprise an additive for maintaining and/or adjusting pH (e.g., pH buffers, pH adjusting agents, etc.). For example, the additive for maintaining and/or adjusting pH may be included in the treatment fluid so as to maintain the pH in, or adjust the pH to, a desired range and thereby maintain, or provide, the necessary ionic strength to form the desired micellar structures. Examples of suitable additives for maintaining and/or adjusting pH include, but are not limited to, sodium acetate, acetic acid, sodium carbonate, potassium carbonate, sodium bicarbonate, potassium bicarbonate, sodium or potassium diacetate, sodium or potassium phosphate, sodium or potassium hydrogen phosphate, sodium or potassium dihydrogen phosphate, sodium hydroxide, potassium hydroxide, lithium hydroxide, combinations thereof, derivatives thereof, and the like. The additive for adjusting and/or maintaining pH may be present in the treatment fluids of the embodiments according to the invention in an amount sufficient to maintain and/or adjust the pH of the fluid. One of ordinary skill in the art, with the benefit of this disclosure, will recognize the appropriate additive for maintaining and/or adjusting pH and amount thereof to use for a chosen application.

[0060] In some embodiments, the composition may optionally comprise additional additives, including, but not limited to, acids, fluid loss control additives, gas, corrosion

inhibitors, scale inhibitors, catalysts, clay control agents, biocides, friction reducers, combinations thereof and the like. For example, in some embodiments, it may be desired to foam the composition using a gas, such as air, nitrogen, or carbon dioxide. In one certain embodiment, the composition may contain a particulate additive, such as a particulate scale inhibitor.

[0061] According to the invention, the composition may be used for carrying out a variety of subterranean treatments, where a viscosified treatment fluid may be used, including, but not limited to, drilling operations, fracturing treatments, and completion operations (e.g., gravel packing). In some embodiments, the treatment fluids may be used in treating a portion of a subterranean formation. In certain embodiments, the composition may be introduced into a well bore that penetrates the subterranean formation. Optionally, the treatment fluid further may comprise particulates and other additives suitable for treating the subterranean formation. For example, the treatment fluid may be allowed to contact the subterranean formation for a period of time sufficient to reduce the viscosity of the treatment fluid. In some embodiments, the treatment fluid may be allowed to contact hydrocarbons, formations fluids, and/or subsequently injected treatment fluids, thereby reducing the viscosity of the treatment fluid. After a chosen time, the treatment fluid may be recovered through the well bore.

[0062] In certain embodiments, the treatment fluids may be used in fracturing treatments. In the fracturing embodiments, the composition may be introduced into a well bore that penetrates a subterranean formation at or above a pressure sufficient to create or enhance one or more fractures in a portion of the subterranean formation. Generally, in the fracturing embodiments, the composition may exhibit viscoelastic behavior which may be due. Optionally, the treatment fluid further may comprise particulates and other additives suitable for the fracturing treatment. After a chosen time, the treatment fluid may be recovered through the well bore.

[0063] The composition according to the invention provides the following benefits when fracturing permeable formations in the 50 to 90 degC temperature range, or even the 54 to 82 degC temperature range: higher viscosity at a given temperature with lower polymer concentration (71.1degC at a shear rate of 100s/s and 25 minutes at temperature – prior art fluid 130cp, fluid according to the invention 210cp); improved fluid loss control (static

leakoff test in an 80mD core at 71.1degC – prior art fluid spurt loss 4.81, $C_w=0.006088$, fluid according to the invention spurt loss 2.61, $C_w=0.001598$); improved shear recovery (viscosity at 100/s after 2 minutes shear at 100/s – prior art fluid 100cp, fluid according to the invention 175cp); less sensitive to the presence of surfactants and de-emulsifiers.

[0064] The method of the invention is also suitable for gravel packing, or for fracturing and gravel packing in one operation (called, for example frac and pack, frac-n-pack, frac-pack, StimPac treatments, or other names), which are also used extensively to stimulate the production of hydrocarbons, water and other fluids from subterranean formations. These operations involve pumping a slurry of “proppant” (natural or synthetic materials that prop open a fracture after it is created) in hydraulic fracturing or “gravel” in gravel packing. In low permeability formations, the goal of hydraulic fracturing is generally to form long, high surface area fractures that greatly increase the magnitude of the pathway of fluid flow from the formation to the wellbore. In high permeability formations, the goal of a hydraulic fracturing treatment is typically to create a short, wide, highly conductive fracture, in order to bypass near-wellbore damage done in drilling and/or completion, to ensure good fluid communication between the rock and the wellbore and also to increase the surface area available for fluids to flow into the wellbore.

[0065] Gravel is also a natural or synthetic material, which may be identical to, or different from, proppant. Gravel packing is used for “sand” control. Sand is the name given to any particulate material from the formation, such as clays, that could be carried into production equipment. Gravel packing is a sand-control method used to prevent production of formation sand, in which, for example a steel screen is placed in the wellbore and the surrounding annulus is packed with prepared gravel of a specific size designed to prevent the passage of formation sand that could foul subterranean or surface equipment and reduce flows. The primary objective of gravel packing is to stabilize the formation while causing minimal impairment to well productivity. Sometimes gravel packing is done without a screen. High permeability formations are frequently poorly consolidated, so that sand control is needed; they may also be damaged, so that fracturing is also needed. Therefore, hydraulic fracturing treatments in which short, wide fractures are wanted are often combined in a single continuous (“frac and pack”) operation with gravel packing. For simplicity, in the following we may refer to any one of hydraulic fracturing, fracturing

and gravel packing in one operation (frac and pack), or gravel packing, and mean them all.

[0066] To facilitate a better understanding of the invention, the following examples of embodiments are given. In no way should the following examples be read to limit, or define, the scope of the invention.

Examples

[0067] A series of experiments were conducted to compare viscosity and fluid loss control of prior art samples made of crosslinked polymer fluid comprising guar polymer and of samples according to the invention at different temperatures.

Rheology experiments

[0068] To illustrate some embodiments according to the invention, a comparison is made between a prior art fluid made of guar polymer and a fluid according to the invention further comprising a VES made of erucic amidopropyl dimethyl betaine (0.5% by weight), ethoxylated linear alcohols (0.2% by weight) and non-emulsifying agent (0.1% by weight).

[0069] Figure 1 shows viscosity profile over time for a first fluid made of guar polymer and a second fluid made of guar polymer with erucic amidopropyl dimethyl betaine (0.5% by weight), ethoxylated linear alcohols (0.2% by weight) and non-emulsifying agent (0.1% by weight). Tests are conducted at temperature of 54.4°C. A small increase in the viscosity can be noted compared to prior art fluid.

[0070] Figure 2 shows shear recovery after 2 min of 1000/s shear for a first fluid made of guar polymer and a second fluid made of guar polymer with erucic amidopropyl dimethyl betaine (0.5% by weight), ethoxylated linear alcohols (0.2% by weight) and non-emulsifying agent. Tests are conducted at temperature of 54.4°C. Clearly an increase in the viscosity can be noted compared to prior art fluid.

[0071] Figure 3 shows viscosity profile over time for a first fluid made of guar polymer and a second fluid made of guar polymer with erucic amidopropyl dimethyl betaine (0.5% by weight), ethoxylated linear alcohols (0.2% by weight) and non-emulsifying agent (0.1% by weight). Tests are conducted at temperature of 71.1°C. An increase in the viscosity can be noted compared to prior art fluid and compared to that one at 54.4°C.

[0072] Figure 4 shows viscosity profile over time for a first fluid made of guar polymer and a second fluid made of guar polymer with erucic amidopropyl dimethyl betaine (0.75% by weight), ethoxylated linear alcohols (0.2% by weight) and non-emulsifying agent (0.1% by weight). Tests are conducted at temperature of 71.1°C. An increase in the viscosity can be noted compared to prior art fluid and previous results.

[0073] Figure 5 shows viscosity profile over time for a fluid made of guar polymer with erucic amidopropyl dimethyl betaine (0.75% by weight) and non-emulsifying agent (0.5% by weight). Tests are conducted at temperature of 71.1°C. An increase in the viscosity can be noted for the fluid according to the invention.

[0074] Figure 6 shows viscosity profile over time for a fluid made of guar polymer with erucic amidopropyl dimethyl betaine (0.75% by weight). Tests are conducted at temperature of 82.2°C. An increase in the viscosity can be noted for the fluid according to the invention.

[0075] Figure 7 shows viscosity profile over time for a fluid made of guar polymer with erucic amidopropyl dimethyl betaine (0.75% by weight) and non-emulsifying agent (0.5% by weight). Tests are conducted at temperature of 82.2°C. An increase in the viscosity can be noted for the fluid according to the invention.

Fluid loss control

[0076] To illustrate some embodiments according to the invention, tests were run at 71.1°C as follows: establish baseline permeability to 2% KCl, perform static leakoff test with fracturing fluid (30 in. 500 psi) and measure retained permeability to 2% KCl at increasing differential pressure up to 250 psi. A test was run with 0.25% by weight of VES in a core with an effective permeability to water of 18 mD shown on Figure 8. Despite the relatively high permeability the values of both spurt loss and C_w were much lower than what is reported in the specification for crosslinked polymer fluid made of guar at 65.5°C in a 1 mD core (see Table 1 below).

T (degC)	Permeability (md)	C _w (ft/min ^{1/2})	Spurt (galUS/100 ft ²)
38	0.76	0.0017	1.62
52	0.77	0.0016	0.15
66	0.73	0.0023	5.17

Table 1

[0077] Series of tests were run in a high permeability core: 85 mD with no VES, and after with 0.1% by weight or 0.5% by weight VES made of erucic amidopropyl dimethyl betaine. Results indicate that the fluid loss control of the fluid is improved with increasing concentrations of VES as shown on Figures 9, 10 and 11.

Optimization

[0078] At 54.4degC there is little difference in the rheology of the crosslinked polymer fluid with or without VES. However, the fluid loss control/efficiency of the fluid is greatly improved (shown on Figure 8) as is the shear recovery (shown on Figure 2). At each temperature there is an optimum concentration of VES: 0.25% by weight at 54.4degC (improved fluid loss control), 0.5% by weight at 65.5degC (improved rheology and fluid loss control), 0.75% by weight at 82.2degC (improved rheology and fluid loss control).

[0079] It is clear that the invention is well adapted to carry out its objectives and attain the ends and advantages mentioned above as well as those inherent therein. While embodiments of the invention have been described in varying detail for purposes of disclosure, it will be understood that numerous changes may be made which will readily suggest themselves to those skilled in the art and which are encompassed within the spirit of the invention disclosed and as defined in the written description and appended claims.

Claims

What is claimed is:

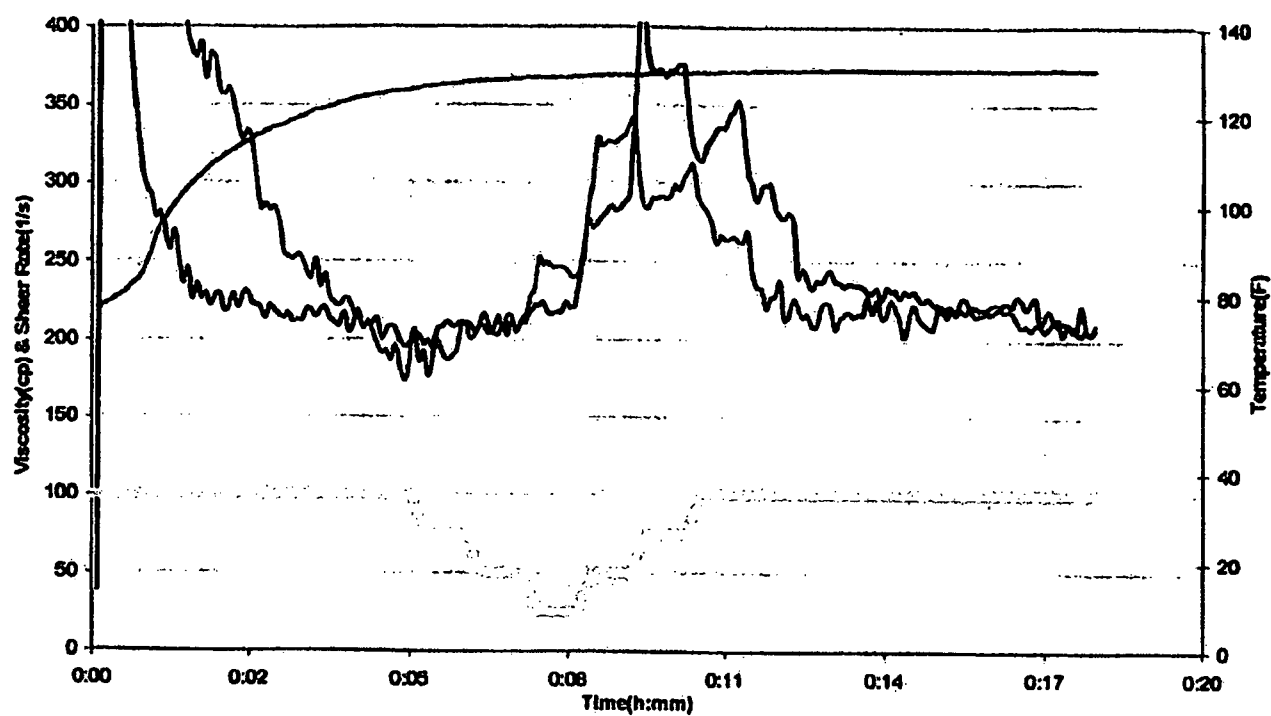
1. A well treatment composition for use in a subterranean formation comprising: a carrier fluid and a viscoelastic surfactant present in a concentration of less than about 1.5% by weight.
2. The composition of claim 1, further comprising a crosslinked polymer in a thickening amount in the carrier fluid.
3. The composition of claim 1, wherein the viscoelastic surfactant is present in a concentration of less than about 1% by weight.
4. The composition of claim 1, wherein the viscoelastic surfactant is present in a concentration of less than about 0.8% by weight.
5. The composition of claim 1, wherein the crosslinked polymer is taken in the group consisting of: polysaccharides, substituted galactomannans, guar gums, high-molecular weight polysaccharides composed of mannose and galactose sugars, guar derivatives, hydroxypropyl guar (HPG), carboxymethylhydroxypropyl guar (CMHPG), carboxymethyl guar (CMG), hydrophobically modified guar, guar-containing compounds, synthetic polymers and mixtures thereof.
6. The composition of claim 1, further comprising a co-surfactant.
7. The composition of claim 1, wherein the viscoelastic surfactant is a zwitterionic surfactant.
8. The composition of claim 7, wherein the viscoelastic surfactant is betaine.
9. The composition of claim 1, wherein the carrier fluid is aqueous based fluid.
10. A method of treating a subterranean formation from a well, the method

comprising:

- a. providing a carrier fluid comprising a viscoelastic surfactant in a concentration of less than about 1.5% by weight; and
 - b. introducing the fluid into the well.
11. The method of claim 10, wherein the fluid further comprises a thickening amount of a crosslinked polymer.
 12. The method of claim 10, further comprising contacting the fluid and the subterranean formation.
 13. The method of claim 12, further comprising fracturing the subterranean formation.
 14. The method of claim 10, wherein the fluid further comprises proppant.
 15. The method of claim 10, wherein the viscoelastic surfactant is present in a concentration of less than about 1% by weight.
 16. The method of claim 10, wherein the viscoelastic surfactant is present in a concentration of less than about 0.8% by weight.
 17. The method of claim 10, wherein the crosslinked polymer is taken in the group consisting of: polysaccharides, substituted galactomannans, guar gums, high-molecular weight polysaccharides composed of mannose and galactose sugars, guar derivatives, hydroxypropyl guar (HPG), carboxymethylhydroxypropyl guar (CMHPG), carboxymethyl guar (CMG), hydrophobically modified guar, guar-containing compounds, synthetic polymers and mixtures thereof.
 18. The method of claim 10, wherein the viscoelastic surfactant is betaine.
 19. The method of claim 10, wherein the carrier fluid is water.
 20. A method to increase the viscosity of a fluid, the method comprising:

Abstract of the Disclosure

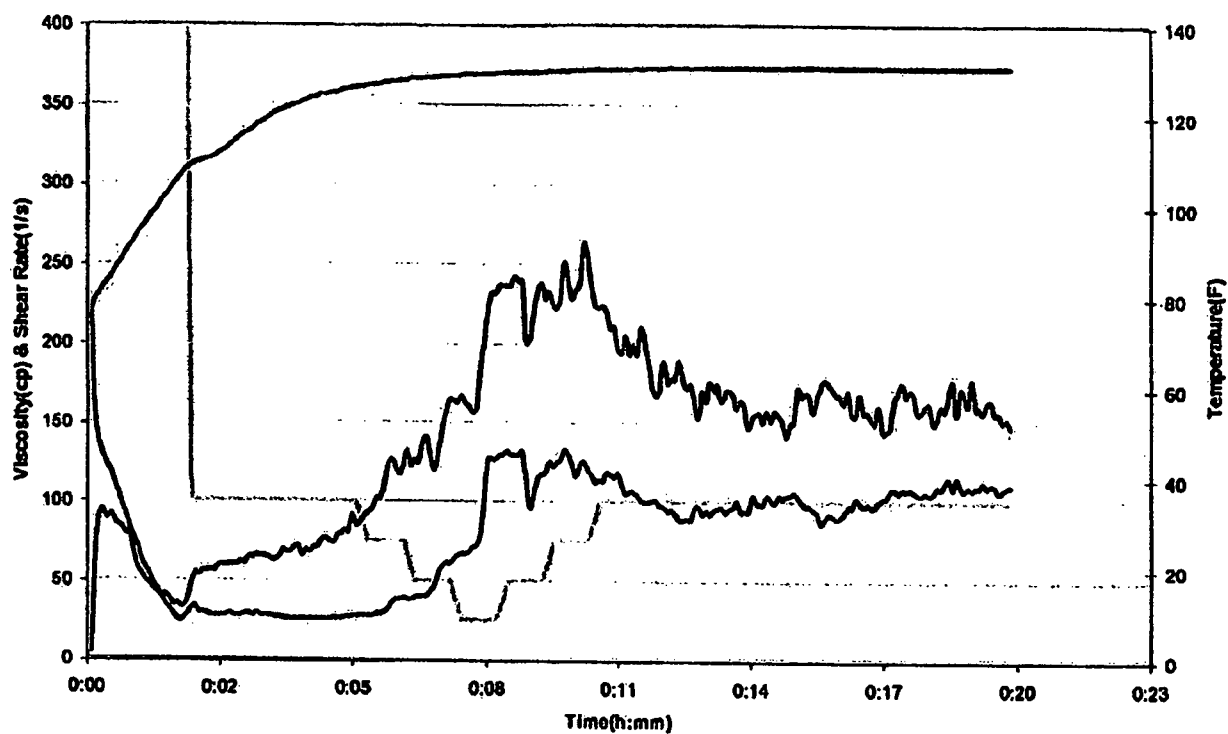
The invention discloses a well treatment composition for use in a subterranean formation comprising: a carrier fluid; and a viscoelastic surfactant being present in a concentration of less than about 1.5% by weight. Optionally, the fluid comprises a crosslinked polymer in a thickening amount in the carrier fluid. The invention also discloses a method to increase the viscosity of a fluid, the method comprising: providing a fluid comprising a thickening amount of a crosslinked polymer; adding a viscoelastic surfactant at a given concentration to the fluid; taking the fluid to a given temperature; defining a viscosity profile of the fluid depending of the concentration and the temperature; comparing said viscosity profile to a viscosity profile of the crosslinked polymer fluid alone; and defining an optimum concentration of the viscoelastic surfactant for each temperature.



- Shear Rate (1/s)
- Crosslinked Polymer Fluid (cP)
- Crosslinked Polymer Fluid + VES (cP)
- Sample Temp (degF)

Figure 1

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- Shear Rate (1/s)
- Crosslinked Polymer Fluid (cP)
- Crosslinked Polymer Fluid + VES (cP)
- Sample Temp (degF)

Figure 2

- a. providing a fluid comprising a thickening amount of a crosslinked polymer;
 - b. adding a viscoelastic surfactant at a given concentration to the fluid;
 - c. taking the fluid to a given temperature;
 - d. defining a viscosity profile of the fluid depending of the concentration and the temperature;
 - e. comparing said viscosity profile to a viscosity profile of the crosslinked polymer fluid alone; and
 - f. defining an optimum concentration of the viscoelastic surfactant for each temperature.
21. The method of claim 20, wherein the given temperature is between 45degC and 95degC.
22. The method of claim 20, wherein the crosslinked polymer is taken in the group consisting of: polysaccharides, substituted galactomannans, guar gums, high-molecular weight polysaccharides composed of mannose and galactose sugars, guar derivatives, hydroxypropyl guar (HPG), carboxymethylhydroxypropyl guar (CMHPG), carboxymethyl guar (CMG), hydrophobically modified guar, guar-containing compounds, synthetic polymers and mixtures thereof..
23. The method of claim 20, wherein the viscoelastic surfactant is zwitterionic surfactant.
24. The method of claim 23, wherein the viscoelastic surfactant is betaine.

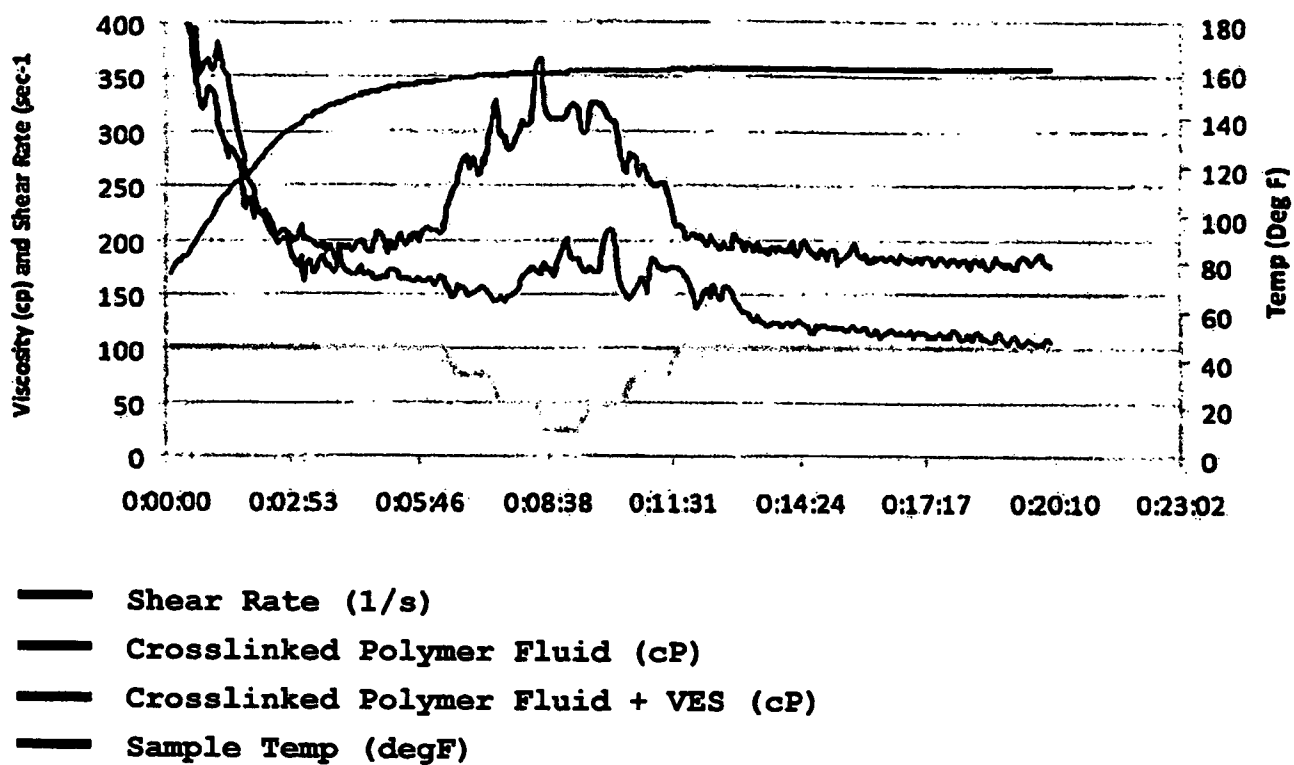


Figure 3

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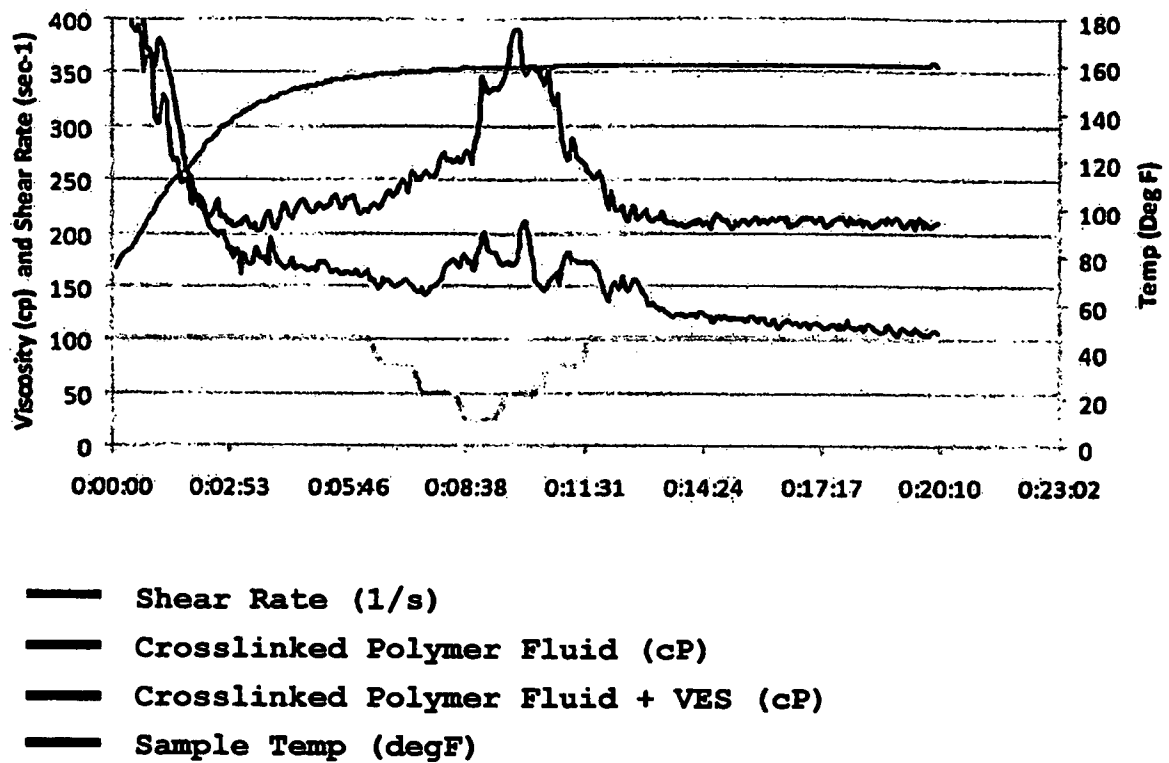


Figure 4

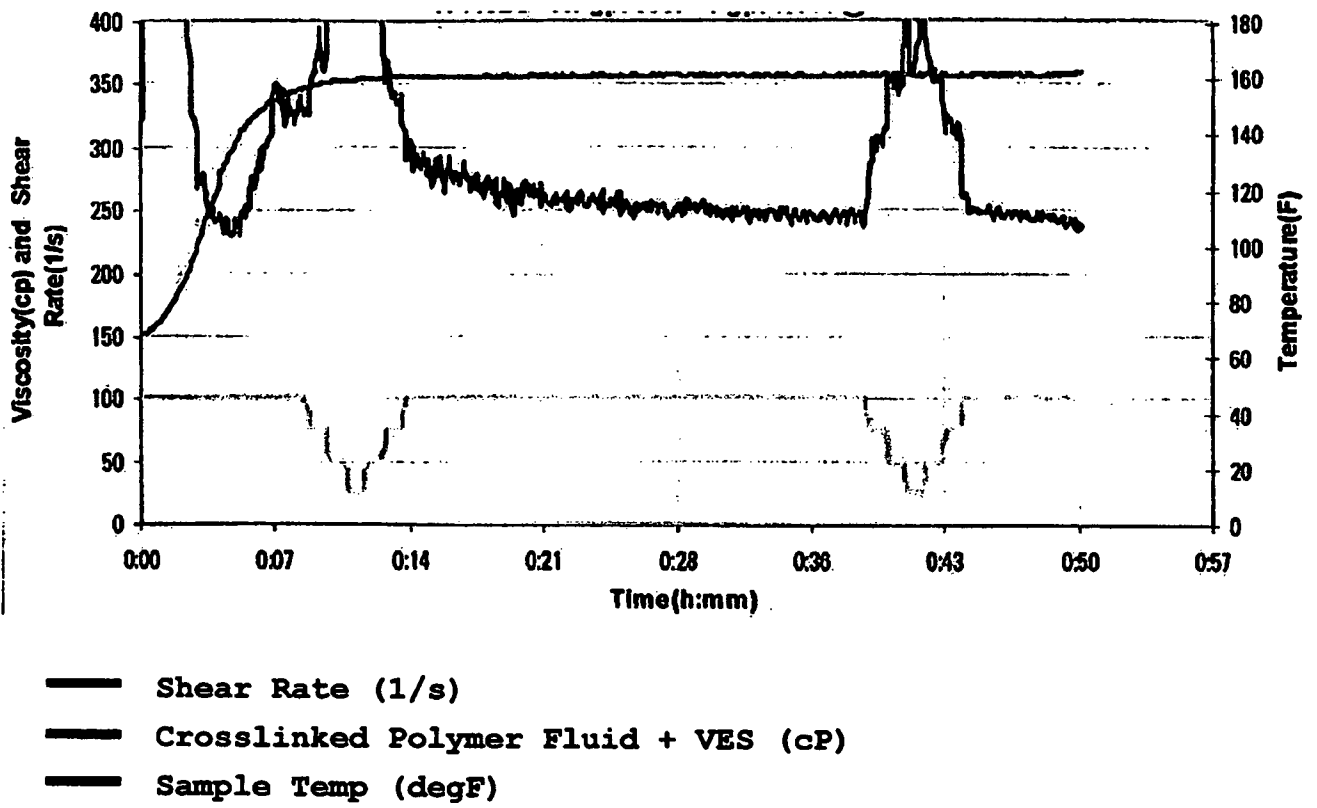


Figure 5

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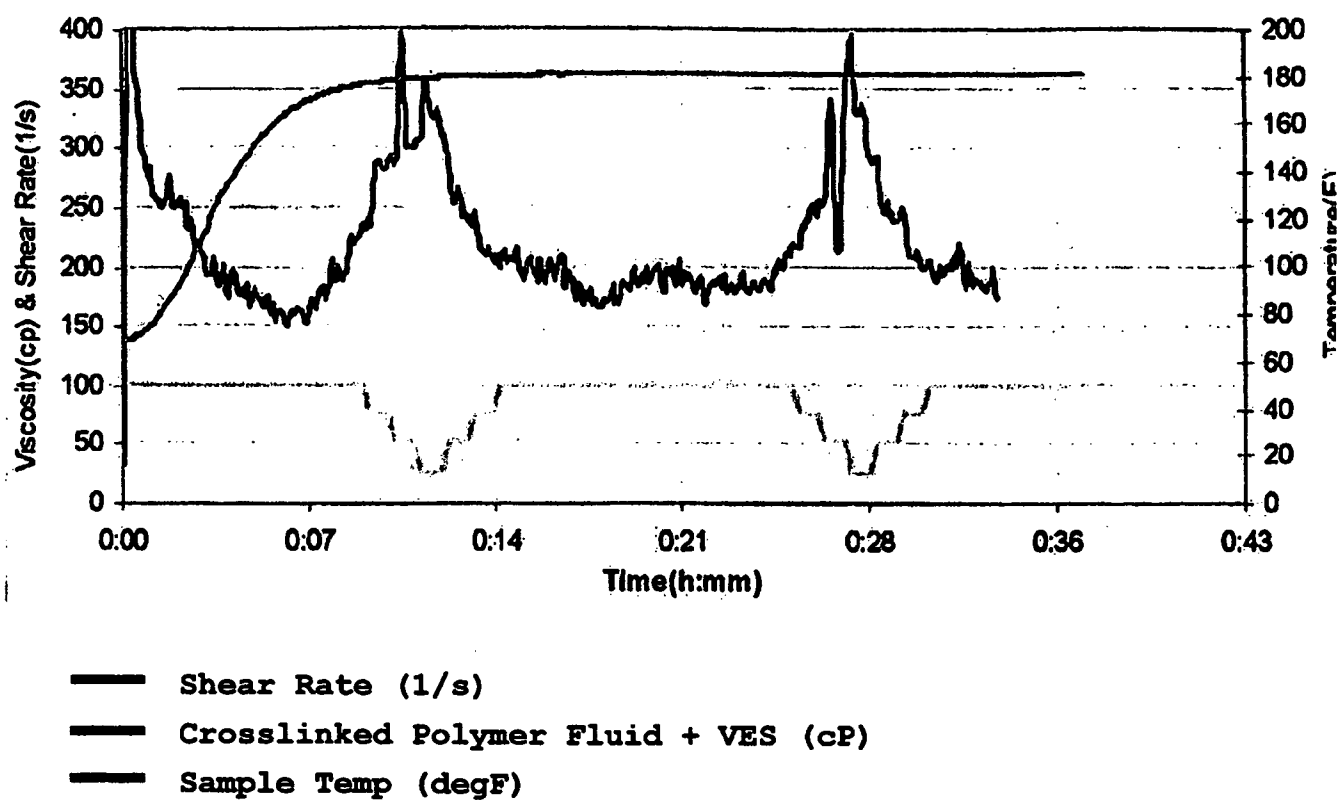


Figure 6

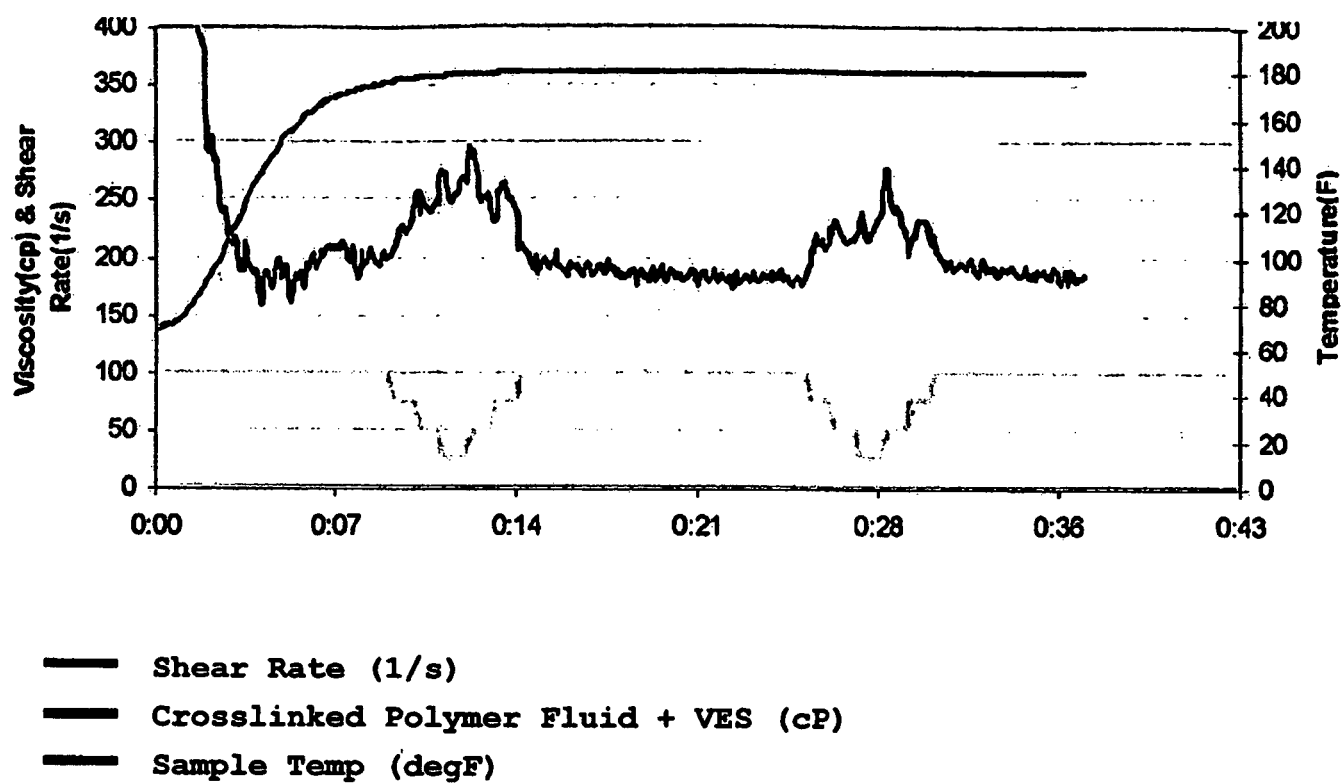


Figure 7

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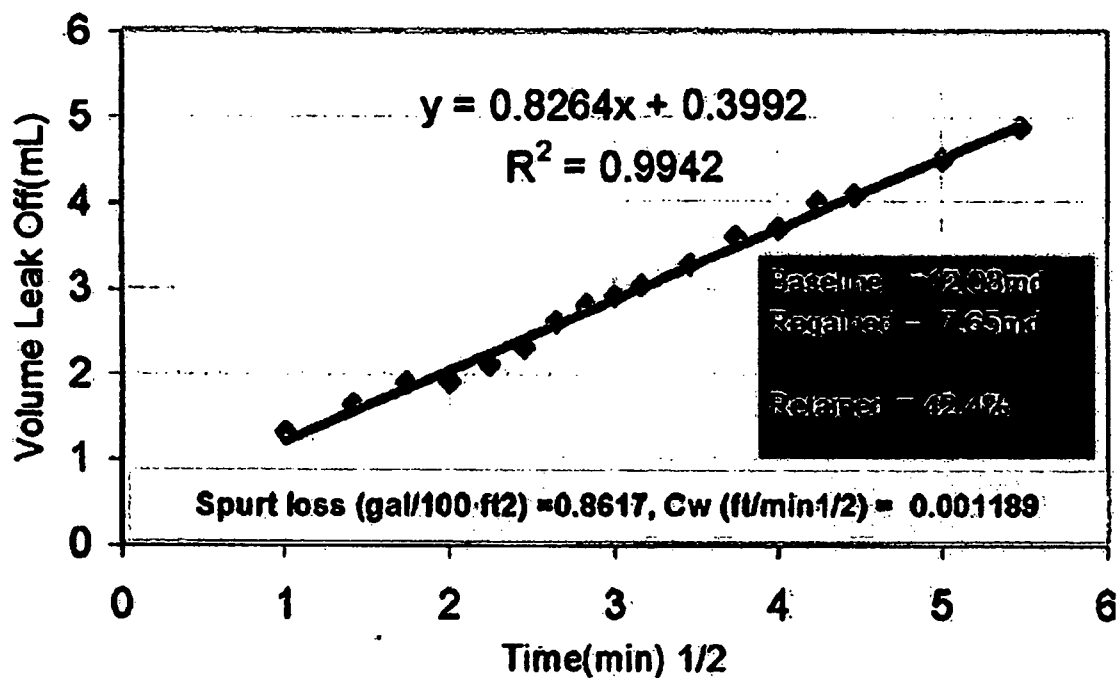


Figure 8

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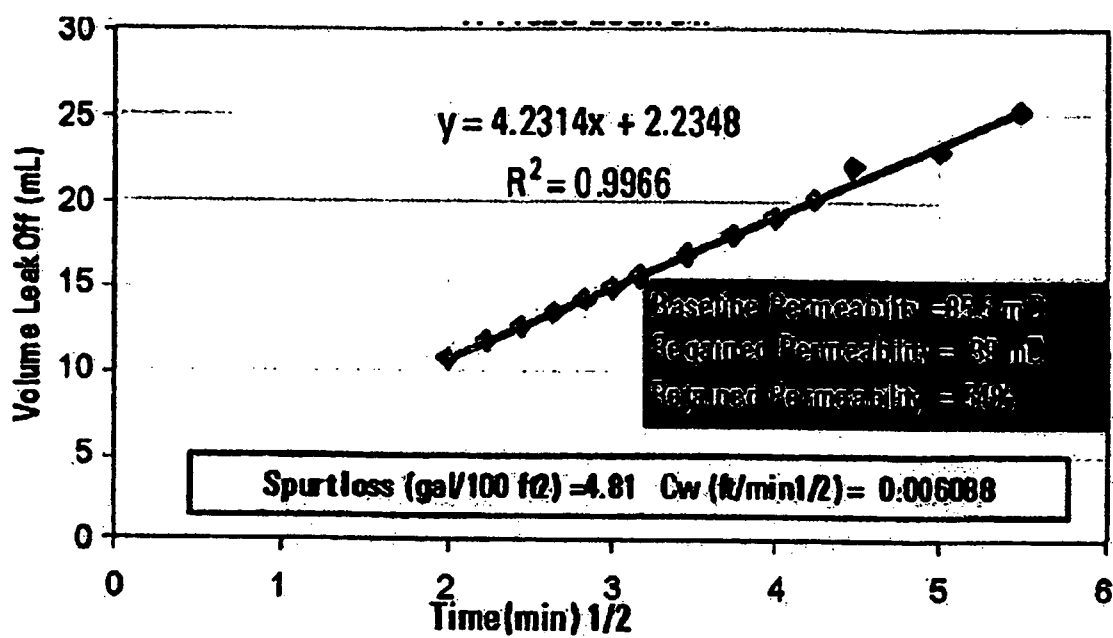


Figure 9

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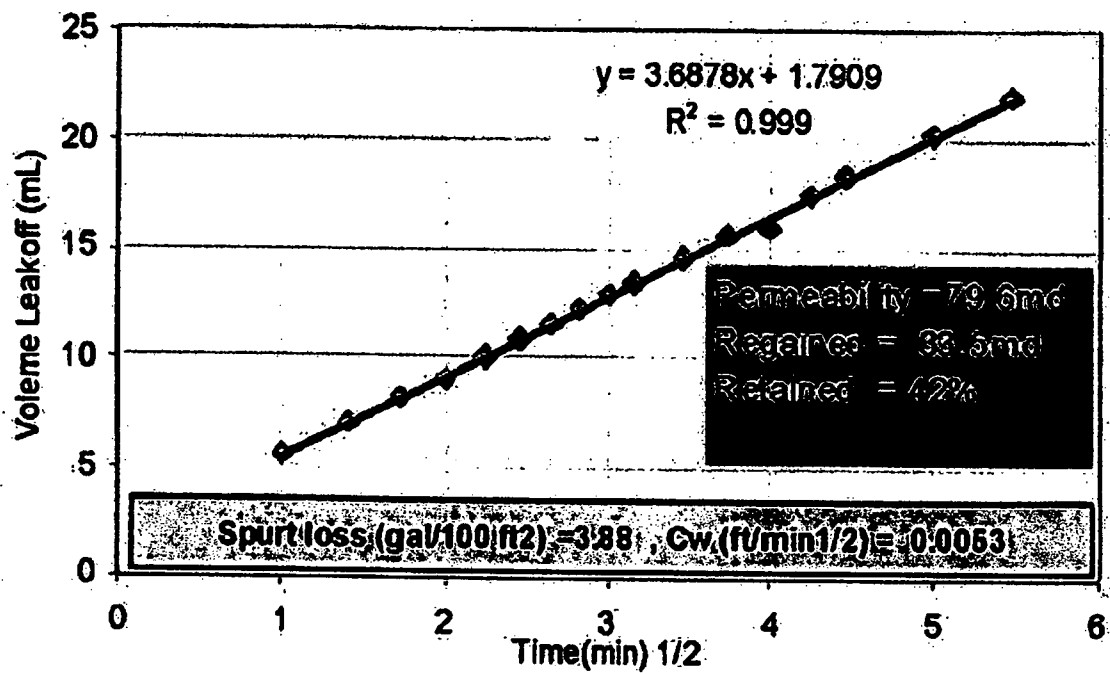


Figure 10

of

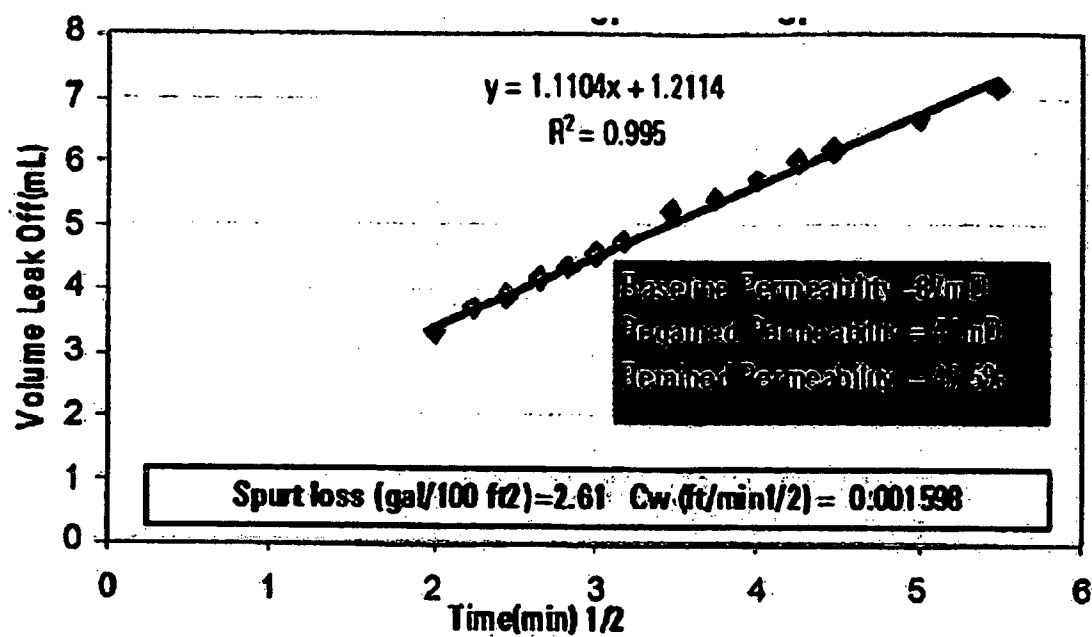


Figure 11

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	56.1202
		Application Number	
Title of Invention	Method and Composition to Increase Viscosity of Crosslinked Polymer Fluids		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Applicant Information:

Applicant 1				
Applicant Authority ☒ Inventor		☐ Legal Representative under 35 U.S.C. 117		☐ Party of Interest under 35 U.S.C. 118
Prefix	Given Name	Middle Name	Family Name	Suffix
	Arthur		Milne	
Residence Information (Select One) ☐ US Residence ☒ Non US Residence ☐ Active US Military Service				
City	Buenos Aires DC	Country Of Residence	AR	
Citizenship under 37 CFR 1.41(b)		UK		
Mailing Address of Applicant:				
Address 1		1939 Lavalle		
Address 2		1640 Martinez		
City	Buenos Aires	State/Province		
Postal Code		Country	AR	
Applicant 2				
Applicant Authority ☒ Inventor		☐ Legal Representative under 35 U.S.C. 117		☐ Party of Interest under 35 U.S.C. 118
Prefix	Given Name	Middle Name	Family Name	Suffix
	Manuel	Jose	Lastre Buevas	
Residence Information (Select One) ☐ US Residence ☒ Non US Residence ☐ Active US Military Service				
City	Bogota	Country Of Residence	CO	
Citizenship under 37 CFR 1.41(b)		CO		
Mailing Address of Applicant:				
Address 1		Cr 68A #23B-53 int 01-302		
Address 2				
City	Bogota	State/Province		
Postal Code		Country	CO	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button. Add				

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).	
☐	An Address is being provided for the correspondence information of this application.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	56.1202	
		Application Number		
Title of Invention	Method and Composition to Increase Viscosity of Crosslinked Polymer Fluids			
Customer Number	27452			
Email Address	kyzaguirre@SLB.COM		Add Email	Remove Email

Application Information:

Title of the Invention	Method and Composition to Increase Viscosity of Crosslinked Polymer Fluids		
Attorney Docket Number	56.1202	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter			
Suggested Class (if any)		Sub Class (if any)	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	11	Suggested Figure for Publication (if any)	1

Publication Information:

☐	Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐	Request Not to Publish. I hereby request that the attached application not be published under 35 U.S. C. 122(b) and certify that the invention disclosed in the attached application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.			
Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	27452		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.			
Prior Application Status		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			

Foreign Priority Information:

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	56.1202
		Application Number	
Title of Invention	Method and Composition to Increase Viscosity of Crosslinked Polymer Fluids		

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

			Remove
Application Number	Country ¹	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			☐ Yes ☒ No

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

Assignee 1

If the Assignee is an Organization check here. ☐

Prefix	Given Name	Middle Name	Family Name	Suffix

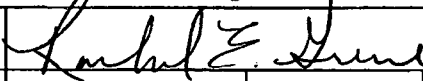
Mailing Address Information:

Address 1			
Address 2			
City		State/Province	
Country		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee Data may be generated within this form by selecting the **Add** button.

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.

Signature			Date (YYYY-MM-DD)	2009-06-25
First Name	Rachel	Last Name	Greene	Registration Number
				58750

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS

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13 de agosto de 2009

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NÚMERO DE SOLICITUD: 12/459,042

FECHA DE RADICACIÓN: 25 de junio de 2009.

EL CÓDIGO DE PAÍS Y NÚMERO DE SU SOLICITUD DE PRIORIDAD QUE SERÁN UTILIZADOS PARA RADICACIONES EN EL EXTERIOR DE ACUERDO CON LA CONVENCIÓN DE PARIS ES EL *US12/459,042*.

Por autoridad del

Sub Secretario de Comercio de Propiedad Intelectual y
Director de la Oficina de Marcas y Patentes de los
Estados Unidos.

(Firma) N. WILLIAMS. Funcionario que Certifica

(SELLLO DE OBLEA)

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 06/25/2009

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☐ El solicitante reclama estatus de pequeña entidad Ver CFR 37, 1.127				No. de Solicitud			
				Fecha de radicación			
				Nombre primer Inventor		Arthur Milne	
				Nombre del Examinador			
				Unidad de Técnica			
Expediente		56.1202					
Monto total del pago		\$ 1.298.00					
MÉTODO DE PAGO (Marque según sea aplicable) ☐ Cheque ☐ Tarjeta de Crédito ☐ Orden de Pago ☐ Otro (Identifique): _____ ☒ Cuenta de Depósito Cuenta de Depósito No. 04-1579 Para la cuenta de depósito indicada, se autoriza al Director (marque según sea aplicable) ☒ Cobrar la comisión que se indica abajo ☐ Cobrar la comisión que se indica abajo, excepto la comisión de presentación ☒ Cobrar cualquier comisión adicional o pago faltante según CFR 37, 1.16 y 1.17 ☒ Acreditar exceso de pago							
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Tipo de solicitud	Comisión \$	Entidad pequeña \$	Comisión \$	Entidad pequeña \$	Comisión \$	Entidad pequeña \$	Comisiones pagadas \$
Utilidad	330	165	540	270	220	110	\$1090.00
Diseño	220	110	100	50	140	70	--
Planta	220	110	330	165	170	85	--
Re-expedición	330	165	540	270	650	325	--
Provisional	220	110	0	0	0	0	--
2. COMISIONES EN EXCESO Descripción de la comisión							
						Comisión \$	Entidad pequeña \$
Cada reivindicación por encima de 20 (incluidas Re-expediciones)						52	26
Cada reivindicación independiente por encima de 3 (incluidas Re-expediciones)						220	110
Múltiples reivindicaciones dependientes						390	195
Total Reivindicaciones		<u>Reivindicaciones Adicionales</u>	<u>Comisión</u>	<u>Comisión</u>	<u>Comisión</u>	<u>Múltiples Reivindicaciones Dependientes</u>	
24 -20 o HP =		4	x	52	=	208.00	
<u>Reivindicaciones Independientes</u>		<u>Reivindicaciones Adicionales</u>	<u>Comisión \$</u>	<u>Comisión</u>	<u>Comisión</u>	<u>Comisión</u>	<u>Comisión</u>
-3 o HP			x		=		
HP = número más alto de reivindicaciones independientes pagadas, si son más de 3							
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<u>Total hojas</u>	<u>Hojas Adicionales</u>	<u>No. de cada 50 hojas adicionales o fracción</u>	<u>Comisión</u>	<u>Comisión</u>	<u>Comisión</u>	<u>Comisión</u>	<u>Comisión</u>
-100 =	/ 50 =	(redondear a un número entero) x					
4. OTRAS COMISIONES Descripción en un idioma diferente a inglés, \$130 (no hay descuento por pequeña entidad) Otras (recargo por radicación tardía)							
ENTREGADO POR							
Firma (Nombre) Rachel Greene		Registro No. 58,750		Teléfono 281-285-4925			
				Fecha: 25 de junio de 2009			
Esta información se requiere según CFR 37 1.51. La información se requiere para obtener o retener un beneficio por el público que vaya a radicar una solicitud (y por USPTO para procesarla). La confidencialidad se rige por el U.S.C. 35 122 y CFR 37 1.11 y 1.14. Se estima que el recaudo de esta información tome 8 horas, incluida la recopilación, preparación y entrega del formulario de la solicitud diligenciado al USPTO. El tiempo variará dependiendo de cada caso. Cualquier comentario acerca del tiempo que usted requiere para diligenciar este formulario y/o sugerencias para reducir esta diligencia, debe enviarse al Director de Información, de la Oficina de Marcas y Patentes, Departamento de Comercio de os EE.UU., P.O. Box 1450, Alexandria, VA 22313-1450.							

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Aprobado para uso hasta 06/30/2010. OMB 0851-0032
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Fecha efectiva 12/08/2004 Comisión de acuerdo con la Ley de Apropiaciones Consolidadas de 2005 (H.R. 4818) TRANSMISIÓN DE COMISIÓN Para FY 2009				Diligencia			
☐ El solicitante reclama estatus de pequeña entidad Ver CFR 37, 1.127				No. de Solicitud			
				Fecha de radicación			
				Nombre primer Inventor		Arthur Milne	
				Nombre del Examinador			
				Unidad de Técnica			
				Expediente		56.1202	
Monto total del pago		\$ 1.298.00					
MÉTODO DE PAGO (Marque según sea aplicable)							
☐ Cheque ☐ Tarjeta de Crédito ☐ Orden de Pago ☐ Otro (Identifique): _____ ☒ Cuenta de Depósito Cuenta de Depósito No. 04-1579 Para la cuenta de depósito indicada, se autoriza al Director (marque según sea aplicable) ☒ Cobrar la comisión que se indica abajo ☐ Cobrar la comisión que se indica abajo, excepto la comisión de presentación ☒ Cobrar cualquier comisión adicional o pago faltante según CFR 37, 1.16 y 1.17 ☒ Acreditar exceso de pago							
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CÁLCULO DE LA COMISIÓN							
1. COMISIÓN BÁSICA DE RADICACIÓN, BÚSQUEDA Y EXAMEN							
		COMISIÓN DE RADICACIÓN		COMISIÓN DE BÚSQUEDA		COMISIÓN DE EXAMEN	
Tipo de solicitud	Comisión \$	Entidad pequeña \$	Comisión \$	Entidad pequeña \$	Comisión \$	Entidad pequeña \$	
Utilidad	330	165	540	270	220	110	
Diseño	220	110	100	50	140	70	
Planta	220	110	330	165	170	85	
Re-expedición	330	165	540	270	650	325	
Provisional	220	110	0	0	0	0	
						Comisiones pagadas \$	
						\$1090.00	
2. COMISIONES EN EXCESO							
Descripción de la comisión						Comisión \$	
Cada reivindicación por encima de 20 (incluidas Re-expediciones)						52	
Cada reivindicación independiente por encima de 3 (incluidas Re-expediciones)						220	
Múltiples reivindicaciones dependientes						390	
Total Reivindicaciones						Múltiples Reivindicaciones Dependientes	
		Reivindicaciones Adicionales	Comisión	Comisión pagada \$			
24 -20 o HP =		4 x	52 =	208.00			
Reivindicaciones Independientes		Reivindicaciones Adicionales	Comisión \$	Comisión Pagada \$			
-3 o HP		x	=				
HP = número más alto de reivindicaciones independientes pagadas, si son más de 3							
3. COMISIÓN DEL TAMAÑO DE LA SOLICITUD							
Si la descripción y los dibujos sobrepasan 100 hojas (excluida la secuencia radicada electrónicamente o listas de computador bajo CFR 37 1.52 (e)), el costo de la comisión por el tamaño de la solicitud es de \$270 (\$135 para una entidad pequeña) por cada 50 hojas adicionales o fracción de las mismas. Ver CFR 35 41(a)(G) y CFR 37, 1.16(s)							
Total hojas	Hojas Adicionales	No. de cada 50 hojas adicionales o fracción	Comisión	Comisión pagada \$			
-100 =	/ 50 =	(redondear a un número entero) x					
4. OTRAS COMISIONES							
Descripción en un idioma diferente a inglés, \$130 (no hay descuento por pequeña entidad)						Comisión pagada \$	
Otras (recargo por radicación tardía)							
ENTREGADO POR							
Firma (Nombre) Rachel Greene		Registro No. 58,750		Teléfono 281-285-4925			
				Fecha: 25 de junio de 2009			
Esta información se requiere según CFR 37 1.51. La información se requiere para obtener o retener un beneficio por el público que vaya a radicar una solicitud (y por USPTO para procesarla). La confidencialidad se rige por el U.S.C. 35 122 y CFR 37 1.11 y 1.14. Se estima que el recaudo de esta información tome 8 horas, incluida la recopilación, preparación y entrega del formulario de la solicitud diligenciado al USPTO. El tiempo variará dependiendo de cada caso. Cualquier comentario acerca del tiempo que usted requiere para diligenciar este formulario y/o sugerencias para reducir esta diligencia, debe enviarse al Director de Información, de la Oficina de Marcas y Patentes, Departamento de Comercio de os EE.UU., P.O. Box 1450, Alexandria, VA 22313-1450.							

Declaración de la Ley de Privacidad

La Ley de Privacidad de 1974 (P.L. 93-579) requiere que se le entregue a usted cierta información relacionada con la entrega de la forma adjunta referente a una solicitud de patente o patente. Por lo tanto, de acuerdo con lo dispuesto en la Ley, le informamos lo siguiente: (1) la autoridad general para el recaudo de esta información es U.S.C. 35 (2)(b)(2); (2) la entrega de la información solicitada es voluntaria; y (3) el propósito principal para el cual la Oficina de marcas y patentes utiliza la información es procesar y/o examinar su entrega relacionada con una solicitud de patente o patente. Si usted no entrega la información solicitada, la Oficina de Marcas y Patentes no podrá procesar y/o examinar sus documentos, lo cual podrá resultar en la terminación del proceso o en el abandono de la solicitud o vencimiento de la patente.

La información que ustedes suministran en esta forma estará sujeta a los siguientes usos rutinarios:

1. La información en esta forma será tratada como confidencial en la medida que se permita de acuerdo con la Ley de Libertad de la Información (*Freedom of Information Act*) (U.S.C 5, 552) y la Ley de Privacidad (U.S.C 5, 552(a)). Los registros de este sistema de registro podrán ser divulgados al Departamento de Justicia para establecer si la Ley de Libertad de la Información requiere la divulgación de dichos registros.
2. Como uso rutinario, se podrá divulgar un registro de este sistema de registros, en el curso de presentar evidencia a una corte, magistrado o tribunal administrativo, incluido lo que se divulgue al abogado de la otra parte en el curso de las negociaciones de conciliación.
3. Como uso rutinario, se podrá divulgar un registro de este sistema de registros, a un Miembro del Congreso que entregue una solicitud que involucre a una persona, a quien pertenece el registro, cuando la persona haya solicitado asistencia del Miembro con respecto al objeto materia del registro.
4. Como uso rutinario, se podrá divulgar un registro de este sistema de registros, a un contratista de la agencia que requiera la información con el fin de realizar un contrato. Los receptores de la información deben cumplir con los requerimientos de la Ley de Privacidad de 1974, y sus modificaciones, de acuerdo con U.S.C. 5, 552^a(m).
5. Como uso rutinario, se podrá divulgar un registro relacionado con una Solicitud Internacional radicada bajo el Tratado de Cooperación de Patentes, a la Oficina Internacional de la Organización Mundial de Propiedad Intelectual (*International Bureau of the World Intellectual Property Organization*), conforme al Tratado de Cooperación de Patentes.
6. Como uso rutinario, se podrá divulgar un registro de este sistema de registros, a otra agencia federal para propósitos de revisión de Seguridad Nacional (USC 35, 181), y para revisión de acuerdo con la Ley de Energía Atómica (*Atomic Energy Act*) (U.S.C 42, 218 (c)).
7. Como uso rutinario, se podrá divulgar un registro de este sistema de registros, al Administrador, Servicios Generales o a su suplente, durante una inspección de registros realizada por GSA como parte de la responsabilidad de esa agencia para recomendar mejoras en las prácticas y programas en el manejo de registros, bajo la autoridad de U.S.C. 44, 2904 y 2906. Dicha divulgación se hará de acuerdo con las normas GSA que rigen la inspección de registros para este propósito y cualquier otra directiva pertinente (como, GSA o e Comercio). Dicha divulgación no podrá hacerse para tomar decisiones acerca de individuos.
8. Como uso rutinario, se podrá divulgar un registro de este sistema de registros, al público luego de publicación de la solicitud de acuerdo con U.S.C. 35, 122(b) o expedición de una patente de acuerdo con U.S.C. 35 151. Además, como uso rutinario se podrá divulgar al público un registro, sujeto a las limitaciones de CFR 37, 1.14, si el registro fue presentado en una solicitud que fue abandonada o en la cual se terminaron las acciones y cuya solicitud

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sea referenciada por una solicitud publicada, una solicitud abierta a inspección pública o una patente expedida.

9. Como uso rutinario, se podrá divulgar un registro de este sistema de registros, a una agencia de control Federal, Estatal o local, si USPTO llega a tener conocimiento de una violación o violación potencial de una ley o reglamentación.

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sea referenciada por una solicitud publicada, una solicitud abierta a inspección pública o una patente expedida.

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Reivindicaciones:

1. Una composición para el tratamiento de pozos para uso en una formación subterránea que comprende: un fluido portador y un surfactante viscoelástico presente en una concentración de menos de cerca de 1,% por peso.
2. La composición de la reivindicación 1, que además comprende un polímero de enlace cruzado en una cantidad de espesamiento en el fluido portador.
3. La composición de la reivindicación 1, en donde el surfactante viscoelástico está presente en una concentración de menos de cerca de 1% por peso.
4. La composición de la reivindicación 1, en donde el surfactantes viscoelástico está presente en una concentración de menos de cerca de 0.8% por peso.
5. La composición de la reivindicación 1, en donde el polímero de enlace cruzado es tomado en el grupo consistente de: polisacáridos, galactomananos sustituidos, gomas guar, polisacáridos de peso molecular alto compuestos de azúcares de manosa y galactosa, derivados guar, hidroxipropil guar (HPG), carboximetilhidroxipropil guar (CMHPG), carboximetil guar (CMG), guar modificado hidrofóticamente, compuestos que contengan guar, polímeros sintéticos y mezclas de lo anterior.
6. La composición de la reivindicación 1, que además comprende un co-surfactante
7. La composición de la reivindicación 1, en donde el surfactante viscoelástico es un surfactante zwitteriónico.
8. La composición de la reivindicación 7, en donde el surfactante viscoelástico es betaína.

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9. La composición de la reivindicación 1, en donde el fluido portador es un fluido de base acuosa.
 10. Un método para el tratamiento de una formación subterránea de un pozo, el método comprende:
 - a. proveer un fluido portador que comprenda un surfactante viscoelástico en una concentración de menos de cerca de 1,5% por peso; e
 - b. introducir el fluido dentro del pozo.
 11. El método según la reivindicación 10, en donde el fluido comprende además una cantidad de espesamiento de un polímero de enlace cruzado.
 12. El método según la reivindicación 10, que además comprende contactar el fluido y la formación subterránea.
 13. El método según la reivindicación 12, que además comprende fracturar la formación subterránea.
 14. El método según la reivindicación 10, en donde el fluido comprende además un agente de sostén.
 15. El método según la reivindicación 10, en donde el surfactante viscoelástico está presente en una concentración de menos de cerca 1% por peso.
 16. El método según la reivindicación 10, en donde el surfactante viscoelástico está presente en una concentración de menos de cerca de 0,8% por peso.
 17. El método según la reivindicación 10, en donde el polímero de enlace cruzado es tomado en el grupo consistente de: polisacáridos, galactomananos sustituidos, gomas guar, polisacáridos de peso molecular alto compuestos de azúcares de manosa y galactosa, derivados guar, hidroxipropil guar (HPG), carboximetilhidroxipropil guar (CMHPG),

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carboximetil guar (CMG), guar modificado hidrofóbicamente, compuestos que contengan guar, polímeros sintéticos y mezclas de lo anterior.

18. El método según la reivindicación 10, en donde el surfactante viscoelástico es betaína.
19. El método según la reivindicación 10, en donde el fluido portador es agua.
20. Un método para aumentar la viscosidad de un fluido, el método comprende:
 - a. proveer un fluido que comprenda una cantidad de espesamiento de un polímero de enlace cruzado;
 - b. agregar al fluido un surfactante viscoelástico a una concentración determinada;
 - c. tomar el fluido a una temperatura determinada;
 - d. definir un perfil de viscosidad del fluido dependiendo de la concentración y la temperatura;
 - e. comparar dicho perfil de viscosidad con un perfil de viscosidad del fluido de polímero de enlace cruzado solo; y
 - f. definir una concentración óptima del surfactante viscoelástico para cada temperatura.
21. El método según la reivindicación 20, en donde la temperatura determinada es entre 45°C y 90°C.
22. El método de la reivindicación 20, en donde el polímero de enlace cruzado es tomado en el grupo consistente de: polisacáridos, galactomananos sustituidos, gomas guar, polisacáridos de peso molecular alto compuestos de azúcares de manosa y galactosa, derivados guar, hidroxipropil guar (HPG), carboximetilhidroxipropil guar (CMHPG), carboximetil guar (CMG),

guar modificado hidrofóbicamente, compuestos que contengan guar, polímeros sintéticos y mezclas de lo anterior.

23. El método según la reivindicación 20, en donde el surfactante es un surfactante zwitteriónico.
24. El método según la reivindicación 23, en donde el surfactante viscoelástico es betaína.



2020

Bogotá D.C.,

Doctor(a)

CASTILLO GIBSON LUIS FELIPE

Apoderado(a) y/o Representante de
SCHLUMBERGER TECHNOLOGY B.V.

REFERENCIA

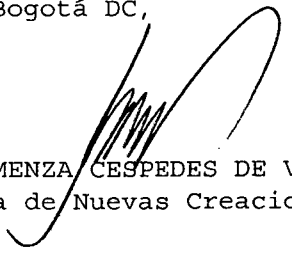
Radicación No. 9 78181
Trámite 2
Evento 1
Actuación 416
Oficio No. 11301
Folios 1

Teniendo en cuenta que la solicitud de privilegio de patente que se tramita bajo el expediente indicado en la referencia, reúne los requisitos de forma establecidos en los artículos 26 y 27 de la Decisión 486 de la Comisión de la Comunidad Andina, y en las demás disposiciones vigentes sobre la materia, se envía el extracto de la solicitud a la Oficina de Comunicaciones para efecto de su publicación en la Gaceta de Propiedad Industrial, conforme lo establece el artículo 40 de la misma Decisión.

Cúmplase

Dado en Bogotá DC,

30 SET. 2010


ALIX CARMENZA CESPEDES DE VERGEL
Directora de Nuevas Creaciones (c)

jfernand