Industria y Comercio
SUPERINTENDENCIA

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

No. 03-069278- -00007-0000

Fecha: 2008-07-02 15:13:36 Dep. 2020 NUECREACIONI
Tra. 11 PATENTEIYII Eve: 378 FASENACIONALI
Act. 329 CTOINFORMACION Folios: 22

FORMULARIO ÚNICO DE CORRECIONES Y MODIFICACIONES
2000-10

1 **SOLICITUD DE:**

[ ] Corrección de Error Material [X] Modificación a una Solicitud.

2 **SOLICITANTE**	Nombre: **SCHLUMBERGER TECHNOLOGY B.V.** Dirección: Parkstraat 83-89 Teléfono: E-mail Domicilio: La Haya, Holanda, Países Bajos	**IDENTIFICACIÓN** C.C [ ] NIT [ ] C.E. [ ] Otro [ ] Número _____
3 **REPRESENTANTE O APODERADO**	Nombre: **LUIS FELIPE CASTILLO GIBSONE** Dirección: Carrera 13 No. 37-43 Piso 12 Teléfono: 285 74 60 Fax: 285 92 67 E-mail info@castillograu.com	**IDENTIFICACIÓN** C.C [X] NIT [ ] C.E. [ ] Otro [ ] Número 79.397.879 de Bogotá T.P. 68.995 del C.S.J.

4 **Número de Expediente**

03 69.278

5 **Descripción de la corrección o modificación solicitada** **MODIFICACION** de nombre, dirección y domicilio de la sociedad solicitante de la patente, por transferencia de SOFITECH N.V., a favor de:

Nombre : **SCHLUMBERGER TECHNOLOGY B.V.**
Dirección : Parkstraat 83-89
Domicilio: La Haya, Holanda, Países Bajos

6 **Comprobante de pago N°** 52094 **Fecha** _____

7 **Anexos:**

[X] Comprobante de pago de la tasa

[X] Poderes, si fuere el caso, **copia auténtica**

[ ] Certificado de existencia y representación legal de las partes, cuando sean personas jurídicas.

[X] documento que respalda la modificación **copia auténtica**

8

NOMBRE **LUIS FELIPE CASTILLO GIBSONE** **FIRMA** Luis Felipe Castillo

C.C ~~79.397.879~~ de Bogotá T.P. 68.995 del C.S.J.

Instrucciones para el diligenciamiento del presente formulario, ver reverso de esta página.

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

No. 03-069278- -00007-0000

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Tra. 11 PATENTEIYII Eve: 378 FASENACIONALI
Act. 329 CTOINFORMACION Folios: 22

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

NIT : 800176089-2

RECIBO OFICIAL DE CAJA : 08 - 52,094
FECHA : JULIO 1 DE 2008

***** C O N S I G N A C I O N *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
CASTILLO GRAU Y ASOCIADOSCONSIGNACION		BANCO DE BOGOTA	062754387	61633	01/07/2008	18,001,000.00
CASTILLO GRAU Y ASOCIADOSCONSIGNACION		BANCO DE BOGOTA	062754387	61644	01/07/2008	75,000.00

***** C O N C E P T O *****

CANT.	RENTISTICO	CONCEPTO	TOTAL CONCEPTO
1	50005-01-03 CAMBIO DE MODALIDAD Y MODIFICA	12 MARCAS Y LEMAS COMERCIALES	103,000.00
		TOTAL : $	103,000.00

SON: CIENTO TRES MIL PESOS

RESPONSABLE : _____

RECIBO DE CAJA APLICADO AL EXPEDIENTE No. _____

APOSTILLE

(Convention de la Haye du 5 Octobre 1961)

1. Country: United States of America

This public document

2. Has been signed by Elizabeth Currie Norwood

3. acting in the capacity of A Notary Public

4. Bears the seal/stamp of Elizabeth Currie Norwood
Commonwealth of Virginia

Certified

5. at Richmond Virginia 6. On February 27, 2008

7. by The Secretary of the Commonwealth

8. No. 2244473-5

9. Seal/Stamp

10. Signature:

Katherine K. Hanley

Secretary of the Commonwealth

Como Notario Veintiséis del Circulo de Bogotá, hago constar que esta copia coincide con original que se ha presentado
Bogotá D.C. - Colombia.
27 JUN 2008
GUSTAVO SAMPER RODRIGUEZ
NOTARIO VEINTISEIS

Colombia

State of Texas

County of Ft. Bend

On this January 29, 2008, 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 not has been publicly recorded, certified copies of which are not available from an official source other than a notary public.

Sherri Sitzmann

Sherri Sitzmann
Notary Public
Expires: June 13, 2009

SHERRI SITZMANN NOTARY PUBLIC STATE OF TEXAS EXPIRES 06-13-2009

ELIZABETH CURRIE NORWOOD NOTARY PUBLIC REG # 362401 MY COMMISSION EXPIRES 3/31/2009 COMMONWEALTH OF VIRGINIA

City of Alexandria
Commonwealth/State of Virginia
I certify this to be a complete, full, true and exact reproduction of the original document
Certified this 19th day of February 2008
Elizabeth Norwood, Notary Public ID No. 362401
My Commission Expires: March 31, 2009

Como Notario Veintiséis del Circulo de Bogotá, hago constar que esta copia coincide con original que se ha presentado
Bogotá D.C. - Colombia.
27 JUN 2008
GUSTAVO SAMPER RODRIGUEZ
NOTARIO VEINTISEIS

BILL OF SALE AND ASSIGNMENT

KNOW ALL MEN BY THESE PRESENTS, that:

SOFITECH N.V., (formerly known as Pumptech S.A.), a company organized under the laws of Belgium ("Seller"), for and in consideration of TEN AND NO/100 U.S. DOLLARS (US$I0.00) and other good and valuable consideration, receipt of which is hereby acknowledged, has BARGAINED, SOLD, ASSIGNED and CONVEYED and by these presents does hereby BARGAIN, SELL, ASSIGN and CONVEY to SCHLUMBERGER TECHNOLOGY B.V., a company organized under the laws of the Netherlands ("Purchaser"), its successors and assigns, forever, all of its rights, title and interest in and to all patents and patent applications, and all rights thereunder, that it may have anywhere in the world as set forth in the Schedules attached hereto, with the understanding that such Schedules shall include all patents and patent applications registered in the name of the Seller until the effective date of this Bill of Sale and Assignment, even if not included explicitly in such Schedules, if they relate to the countries mentioned in the Schedules (the "Assets");

TO HAVE AND TO HOLD said Assets unto Purchaser, its successors and assigns, forever, and Seller does for itself, its successors and assigns, hereby warrant, covenant and agree that Seller has the full right and power to transfer and convey said Assets to Purchaser, that the Assets are transferred free and clear and not subject to any claim, lien, security interest or encumbrance of any kind, and that this conveyance shall convey to Purchaser good and merchantable title to the Assets which title Seller does hereby warrant against all and every person or persons whomever lawfully claiming or to claim the same or any part thereof. Seller will execute such further instruments as Purchaser reasonably requests to perfect or further evidence the transfer of any of the Assets.

This Bill of Sale and Assignment shall be governed and construed in accordance with the laws of the Netherlands.

Como Notario Veintiséis del Circulo de Bogotá, hago constar que esta copia coincide con original que se ha presentado Bogotá D.C.- Colombia.

27 JUN 2008

GUSTAVO SAMPER RODRIGUEZ
NOTARIO VEINTISEIS

IN WITNESS WHEREOF, Seller has caused this Bill of Sale and Assignment is executed by its duly authorized corporate officer with effect as of the 1st day of December, 2005.

SOFITECH N.V.

BY: _____

Title: _____

Accepted by: Schlumberger Technology B.V.

By: _____

Title: _____

Seen for legalization the signature of:
Abraham R. Verburg
Eileen Hardell
by me, Mrs. Saskia Daniëlle Meijer, Llm, junior civil law notary, substituting for the absent Mr Michaël John José Reinier Lentze, Llm, civil law notary residing at The Hague (The Netherlands), on this day of:

Notariskantoor Elbers & Lentze
Parkstraat 93
2514 JH 's-Gravenhage
tel. 070-364 49 30

Mr M.J.J.R. LENTZE
NOTARIS TE 's-GRAVENHAGE

Como Notario Veintiséis del Circulo de Bogotá, hago constar que esta copia coincide con original que se ha presentado Bogotá D.C. - Colombia.
27 JUN 2008
GUSTAVO SAMPER RODRIGUEZ
NOTARIO VEINTISEIS

SCHEDULE

Patents and Patent Applications

Como Notaria Veintiséis del Circulo de Bogotá, hago constar que esta copia coincide con original que se ha presentado
Bogotá D.C. - Colombia.
27 JUN 2008
GUSTAVO SAMPER RODRIGUEZ
NOTARIO VEINTISEIS

EN BLANCO
NOTARIA VEINTISEIS

EN BLANCO
NOTARIA VEINTISEIS

		Transfer to STBV												
Owner [W]	File Number	Country [C]	transfer to	Protection type [C]	Current Status: Event [W]	Current Status: Date	Filing date	Filing number	Publication date	Publication number	Grant date	Grant number	Abandon date	Abandon Number
PUMP TECHS	28.0163-	germany	STBV	EPA	ABANDONED	27/DEC/1994	10/JAN/1983	83200030.1			24/AUG/1988	P33 77 771.3-08	27/DEC/1994	HYDROCHEM
PUMP TECHS	28.0163-	italy	STBV	EPA	ABANDONED	27/DEC/1994	10/JAN/1983	83200030.1			24/AUG/1988	0 083 957	27/DEC/1994	HYDROCHEM
PUMP TECHS	31.0205-	germany	STBV	EPA	ABANDONED	01/APR/1994	21/APR/1984	84104532.1			07/DEC/1988	P34 75 561.6-08	01/APR/1994	
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PUMP TECHS	32.0441-	germany	STBV	EPA	ABANDONED	31/DEC/1996	08/AUG/1986	86201401.6			11/SEP/1991	P36 81 378.8-08	31/DEC/1996	
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PUMP TECHS	32.0678-	italy	STBV	EPA	ABANDONED	22/OCT/2004	17/MAR/1986	86200416.5			27/DEC/1991	0 195 484	22/OCT/2004	0 195 484
PUMP TECHS	32.0818-	italy	STBV	EPA	ABANDONED	28/DEC/1995	30/JUN/1986	86201144.2			21/APR/1993	0 208 373	28/DEC/1995	
PUMP TECHS	32.0818-	germany	STBV	EPA	ABANDONED	28/DEC/1995	30/JUN/1986	86201144.2			21/APR/1993	P36 88 303.4-08	28/DEC/1995	
PUMP TECHS	55.0031	germany	STBV	EPA	ABANDONED	20/JAN/1998	01/APR/1983	83400690.0			15/JUN/1988	P 33 77 058.1-0	20/JAN/1998	
PUMP TECHS	55.0031	italy	STBV	EPA	EXPIRY DATE	01/APR/2003	01/APR/1983	83400690.0			15/JUN/1988	0 091 377		
PUMP TECHS	55.0054	germany	STBV	EPA	ABANDONED	03/NOV/1995	11/NOV/1985	85201837.3			18/OCT/1989	0 187 396	03/NOV/1995	HYDROCHEM
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PUMP TECHS	55.0075	germany	STBV	EPA	ABANDONED	20/JAN/1998	27/FEB/1987	87200345.4			22/APR/1992	P 37 78 407.2-0	20/JAN/1998	
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PUMP TECHS	55.0097	italy	STBV	EPA	ABANDONED	04/JUN/2002	09/MAR/1988	88200460.9			18/SEP/1991	0 286 152	04/JUN/2002	
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PUMP TECHS	55.0105	italy	STBV	EPA	ABANDONED	02/JAN/1992	06/JUN/1988	88201131.5			02/JAN/1992	0 296 655	02/JAN/1992	0 296 655
PUMP TECHS	55.0105	germany	STBV	EPA	ABANDONED	02/JAN/1992	06/JUN/1988	88201131.5			02/JAN/1992	P 38 67 333.9-0	02/JAN/1992	P 38 67 333.9-0
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PUMP TECHS	55.0120	IT	STBV	EPA	GRANTED	09/SEP/1992	27/OCT/1989	89202711.1			09/SEP/1992	0 374 984		
PUMP TECHS	55.0120	NL	STBV	EPA	GRANTED	09/SEP/1992	27/OCT/1989	89202711.1			09/SEP/1992	0 374 984		
PUMP TECHS	55.0123	italy	STBV	EPA	ABANDONED	06/SEP/2002	22/DEC/1989	89203297.0			19/JAN/1994	0 377 255	06/SEP/2002	
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PUMP TECHS	55.0125	italy	STBV	EPA	ABANDONED	15/AUG/1996	05/JUN/1991	91201384.4	02/JAN/1992	0 463 661	15/MAY/1996	0 463 661	15/AUG/1996	
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PUMP TECHS	55.0132	italy	STBV	EPA	ABANDONED	03/AUG/1995	02/MAR/1991	91200447.0					03/AUG/1995	
PUMP TECHS	55.0132	germany	STBV	EPA	ABANDONED	26/NOV/2002	02/MAR/1991	91200447.0			07/JUN/1995	691 10 174.4-08	26/NOV/2002	691 10 174.4-08

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PUMP TECHS	55.0132	denmark	STBV	EPA	ABANDONED	03/AUG/1995	02/MAR/1991	91200447.0					03/AUG/1995	
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PUMP TECHS	55.0135	DE	STBV	EPA	GRANTED	23/AUG/1995	19/NOV/1991	91203009.5	03/JUN/1992	0 488 446	23/AUG/1995	691 12 357.8-08		
PUMP TECHS	55.0135	DK	STBV	EPA	ABANDONED	31/AUG/1995	19/NOV/1991	91203009.5	03/JUN/1992	0 488 446	23/AUG/1995	0 488 446	31/AUG/1995	
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PUMP TECHS	55.0142	denmark	STBV	EPA	ABANDONED	12/JAN/1996	01/MAR/1991	91200440.5	11/SEP/1991	0 445 875	13/DEC/1995	0 445 875	12/JAN/1996	
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PUMP TECHS	55.0149	norway	STBV	PCT	GRANTED	04/OCT/1999	15/MAR/1993	94.3527	30/SEP/1993	93/18848	04/OCT/1999	306.200		
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PUMP TECHS	55.0155	denmark	STBV	EPA	ABANDONED	14/OCT/1996	18/JUN/1993	93201766.8	26/JAN/1994	0 580 196	14/AUG/1996	0 580 196	14/OCT/1996	
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PUMP TECHS	56.0024	germany	STBV	EPA	ABANDONED	20/JAN/1998	13/JAN/1988	88200035.9	17/AUG/1988	0 278 540	05/AUG/1992	0 278 540	20/JAN/1998	
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PUMP TECHS	56.0050	italy	STBV	EPA	ABANDONED	20/JAN/1998	14/JAN/1988	88200047.4			23/OCT/1991	0 276 879	20/JAN/1998	
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PUMP TECHS	56.0060	germany	STBV	EPA	ABANDONED	07/APR/2005	07/APR/1988	88200661.2			15/DEC/1993	38 86 253.0-08	07/APR/2005	38 86 253.0-08
PUMP TECHS	56.0060	italy	STBV	EPA	ABANDONED	07/APR/2005	07/APR/1988	88200661.2			15/DEC/1993	0 288 106	07/APR/2005	0 288 106
PUMP TECHS	56.0075	germany	STBV	EPA	ABANDONED	31/DEC/1996	08/JUN/1990	90201478.6			25/AUG/1993	690 02 878.4-08	31/DEC/1996	
PUMP TECHS	56.0075	italy	STBV	EPA	ABANDONED	26/FEB/2003	08/JUN/1990	90201478.6			25/AUG/1993	0 402 996	26/FEB/2003	0 402 996
PUMP TECHS	56.0088	germany	STBV	EPA	ABANDONED	06/JUL/1994	07/JUL/1988	88201425.1			09/JUN/1993	P 3881598.2-08	06/JUL/1994	
PUMP TECHS	56.0088	italy	STBV	EPA	ABANDONED	06/JUL/1994	07/JUL/1988	88201425.1			09/JUN/1993	0 301 626	06/JUL/1994	
PUMP TECHS	56.0095	germany	STBV	EPA	GRANTED	03/JUN/1992	13/JUL/1988	88201498.8			03/JUN/1992	P38 71 642.9-08		
PUMP TECHS	56.0095	italy	STBV	EPA	GRANTED	03/JUN/1992	13/JUL/1988	88201498.8			03/JUN/1992	0 302 544		
PUMP TECHS	56.0127	italy	STBV	EPA	ABANDONED	03/OCT/1996	27/OCT/1989	89202713.7					03/OCT/1996	
PUMP TECHS	56.0127	germany	STBV	EPA	ABANDONED	03/OCT/1996	27/OCT/1989	89202713.7					03/OCT/1996	
PUMP TECHS	56.0139	denmark	STBV	EPA	ABANDONED	09/JUL/1997	08/FEB/1991	91200260.7	18/SEP/1991	0 446 976	23/APR/1997	0 446 976	16/OCT/2003	
PUMP TECHS	56.0139	germany	STBV	EPA	ABANDONED	09/JUL/1997	08/FEB/1991	91200260.7	18/SEP/1991	0 446 976	23/APR/1997	0 446 976	16/OCT/2003	
PUMP TECHS	56.0139	italy	STBV	EPA	ABANDONED	09/JUL/1997	08/FEB/1991	91200260.7	18/SEP/1991	0 446 976	23/APR/1997	0 446 976	16/OCT/2003	
PUMP TECHS	56.0147	denmark	STBV	EPA	ABANDONED	04/OCT/1995	26/JUL/1991	91201955.1			20/SEP/1995	0 471 400	04/OCT/1995	
PUMP TECHS	56.0147	germany	STBV	EPA	ABANDONED	24/JUN/2002	26/JUL/1991	91201955.1			20/SEP/1995	691 13 174.0-08	24/JUN/2002	691 13 174.0-08
PUMP TECHS	56.0147	italy	STBV	EPA	ABANDONED	04/OCT/1995	26/JUL/1991	91201955.1			20/SEP/1995	0 471 400	04/OCT/1995	

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PUMP TECHS	56.0151	germany	STBV	EPA	ABANDONED	28/DEC/1995	21/MAR/1990	90200667.5			10/MAR/1993	690 01 031.1-08	28/DEC/1995	
PUMP TECHS	56.0151	italy	STBV	EPA	ABANDONED	28/DEC/1995	21/MAR/1990	90200667.5			10/MAR/1993	0 390 258	28/DEC/1995	
PUMP TECHS	56.0177	italy	STBV	EPA	ABANDONED	06/OCT/1994	01/JUN/1990	90201448.9	12/DEC/1990	0 401 936	05/OCT/1994	0 401 936	26/FEB/2003	
PUMP TECHS	56.0177	germany	STBV	EPA	ABANDONED	06/OCT/1994	01/JUN/1990	90201448.9	12/DEC/1990	0 401 936	05/OCT/1994	0 401 936	26/FEB/2003	
PUMP TECHS	56.0199	italy	STBV	EPA	ABANDONED	13/JUL/1994	01/MAR/1991	91200443.9			13/JUL/1994	0 444 760	13/JUL/1994	0 444 760
PUMP TECHS	56.0199	denmark	STBV	EPA	ABANDONED	13/JUL/1994	01/MAR/1991	91200443.9			13/JUL/1994	0 444 760	13/JUL/1994	0 444 760
PUMP TECHS	56.0199	germany	STBV	EPA	ABANDONED	22/OCT/2004	01/MAR/1991	91200443.9	04/SEP/1991	0 444 760	13/JUL/1994	691 02 792.7-08	22/OCT/2004	691 02 792.7-08
PUMP TECHS	56.0215	denmark	STBV	EPA	ABANDONED	14/FEB/2000	21/MAR/1991	91200632.7	02/OCT/1991	0 449 360	08/FEB/1995	0 449 360	14/FEB/2000	
PUMP TECHS	56.0215	italy	STBV	EPA	ABANDONED	17/FEB/1995	21/MAR/1991	91200632.7					17/FEB/1995	
PUMP TECHS	56.0215	germany	STBV	EPA	ABANDONED	14/FEB/2000	21/MAR/1991	91200632.7			08/FEB/1995	691 07 228.0-08	14/FEB/2000	
PUMP TECHS	56.0218	denmark	STBV	EPA	ABANDONED	02/MAY/1996	09/APR/1992	92201035.0			06/MAR/1996	0 512 594	02/MAY/1996	
PUMP TECHS	56.0218	italy	STBV	EPA	ABANDONED	02/MAY/1996	09/APR/1992	92201035.0			06/MAR/1996	0 512 594	02/MAY/1996	
PUMP TECHS	56.0218	germany	STBV	EPA	ABANDONED	02/MAY/1996	09/APR/1992	92201035.0			06/MAR/1996	692 08 724.9-08	02/MAY/1996	
PUMP TECHS	56.0229	denmark	STBV	EPA	ABANDONED	26/FEB/1997	12/SEP/1991	91202335.5	25/MAR/1992	0 476 758	12/FEB/1997	0 476 758	02/DEC/1987	
PUMP TECHS	56.0229	italy	STBV	EPA	ABANDONED	26/FEB/1997	12/SEP/1991	91202335.5	25/MAR/1992	0 476 758	12/FEB/1997	0 476 758	26/FEB/1997	0 476 758
PUMP TECHS	56.0229	germany	STBV	EPA	ABANDONED	26/FEB/1997	12/SEP/1991	91202335.5	25/MAR/1992	0 476 758	12/FEB/1997	0 476 758	26/FEB/1997	0 476 758
PUMP TECHS	56.0260	denmark	STBV	EPA	VALIDATION OF EPO DESIGNATION	27/FEB/1997	16/JUL/1992	92202185.2	24/FEB/1993	0 528 461	01/OCT/1997	0 528 461		
PUMP TECHS	56.0260	germany	STBV	EPA	ABANDONED	27/FEB/1997	16/JUL/1992	92202185.2	24/FEB/1993	0 528 461	01/OCT/1997	0 528 461	26/SEP/1997	
PUMP TECHS	56.0260	italy	STBV	EPA	ABANDONED	27/FEB/1997	16/JUL/1992	92202185.2	24/FEB/1993	0 528 461	01/OCT/1997	0 528 461	27/FEB/1998	
PUMP TECHS	56.0282	germany	STBV	EPA	ABANDONED	27/JAN/1998	22/NOV/1993	93203264.2	01/JUN/1994	0 599 420	29/DEC/1997	0 599 420	27/JAN/1998	0 599 420
PUMP TECHS	56.0282	italy	STBV	EPA	ABANDONED	27/JAN/1998	22/NOV/1993	93203264.2	01/JUN/1994	0 599 420	29/DEC/1997	0 599 420	27/JAN/1998	0 599 420
PUMP TECHS	56.0284	italy	STBV	EPA	ABANDONED	06/DEC/1995	23/NOV/1993	93203276.6					06/DEC/1995	
PUMP TECHS	56.0284	germany	STBV	EPA	ABANDONED	06/DEC/1995	23/NOV/1993	93203276.6					06/DEC/1995	
PUMP TECHS	56.0287	italy	STBV	EPA	ABANDONED	27/JAN/1998	23/NOV/1993	93203278.2	01/JUN/1994	0 599 423	29/DEC/1997	0 599 423	27/JAN/1998	0 599 423
PUMP TECHS	56.0287	germany	STBV	EPA	ABANDONED	27/JAN/1998	23/NOV/1993	93203278.2	01/JUN/1994	0 599 423	29/DEC/1997	0 599 423	27/JAN/1998	0 599 423
PUMP TECHS	56.0312	denmark	STBV	EPA	GRANTED	30/JAN/2002	29/MAR/1994	94400664.2	12/OCT/1994	0 619 415	30/JAN/2002	0 619 415		
PUMP TECHS	56.0312	italy	STBV	EPA	ABANDONED	18/NOV/2005	29/MAR/1994	94400664.2	12/OCT/1994	0 619 415	30/JAN/2002	0 619 415	18/NOV/2005	
PUMP TECHS	56.0312	germany	STBV	EPA	GRANTED	30/JAN/2002	29/MAR/1994	94400664.2	12/OCT/1994	0 619 415	30/JAN/2002	69429739.9-08		
SOFITECH N.V.	110.0068	oman	STBV	PCT	FILING	24/MAY/2004	24/MAY/2004	PCT/IB2004/001683						
SOFITECH N.V.	110.0068	international procedure	STBV (see note on Internat. Procedure)	PCT	PUBLICATION	02/DEC/2004	24/MAY/2004	PCT/IB2004/001683	02/DEC/2004	WO 2004/104637				
SOFITECH N.V.	110.0068	mexico	STBV	PCT	DESIGNATED	24/MAY/2004								
SOFITECH N.V.	16.0041	international procedure	STBV (see note on Internat. Procedure)	PCT	SOLD	01/DEC/1999	17/JUN/1998	PCT/EP98/03730	23/DEC/1998	98/58152				

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SOFITECH N.V.	57.0291	international procedure	STBV (see note on Internat. Procedure)	PCT	PUBLICATION	26/AUG/1999	28/JAN/1999	PCT/GB99/00298	26/AUG/1999	99/42539				
SOFITECH N.V.	57.0291	norway	STBV	PCT	ABANDON (THIRD PARTY PATENT)	19/JUL/2004	28/JAN/1999	PCT/GB99/00298	26/AUG/1999	99/42539			19/JUL/2004	
SOFITECH N.V.	57.0291	australia	STBV	PCT	ABANDON (THIRD PARTY PATENT)	19/JUL/2004	28/JAN/1999	PCT/GB99/00298	12/DEC/2002	755319	27/MAR/2003	755319	19/JUL/2004	
SOFITECH N.V.	57.0305	international procedure	STBV (see note on Internat. Procedure)	PCT	PUBLICATION	07/OCT/1999	25/MAR/1999	PCT/GB99/00941	07/OCT/1999	99/50529				
SOFITECH N.V.	57.0305	norway	STBV	PCT	NATIONAL PHASE	26/SEP/2000	25/MAR/1999	2000 4830	07/OCT/1999	99/50529				
SOFITECH N.V.	57.0325	international procedure	STBV (see note on Internat. Procedure)	PCT	PUBLICATION	27/DEC/2001	11/JUN/2001	PCT/GB01/02569	27/DEC/2001	01/98627				
SOFITECH N.V.	57.0365	international procedure	STBV (see note on Internat. Procedure)	PCT	PUBLICATION	14/FEB/2002	23/JUL/2001	PCT/GB01/03294	14/FEB/2002	02/12673				
SOFITECH N.V.	57.0394	australia	STBV	PCT	FILING	13/FEB/2002	13/FEB/2002	2002231958						
SOFITECH N.V.	57.0394	international procedure	STBV (see note on Internat. Procedure)	PCT	PUBLICATION	22/AUG/2002	13/FEB/2002	PCT/GB02/00587	22/AUG/2002	02/064945				
SOFITECH N.V.	57.0394	colombia	STBV	PCT	PUBLICATION	31/MAY/2005	13/FEB/2002	03069278	31/MAY/2005					
SOFITECH N.V.	57.0394	indonesia	STBV	PCT	PUBLICATION	11/SEP/2003	13/FEB/2002	W-00 2003 01558	11/SEP/2003	037.260				

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SOFITECH N.V.	57.0399	international procedure	STBV (see note on Internat. Procedure)	PCT	PUBLICATION	14/FEB/2002	11/JUL/2001	PCT/GB01/03131	14/FEB/2002	02/11874				
SOFITECH N.V.	57.0400	australia	STBV	PCT	FILING	10/JAN/2002	10/JAN/2002	2002219353						
SOFITECH N.V.	57.0400	international procedure	STBV (see note on Internat. Procedure)	PCT	PUBLICATION	29/AUG/2002	10/JAN/2002	PCT/GB02/00088	29/AUG/2002	02/066790				
SOFITECH N.V.	57.0424	international procedure	STBV (see note on Internat. Procedure)	PCT	PUBLICATION	07/NOV/2002	26/APR/2002	PCT/GB02/01960	07/NOV/2002	02/088520 A1				
SOFITECH N.V.	57.0452	international procedure	STBV (see note on Internat. Procedure)	PCT	PUBLICATION	11/MAR/2004	20/AUG/2003	PCT/GB2003/003645	11/MAR/2004	2004/020783 A1				
SOFITECH N.V.	57.0458	australia	STBV	PCT	FILING	13/FEB/2002	13/FEB/2002	2002229950						
SOFITECH N.V.	57.0458	international procedure	STBV (see note on Internat. Procedure)	PCT	PUBLICATION	22/AUG/2002	13/FEB/2002	PCT/GB02/00589	22/AUG/2002	02/064946				
SOFITECH N.V.	57.0458	colombia	STBV	PCT	PUBLICATION	31/MAY/2005	13/FEB/2002	03069557	31/MAY/2005					
SOFITECH N.V.	57.0458	indonesia	STBV	PCT	PUBLICATION	25/SEP/2003	13/FEB/2002	W-00 2003 01559	25/SEP/2003	037.380				
SOFITECH N.V.	57.0465	international procedure	STBV (see note on Internat. Procedure)	PCT	PUBLICATION	10/JUL/2003	20/DEC/2002	PCT/GB2002/005833	10/JUL/2003	03/056130				

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SOFITECH N.V.	57.0532	international procedure	STBV (see note on Internat. Procedure)	PCT	PUBLICATION	30/SEP/2004	18/MAR/2004	PCT/GB2004/001182	30/SEP/2004	2004/083827 A1				
SOFITECH N.V.	57.0552	international procedure	STBV (see note on Internat. Procedure)	PCT	PUBLICATION	21/APR/2005	08/OCT/2004	PCT/GB2004/004251	21/APR/2005	2005/035936				
SOFITECH N.V.	95.0090	international procedure	STBV (see note on Internat. Procedure)	PCT	TRANSFERED PATENT TO THIRD PARTY	09/MAR/1995	30/AUG/1994	PCT/GB/9401877	09/MAR/1995	95/06694			28/FEB/1996	
SOFITECH N.V.	95.0090	germany	STBV	EPA	ABANDONED	18/AUG/1999	30/AUG/1994	94924940.3	23/AUG/1995	0 667 890	15/SEP/1999	0 667 890		
SOFITECH N.V.	95.0090	italy	STBV	EPA	ABANDONED	18/AUG/1999	30/AUG/1994	94924940.3	23/AUG/1995	0 667 890	15/SEP/1999	0 667 890		
SOFITECH N.V.	95.0091	italy	STBV	EPT	TRANSFERED PATENT TO THIRD PARTY	26/JUL/2000	30/AUG/1994	94924941.1	16/AUG/1995	0 666 893	26/APR/2000	0 666 893	26/JUL/2000	DECISION MI
SOFITECH N.V.	95.0091	austria	STBV	EPT	TRANSFERED PATENT TO THIRD PARTY	26/JUL/2000	30/AUG/1994	94924941.1	16/AUG/1995	0 666 893	26/APR/2000	0 666 893	26/JUL/2000	DECISION MI
SOFITECH N.V.	95.0091	denmark	STBV	EPT	TRANSFERED PATENT TO THIRD PARTY	26/JUL/2000	30/AUG/1994	94924941.1	16/AUG/1995	0 666 893	26/APR/2000	0 666 893	26/JUL/2000	DECISION MI
SOFITECH N.V.	95.0091	germany	STBV	EPT	TRANSFERED PATENT TO THIRD PARTY	26/JUL/2000	30/AUG/1994	94924941.1	16/AUG/1995	0 666 893	26/APR/2000	0 666 893	26/JUL/2000	DECISION MI
SOFITECH N.V.	95.0091	trinidad and tobago	STBV	PCT	TRANSFERED PATENT TO THIRD PARTY	16/MAY/1995	30/AUG/1994	82885	09/MAR/1995	95/06695	16/MAY/1995	30/1995		
SOFITECH N.V.	95.0100	international procedure	STBV (see note on Internat. Procedure)	PCT	TRANSFERED PATENT TO THIRD PARTY	15/FEB/1996	04/AUG/1995	PCT/EP95/03102	15/FEB/1996	96/04350				
SOFITECH N.V.	95.0100	italy	STBV	EPA	VALIDATION OF EPO DESIGNATION	11/OCT/1999	04/AUG/1994	94401810.0	07/FEB/1996	0 695 795	15/SEP/1999	0 695 795		
SOFITECH N.V.	95.0100	germany	STBV	EPA	TRANSFERED PATENT TO THIRD PARTY	11/OCT/1999	04/AUG/1994	94401810.0	07/FEB/1996	0 695 795	15/SEP/1999	0 695 795		

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SOFITECH N.V.	95.0100	denmark	STBV	EPA	TRANSFERED PATENT TO THIRD PARTY	11/OCT/1999	04/AUG/1994	94401810.0	07/FEB/1996	0 695 795	15/SEP/1999	0 695 795		
SOFITECH N.V.	95.0104	mexico	STBV	PCT	ABANDONED	14/OCT/1998	12/SEP/1995	PCT/EP 95/03579	21/MAR/1996	WO 96/08543			14/OCT/1998	
SOFITECH N.V.	95.0104	norway	STBV	PCT	ABANDONED	14/OCT/1998	12/SEP/1995	PCT/EP 95/03579	21/MAR/1996	WO 96/08543			14/OCT/1998	
SOFITECH N.V.	95.0104	italy	STBV	EPT	ABANDONED	03/MAR/2000	12/SEP/1995	PCT/EP 95/03579	04/SEP/1996	0 729 497	05/JAN/2000	0 729 497		
SOFITECH N.V.	95.0104	germany	STBV	EPT	ABANDONED	03/MAR/2000	12/SEP/1995	PCT/EP 95/03579	04/SEP/1996	0 729 497	05/JAN/2000	0 729 497		
SOFITECH N.V.	95.0104	denmark	STBV	EPT	ABANDONED	03/MAR/2000	12/SEP/1995	PCT/EP 95/03579	04/SEP/1996	0 729 497	05/JAN/2000	0 729 497		
SOFITECH N.V.	95.0107	norway	STBV	PCT	NATIONAL PHASE	20/JAN/1999	16/JUL/1997	990251	29/JAN/1998	WO 98/03609				
SOFITECH N.V.	95.0108	international procedure	STBV (see note on Internat. Proced ure)	PCT	PUBLICATION	10/FEB/2000	16/JUL/1999	PCT/EP99/0532 9	10/FEB/2000	WO 00/06664				
SOFITECH N.V.	95.0110	australia	STBV	PCT	NATIONAL PHASE	02/SEP/1998	02/SEP/1998	95382/98						
SOFITECH N.V.	95.0110	denmark	STBV	EPT	DESIGNATED	02/SEP/1998								
SOFITECH N.V.	95.0110	germany	STBV	EPT	DESIGNATED	02/SEP/1998								
SOFITECH N.V.	95.0110	ireland	STBV	EPT	TRANSFERED PATENT TO THIRD PARTY	02/SEP/1998								
SOFITECH N.V.	95.0110	italy	STBV	EPT	DESIGNATED	02/SEP/1998								
SOFITECH N.V.	95.0113	international procedure	STBV (see note on Internat. Proced ure)	PCT	PUBLICATION	02/JUN/2000	23/NOV/1998	PCT/FR98/0249 7	02/JUN/2000	WO 00/31154				
SOFITECH N.V.	95.0115	international procedure	STBV (see note on Internat. Proced ure)	PCT	FILING	13/JUN/2000	13/JUN/2000	PCT/EP00/0551 3						
PUMP TECHS	55.0120	IT	STBV	EPA	GRANTED	09/SEP/1992	27/OCT/1989	89202711.1			09/SEP/1992	0 374 984		
		* note on EP: transfer to SPS for France, Austria, Spain, Portugal, SHL for NL and UK, STBV for Bulgaria, Czech Republic, Denmark, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Poland, Romania, Slovakia, Slovenia, Turkey, PRAD for all other countries that are member states of the Eurpean Patent Organisation										

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		* note on International Procedure: once countries are designated, use STC for US, SCL for Canada, SPS for France, Austria, Spain, Portugal, SHL for Japan, NL, UK and Saudi Arabia, STBV for Albania, Argentina, Australia, Azerbaijan, Brunei, Bulgaria, Colombia, Czech Republic, Denmark, Faroe Islands, Germany, Greece, Hungary, Indonesia, Ireland, Israel, Italy, Kazakhstan, Korea, Kuweit, Lithuania, Malaysia, Mexico, New Zealand, Norway, Oman, Pakistan, Poland, Quatar, Romania, Russia, Slovenia, Slovakia, South Africa, Thailand, Trinidad, Tunisia, Turkey, Turkmenistan, Ukraine, Uzbekistan, Venezuela, and PRAD for all other countries					

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SOFITECH	21.1005	AR	STBV	NP	PUBLICATION	21/JAN/2004	23/JAN/2002	P020100227	21/JAN/2004	AR034016A1		
SOFITECH	22.1449	MX	STBV	NP	FILING	16/APR/2002	16/APR/2002	PA/a/2002/003803				
SOFITECH	25.0189	AU	STBV	NP	PUBLICATION	31/MAY/2007	01/AUG/2002	2002300367	31/MAY/2007	2002300367		
SOFITECH	25.0189	SA	STBV	NP	GRANTED	29/OCT/2006	03/AUG/2002	02 23 0231			29/OCT/2006	1478
SOFITECH	25.0198	GC	STBV	NP	FILING	31/MAR/2003	31/MAR/2003	GCC/P/2003/2576				
SOFITECH	25.0200	AU	STBV	NP	FILING	29/JUL/2003	29/JUL/2003	2003227338	27/JAN/2005			
PUMP TECHS	55.0091	NO	STBV	NP	GRANTED	29/MAR/1995	27/NOV/1987	87.4957			29/MAR/1995	176.402
PUMP TECHS	55.0120	NO	STBV	NP	GRANTED	05/FEB/1997	20/DEC/1989	89.5151	22/JUN/1990	895151	05/FEB/1997	180.056
PUMP TECHS	55.0132	NO	STBV	NP	GRANTED	24/NOV/1997	06/MAR/1991	91.0884			24/NOV/1997	301.658
PUMP TECHS	55.0135	NO	STBV	NP	GRANTED	06/JUL/1998	28/NOV/1991	91.4691			06/JUL/1998	303.413
PUMP TECHS	55.0149	VE	STBV	NP	GRANTED	05/JAN/1996	26/FEB/1993	276/93	01/NOV/1994	276/93	05/JAN/1996	54.912
PUMP TECHS	55.0154	NO	STBV	NP	PUBLICATION	12/SEP/1994	09/MAR/1994	94 0826	12/SEP/1994	94 0826	21/MAY/2002	312.508
PUMP TECHS	55.0159	NO	STBV	NP	GRANTED	10/APR/2000	19/AUG/1993	93.2955			10/APR/2000	307.468
SOFITECH	55.0161	AU	STBV	NP	GRANTED	21/DEC/1995	19/APR/1994	60529/94			21/DEC/1995	665306
SOFITECH	55.0161	NO	STBV	NP	GRANTED	05/APR/2005	20/APR/1994	94.1439			05/APR/2005	318.436
SOFITECH	55.0162	AU	STBV	NP	GRANTED	20/MAY/1996	19/APR/1994	60530/94	27/OCT/1994		20/MAY/1996	666261
SOFITECH	55.0162	ID	STBV	NP	PUBLICATION	12/JAN/1995	19/APR/1994	P-940579	12/JAN/1995	007.755 A		
SOFITECH	55.0162	NO	STBV	NP	GRANTED	17/FEB/2003	20/APR/1994	94.1440			17/FEB/2003	314.233
SOFITECH	55.0162	VE	STBV	NP	GRANTED	07/MAR/1997	16/MAY/1994	677-94			07/MAR/1997	56.062
SOFITECH	55.0163	NO	STBV	NP	GRANTED	08/JUL/2002	07/OCT/1994	94.3810			08/JUL/2002	312.845
SOFITECH	55.0169	AR	STBV	NP	GRANTED	04/JUL/2003	12/JUN/1996	P 96 01 03116			04/JUL/2003	AR004941B1
SOFITECH	55.0169	ID	STBV	NP	GRANTED	14/JUN/2005	13/JUN/1996	P-961676	11/DEC/1997	017,225	14/JUN/2005	P-961676
SOFITECH	55.0169	MX	STBV	NP	GRANTED	23/JUL/2002	12/JUN/1996	962298			23/JUL/2002	209129
SOFITECH	55.0169	NO	STBV	NP	GRANTED	13/DEC/2004	12/JUN/1996	962474			13/DEC/2004	19962474
SOFITECH	55.0169	TH	STBV	NP	FILING	28/MAY/1996	28/MAY/1996	031596	10/JUN/1997	25515		
SOFITECH	55.0169	VE	STBV	NP	GRANTED	19/NOV/2001	11/JUN/1996	1071-96			19/NOV/2001	58.548
SOFITECH	55.0175	NO	STBV	NP	GRANTED	27/MAY/2002	19/MAR/1996	96.1120			27/MAY/2002	312561
SOFITECH	55.0185	AR	STBV	NP	PUBLICATION	03/MAY/2004	11/FEB/1998	P 98 01 00599	03/MAY/2004	AR011662B1	03/MAY/2004	AR011662B1
SOFITECH	55.0185	VE	STBV	NP	GRANTED	23/SEP/2002	12/FEB/1998	270/98	07/JUL/2000	NO. 440	23/SEP/2002	59.008
SOFITECH	55.0190	AR	STBV	NP	FILING	13/NOV/1998	13/NOV/1998	P98 01 05766				
SOFITECH	55.0190	DE	STBV	NP	GRANTED	26/OCT/2000	24/NOV/1997	197 52 093.6			26/OCT/2000	197 52 093.6
SOFITECH	55.0190	VE	STBV	NP	FILING	24/NOV/1998	24/NOV/1998	2659-98				
SOFITECH	55.0195	TN	STBV	NP	GRANTED	17/FEB/2002	02/NOV/1998	SN 98198			17/FEB/2002	17459
SOFITECH	55.0202	VE	STBV	NP	FILING	06/DEC/1999	06/DEC/1999	2618-99				
SOFITECH	55.0204	GC	STBV	NP	FILING	09/AUG/2000	09/AUG/2000	GCC/P/2000/804				
SOFITECH	55.0204	VE	STBV	NP	FILING	03/FEB/2000	03/FEB/2000	388-2000				
SOFITECH	55.0208	GC	STBV	NP	GRANTED	29/JUN/2005	26/JUL/2000	GCC/P/2000/774	18/APR/2004	4/688	29/JUN/2005	GC0000135
SOFITECH	55.0209	CO	STBV	NP	GRANTED	26/DEC/2005	06/OCT/2000	000-76102	30/MAY/2002	000-76102	26/DEC/2005	28.459
SOFITECH	55.0209	VE	STBV	NP	FILING	05/OCT/2000	05/OCT/2000	2227-2000				
SOFITECH	55.0214	MY	STBV	NP	GRANTED	31/MAY/2006	26/FEB/2001	PI20010839			31/MAY/2006	MY-127831-A
SOFITECH N.V.	55.0214	TH	STBV	NP	FILING	23/FEB/2001	23/FEB/2001	063763				
SOFITECH	55.0215	TH	STBV	NP	FILING	14/MAR/2001	14/MAR/2001	64245				
SOFITECH	55.0215	VE	STBV	NP	FILING	19/MAR/2001	19/MAR/2001	624-2001				
SOFITECH	55.0220	GC	STBV	NP	FILING	10/NOV/2001	10/NOV/2001	GCC/P/2001/1717				
SOFITECH	55.0224	GC	STBV	NP	FILING	27/NOV/2001	27/NOV/2001	GCC/P/2001/1753				
PUMP TECHS	56.0312	ID	STBV	NP	GRANTED	15/APR/2003	05/APR/1994	P-940514			15/APR/2003	ID 0 010 459
SOFITECH	56.0312	MY	STBV	NP	GRANTED	29/DEC/2006	10/OCT/1996	PI 96004194			29/DEC/2006	MY-127831-A
PUMP TECHS	56.0312	NO	STBV	NP	GRANTED	27/AUG/2001	30/MAR/1994	19941182			27/AUG/2001	330.787
SOFITECH	56.0312	VE	STBV	NP	GRANTED	28/SEP/2000	14/NOV/1996	1945/96			28/SEP/2000	58.081
PUMP TECHS	56.0324	NO	STBV	NP	GRANTED	12/FEB/2001	13/MAY/1994	19941811			12/FEB/2001	309.536

SOFITECH	56.0350	AR	STBV	NP	GRANTED	11/JUL/2003	03/APR/1996	336.047			11/JUL/2003	AR001520B1
SOFITECH	56.0350	NO	STBV	NP	GRANTED	30/JAN/2006	27/JUL/1995	19952967			30/JAN/2006	320.814
SOFITECH	56.0350	VE	STBV	NP	GRANTED	10/SEP/1999	18/SEP/1995	1639-95			10/SEP/1999	1639-95
SOFITECH	56.0362	ID	STBV	NP	GRANTED	22/SEP/2006	08/JAN/1996	P-960038			22/SEP/2006	P-960038
SOFITECH	56.0417	AR	STBV	NP	GRANTED	19/NOV/2003	07/OCT/1997	P970104636			19/NOV/2003	AR011245B1
SOFITECH	56.0417	NO	STBV	NP	FILING	08/OCT/1997	08/OCT/1997	19974645				
SOFITECH	56.0417	VE	STBV	NP	FILING	08/OCT/1997	08/OCT/1997	2038/97				
SOFITECH	56.0424	AR	STBV	NP	GRANTED	20/DEC/2005	28/MAY/1998	P/98/01/02491	30/APR/2001		20/DEC/2005	AR012881B1
SOFITECH	56.0424	AU	STBV	NP	GRANTED	16/AUG/2001	07/JUL/1998	732925			16/AUG/2001	732925
SOFITECH	56.0424	ID	STBV	NP	GRANTED	16/SEP/2002	09/JUL/1998	P980968			16/SEP/2002	ID 0 008 850
SOFITECH	56.0428	NO	STBV	NP	GRANTED	28/JUN/2004	26/MAY/1998	19982371			28/JUN/2004	316930
SOFITECH	56.0503	AR	STBV	NP	FILING	04/APR/2001	04/APR/2001	P01 01 01605				
SOFITECH	56.0503	GC	STBV	NP	FILING	03/APR/2001	03/APR/2001	GCC/P/2001/1268				
SOFITECH	56.0503	TH	STBV	NP	PUBLICATION	22/NOV/2002	03/APR/2001	064804	22/NOV/2002	54016		
SOFITECH	56.0503	VE	STBV	NP	PUBLICATION	01/SEP/2003	04/APR/2001	2001-000724	01/SEP/2003	2001-000724		
SOFITECH	56.0505	VE	STBV	NP	PUBLICATION	10/NOV/2003	04/JUL/2001	2001-001432	10/NOV/2003	2001-001432		
SOFITECH	56.0509	GC	STBV	NP	FILING	15/OCT/2003	15/OCT/2003	GCC/P/2003/2976				
SOFITECH	56.0522	CO	STBV	NP	PUBLICATION	30/MAY/2003	27/SEP/2000	00073260	30/MAY/2003	00073260		
SOFITECH	56.0522	GC	STBV	NP	GRANTED	29/MAR/2006	27/SEP/2000	GCC/P/2000/920			29/MAR/2006	GC 0000204
SOFITECH	56.0522	VE	STBV	NP	FILING	15/AUG/2000	15/AUG/2000	2000-002151				
SOFITECH	56.0525	GC	STBV	NP	FILING	15/OCT/2000	15/OCT/2000	GCC/P/2000/956				
SOFITECH	56.0525	VE	STBV	NP	PUBLICATION	11/NOV/2002	28/AUG/2000	2000-002308	11/NOV/2002	2000-002308		
SOFITECH	56.0527	GC	STBV	NP	FILING	29/APR/2001	29/APR/2001	GCC/P/2001/1328				
SOFITECH	56.0531	GC	STBV	NP	FILING	14/JUN/2000	14/JUN/2000	GCC/P/2000/718				
SOFITECH	56.0531	VE	STBV	NP	PUBLICATION	11/NOV/2002	20/JUL/2000	2000-002267	11/NOV/2002	2000-002267		
SOFITECH	56.0554	VE	STBV	NP	PUBLICATION	26/MAY/2003	13/FEB/2001	2001-000319	26/MAY/2003	2001-000319		
SOFITECH	56.0555	AU	STBV	NP	08/JAN/2004	06/MAR/2002	21299/02			08/JAN/2004	768819	
SOFITECH	56.0555	ID	STBV	GRANTED	14/JUN/2004	28/NOV/2002	W-			14/JUN/2004	ID 0 013 613	
SOFITECH	56.0559	VE	STBV	NP	PUBLICATION	01/SEP/2003	04/MAY/2001	2001-000952	01/SEP/2003	2001-000952		
SOFITECH	56.0569	GC	STBV	NP	FILING	18/MAR/2002	18/MAR/2002	GCC/P/2002/1912				
SOFITECH	56.0569	VE	STBV	NP	FILING	01/MAR/2002	01/MAR/2002	2002-000356				
SOFITECH	56.0603	GC	STBV	NP	FILING	12/FEB/2002	12/FEB/2002	GCC/P/2002/1858				
SOFITECH	56.0609	SA	STBV	NP	GRANTED	14/NOV/2006	12/NOV/2001	01220520			14/NOV/2006	1579
SOFITECH	56.0609	VE	STBV	NP	PUBLICATION	12/JAN/2004	19/SEP/2001	2001-001987	12/JAN/2004	2001-001987		
SOFITECH	56.0616	GC	STBV	NP	FILING	28/JUN/2003	28/JUN/2003	GCC/P/2003/2746				
SOFITECH	56.0621	GC	STBV	NP	FILING	13/MAY/2002	13/MAY/2002	GCC/P/2002/1989				
SOFITECH	56.0621	VE	STBV	NP	FILING	15/MAY/2002	15/MAY/2002	2002-000864				
SOFITECH	56.0623	ID	STBV	NP	GRANTED	18/MAY/2006	12/MAR/2002	P-00200200127	12/SEP/2002	033881	18/MAY/2006	P-00200200127
SOFITECH	56.0629	VE	STBV	NP	PUBLICATION	02/JUN/2005	23/JUL/2002	2002-001415	02/JUN/2005	2002-001415		
SOFITECH	56.0630	GC	STBV	NP	FILING	14/DEC/2002	14/DEC/2002	GCC/P/2002/2388				
SOFITECH	56.0633	GC	STBV	NP	FILING	16/DEC/2003	16/DEC/2003	GCC/P/2003/3105				
SOFITECH	56.0634	GC	STBV	NP	FILING	11/JUN/2003	11/JUN/2003	GCC/P/2003/2711				
SOFITECH	56.0638	VE	STBV	NP	FILING	11/SEP/2002	11/SEP/2002	2002-001783				
SOFITECH	56.0639	VE	STBV	NP	PUBLICATION	02/JUN/2005	20/SEP/2002	2002-001832	02/JUN/2005	2002-001832		
SOFITECH	56.0647	GC	STBV	NP	FILING	13/OCT/2002	13/OCT/2002	GCC/P/2002/2266				
SOFITECH	56.0649	GC	STBV	NP	FILING	04/OCT/2003	04/OCT/2003	GCC/P/2003/2948				
SOFITECH	56.0651	GC	STBV	NP	FILING	29/JUL/2002	29/JUL/2002	GCC/P/2002/2149				
SOFITECH	56.0651	VE	STBV	NP	PUBLICATION	02/JUN/2005	25/JUL/2002	2002-001430	02/JUN/2005	2002-001430		
SOFITECH	56.0652	GC	STBV	NP	FILING	14/DEC/2002	14/DEC/2002	GCC/P/2002/2375				
SOFITECH	56.0659	GC	STBV	NP	FILING	15/JUN/2003	15/JUN/2003	GCC/P/2003/2714				
SOFITECH	56.0659	VE	STBV	NP	PUBLICATION	17/APR/2006	04/JUL/2003	2003-001134	17/APR/2006	2003-001134		

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Bogotá D.C. Colombia.
27 JUN 2008
GUSTAVO SAMPER RODRIGUEZ
NOTARIO VEINTISEIS

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SOFITECH	56.0675	GC	STBV	NP	FILING	24/MAY/2003	24/MAY/2003	GCC/P/2003/2668				
SOFITECH	56.0675	VE	STBV	NP	PUBLICATION	20/DEC/2005	27/MAY/2003	2003-000842	20/DEC/2005	2003-000842		
SOFITECH	56.0698	GC	STBV	NP	FILING	16/SEP/2003	16/SEP/2003	GCC/P/2003/2904				
SOFITECH	56.0708	GC	STBV	NP	FILING	28/OCT/2003	28/OCT/2003	GCC/P/2003/2996				
SOFITECH	56.0710	GC	STBV	NP	FILING	26/JAN/2004	26/JAN/2004	GCC/P/2004/3190				
SOFITECH	56.0714	GC	STBV	NP	FILING	18/NOV/2003	18/NOV/2003	GCC/P/2003/3047				
SOFITECH	56.0720	GC	STBV	NP	FILING	20/APR/2004	20/APR/2004	GCC/P/2004/3401				
SOFITECH	56.0720	TH	STBV	NP	FILING	19/APR/2004	19/APR/2004	090260	26/JUL/2005	69759		
SOFITECH	56.0748	GC	STBV	NP	FILING	03/DEC/2003	03/DEC/2003	GCC/P/2003/3068				
SOFITECH	56.0758	GC	STBV	NP	FILING	28/OCT/2003	28/OCT/2003	GCC/P/2003/2997				
SOFITECH	57.0151	VE	STBV	NP	GRANTED	03/MAR/1998	13/JUL/1994	1009/94	09/FEB/1996		03/MAR/1998	56.481
SOFITECH	57.0236	NO	STBV	NP	GRANTED	05/JAN/2004	22/MAY/1998	98.2338			05/JAN/2004	316287
SOFITECH	57.0245	NO	STBV	NP	FILING	31/OCT/1997	31/OCT/1997	97.5040				
SOFITECH	57.0268	NO	STBV	NP	FILING	11/DEC/1998	11/DEC/1998	1998.5826				
SOFITECH	57.0271	NO	STBV	NP	FILING	11/DEC/1998	11/DEC/1998	1998.5828				
SOFITECH	57.0279	NO	STBV	NP	FILING	11/DEC/1998	11/DEC/1998	1998.5827				
SOFITECH	57.0365	GC	STBV	NP	FILING	05/AUG/2001	05/AUG/2001	GCC/P/2001/1554				
SOFITECH	21.1149/21.1150	GC	STBV	NP	FILING	07/SEP/2004	07/SEP/2004	GCC/P/2004/3789				
SOFITECH	56.0546CIP1	GC	STBV	NP	FILING	16/OCT/2002	16/OCT/2002	GCC/P/2002/2274				
SOFITECH	56.0546CIP1	MX	STBV	NP	FILING	16/OCT/2002	16/OCT/2002	PA/a/2002/010206				

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27 JUN 2008

GUSTAVO SAMPER RODRIGUEZ
NOTARIO VEINTISEIS

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CORNELIO NIEMAN TRADUCTOR OFICIAL RESOLUCION 5455, NOV5,82

TRADUCCION OFICIAL
DE LEGALIZACIONES
DEL HOLANDES AL INGLES
PERTENECIENTES A DOCUMENTOS DE SCHLUMBERGER TECHNOLOGY B.V.

Visto para legalización de la firma de Mr. A.J.van der Linden
por Presidente de la Corte del Distrito de La Haya
el 09 OCT 2000
lleva firma y sello

Visto para legalización de mr. A.H. van Delden
Presidente de la Corte del Distrito La Haya
El Ministro de Justicia, en nombre del Ministro,
Jefe de la dirección Manejo y Apoyo
Departamento Administrativo
para el, firma y sello 10 oct 2000

Visto para legalización de la firma de PNA de Raad
La Haya 10 oct 2000
El Ministro de Relaciones Exteriores para el,
firma Sra I.S. IJserinkhuijsen
fl 20,=
Lleva Certificación Consul de Colombia en La Haya Holanda
de fecha 27 Octubre 2000 firmado por Carlos ABONDANO B
con no. 263 sello seco
Lleva sello Ministerio de Relaciones Exteriores, Jefe
Legalizaciones, Bogotá de fecha 2000 NOV 9 con no. 468464
firmado

NO SE ASUME RESPONSABILIDAD DEL TEXTO
2001 MAY -8 A 11:1
JEFE DE LEGALIZACIONES SANTAFE DE BOGOTA D.C.

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27 JUN 2008
GUSTAVO SAMPER RODRIGUEZ
NOTARIO VEINTISEIS

MINISTERIO DE RELACIONES EXTERIORES
132579
CUYA FIRMA APARECE EN EL DOCUMENTO DESEAPEÑA LAS FUNCIONES INDICADAS

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27 JUN 2008
GUSTAVO SAMPER RODRIGUEZ
NOTARIO VEINTISEIS

Castillo Grau & Associates

LAW OFFICES
P.O. BOX 251473
BOGOTA, COLOMBIA

FOR PATENTS AND TRADE MARKS IN

COLOMBIA

PODER GENERAL

(1). SCHLUMBERGER TECHNOLOGY B.V.

domiciliado en (2). La Haya, Holanda

nombra al Dr. (3) German Castillo Grau y/o Adriana Castillo Gibsone y/o Luis Felipe Castillo Gibsone. . . .

. . . . . con oficinas en la Carrera 13 No. 37 -43 Piso 12 en Bogotá, Colombia como sus representantes con poder especial amplio y suficiente, para recabar de las oficinas y autoridades Colombianas, administrativas, judiciales o de policía, en primera o segunda instancia, la obtención de Patentes de Invención, Registro de Marcas, de Modelos y de Dibujos Industriales, de Nombres Comerciales y Enseñas, lo mismo que traspasos, extensiones, renovaciones, cambios de nombre, registro de licencias de explotación y registro de licencias de uso referentes a tales actuaciones, a cuyo efecto les faculta para dar ante dichas autoridades todos los pasos necesarios al objeto indicado, elevar solicitudes, formular descripciones, enmiendas, protestas, declaraciones, apelaciones y reclamos, solicitar la aplicación de medidas cautelares, aceptar en nuestro nombre y representación la Cesión de derechos de invención y de patente de invención que se nos haga por cualquier persona, abonar todos los impuestos, cuotas y pagos determinados por la ley, recibir todos los documentos y valores dando el descargo respectivo, llenar cualesquiera otros requisitos, desistir y tomar en fin todas las medidas que creyeren conducentes al resguardo de nuestros intereses y en caso de presentarse oposiciones para que intervengan como demandantes o como demandados, con todas las demás facultades legales necesarias. Este poder comprende además las facultades de recibir, desistir, transigir, comprometer, sustituir, revocar sustituciones, recibir notificaciones y nombrar apoderados judiciales o extra-judiciales.

Dado y firmado en (4) Octubre 2, 2000

(5) . . . . . .

Corporate Seal to be affixed . . . . . .

GENERAL POWER OF ATTORNEY

(1). SCHLUMBERGER TECHNOLOGY B.V.

domiciled in (2). PARKSTRAAT 83-89 2514 VG THE HAGUE THE NETHERLANDS

hereby appoint Dr. (3) German Castillo Grau and/or Adriana Castillo Gibsone and/or Luis Felipe Castillo Gibsone . . . . . .

. . . . . With offices at Carrera 13 No. 37 -43 Piso 12 en Bogotá, Colombia as our representatives with special, ample and sufficient power to obtain from the offices and Colombian authorities, administrative, judicial and police, in first or in second instance, Patents of Invention, registration of trade Marks, of Models and Industrial Drawings, of Commercial Names and ensigns, as well as assignments, extensions, renewals, changes of name, registration of licences of explotation and of licences of use refering to said actions who are empowered to take before said authorities all of the necesary steps for the purposes indicated, to file applications, to formulate descriptions, corrections, protests, declarations, appeals and claims, apply for precautionary measures, to accept on our behalf and representation the assignment of rights of invention and titles of invention that may be done to us by any person, to pay all taxes, quotas and payments prescribed by law, to receive all the documents and proceeds giving the respective acquitance or receipt; to fulfill any other requisites to desist and take in fact any other measures that may be deemed conducive to the safeguard of our interests, and in case oppositions are presented to interevene as complainant and defendant, with all neccesary legal faculties. This power of attorney includes the faculties to receive, desist, compromise, transact, substitute it in all or in part, to revoke substitutions, to receive notifications and to appoint extra-judicial or judicial attorneys.

Given and signed in (4) 2 OCTOBER 2000

Como Notario Veintiséis del Circulo de Bogotá, hago constar que esta copia coincide con original que se ha presentado
Bogotá D.C. - Colombia.
27 JUN 2008
GUSTAVO SAMPER RODRIGUEZ
NOTARIO VEINTISEIS

La declaración Notarial a la vuelta.
Notarial acknowledgement on other side.

1 Applicant's name

2 Applicant's Address

Leave blank

4 Date

5 Applicant's signature

The applicant's signature must be attested by a Notary Public through the NOTARIAL CERTIFICATE: in the "(Individual)", when the signer is a natural person; and in the "(Corporations)", when is a legal one. The Notary's signature must then be legalized by a Colombian Consular Officer.

La firma del solicitante debe ser atestada por un Notario Público por medio de la DECLARACION NOTARIAL: en la "(Individual)", cuando el firmante es una persona natural; y en la de "(Sociedades)", cuando es una persona jurídica. La firma del notario deberá ser legalizada por el Consulado Colombiano.

DECLARACION NOTARIAL

(Individual)

A los . . . . días del mes . . . . . de 19 . . . . compareci . . . . personalmente ante mí, Notario Público . . . . . .

. . . . . .

a quien(es) doy fé de conocer y me consta que es (son) la(s) persona(s) descritas y firmante(s) del documento que precede, declarando ante mí que otorga(n) el mismo para los fines y propósitos que en él se expresan.

El Notario Público,

NOTARIAL CERTIFICATE

(Individual)

On this. . . .day of. . . . . personally appeared before me, a Notary Public . . . . . .

to me known, and known to me be the person(s) described in and who executed the foregoing document, and he (they) duly acknowledged to me that he (they) executed same for the uses and purposes therein expresed.

Notary Public

. . . . . .

(Sociedades)

El infrascrito Notario Certifica: que la firma que antecede y dice . . . . . .
Abraham Rutger Verburg . . . . . .
. . . . . .
es auténtica; que el signatario desempeña actualmente el cargo de Director . . . .
Gerente . . . . . .
de SCHLUMBERGER TECHNOLOGY . .
B.V. . . . . .
que tiene facultad para otorgar este poder; y que dicha compañia está domiciliada en . . .
La Haya, Holanda . . . . . .
y actualmete existe y está organizada de acuerdo a las leyes de Holanda . . . . .
. . . . . .
Todos los hechos anteriores le constan por haber examinado los documentos respectivos y de todo ello da fé.

Dado y firmado en . . . La Haya, ...
Holanda . . . . . .

El Notario Público

(Corporations)

The undersigned Notary Public certifies; that the preceding signature reading . Abraham Rutger Verburg . . . . . .
. . . . . .
is authentic; that the signor at present fills the post of . managing director . . . . . .
. . . . . .
of Schlumberger . . . . . .
Technology B.V. . . . . .
and that he is empowered to grant this power; and that said company is domicilied in . . . . . .
The Hague, The . . . . . .
Netherlands . . . . . .
and actually exists and is organized in accordance with the laws of . . . The . . . . . .
. . . . Netherlands . . . . . .
all the foregoing facts are known to the Notary due to his having examined the respetive documents to which he, the Notary attests

Granted and signed in . The Hague, ...
The Netherlands . . .

Notary Public

Mr A.J. van der LINDEN
Notaris te 's-Gravenhage

. . . . . .

(Con legalización Consular)

(With Consular legalization)

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Bogotá D.C. - Colombia.
27 JUN 2008
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Gezien voor legalisatie der handtekening
van mr. A.J. van der Linden
door Ons President van de Arrondissements-
rechtbank te 's-Gravenhage, de 9 OKT. 2000

President Arrondissements-Rechtbank 's-Gravenhage

Gezien voor legalisatie van de handtekening
van dhr/mw ..... F.M.A. de Kroad .....

's-Gravenhage, 10 OKT 2000

De Minister van
Buitenlandse Zaken
voor deze,

mw I.S. IJserinkhuijsen

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van mr. A.H. van Delden
President van de Arrondissementsrechtbank te Den Haag
's-Gravenhage
De Minister van Justitie, 10 OKT. 2000
namens de minister,
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El suscrito Cónsul de Colombia (E) en La Haya, Holanda,
vistos los documentos presentados por los interesados,

CERTIFICA:

Que el Señor **A.J. VAN DER LINDEN**, quien como Notario Público de La Haya, Países Bajos, autenticó la firma del signatario del poder precedente, ejercía en la fecha las funciones indicadas, y su firma corresponde a la registrada en este Consulado.

Que la Compañía **SCHLUMBERGER TECHNOLOGY B.V.** es una Sociedad constituída de acuerdo con las leyes de los Países Bajos, cumple su objeto conforme a las mismas y se halla registrada en la Cámara de Comercio y Fábricas de La Haya, Haaglanden, bajo el número **27101455**;

Que el Señor **Abraham Rutger VERBURG,** signatario del presente documento, quien en su carácter de Director de la Empresa **SCHLUMBERGER TECHNOLOGY B.V.** tiene facultad para ello y cuya firma fue autenticada ante el Notario Público de La Haya, el Señor **A.J. VAN DER LINDEN,** es el representante legal de la citada Empresa en este país.

El Cónsul de Colombia (E) en La Haya, Países Bajos, no asume responsabilidad alguna por el contenido del documento.

Esta certificación se expide en La Haya, Países Bajos, a los veintisiete (27) días del mes de Octubre de dos mil (2000).

Impuesto de Timbre	US$	7.00.
Derechos Consulares	US$.	100.00
Costo Total Pagado	US$.	107.00

Certificación No. **263**

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CONSUL DE COLOMBIA (E)
LA HAYA

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NOTARIA VEINTISEIS

MINISTERIO DE RELACIONES EXTERIORES

DOCUMENTO PARA ANEXAR AL

LAS FOLIOS

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Carlos Arturo Mendoza

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EN BLANCO
NOTARIA VEINTISEIS

US005551516A

United States Patent [19]

Norman et al.

[11] Patent Number: 5,551,516

[45] Date of Patent: Sep. 3, 1996

[54] **HYDRAULIC FRACTURING PROCESS AND COMPOSITIONS**

[75] Inventors: **William D. Norman**, Lafayette, La.; **Raymond J. Jasinski**, Tulsa; **Erik B. Nelson**, Broken Arrow, both of Okla.

[73] Assignee: **Dowell, a division of Schlumberger Technology Corporation**

[21] Appl. No.: **389,857**

[22] Filed: **Feb. 17, 1995**

[51] **Int. Cl.**[6] **E21B 43/269**

[52] **U.S. Cl.** **166/308**; 507/239; 507/244; 507/922

[58] **Field of Search** 166/308; 507/239, 507/240, 244, 922

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,760,881	9/1973	Kiel	166/308
4,061,580	12/1977	Jahnke	507/922 X
4,615,825	10/1986	Teot et al.	507/239 X
4,725,372	2/1988	Teot et al.	507/922 X
5,258,137	11/1993	Bonekamp et al.	507/240 X
5,310,002	5/1994	Blauch et al.	166/308 X

Primary Examiner—George A. Suchfield
Attorney, Agent, or Firm—John E. Vick, Jr.

[57] **ABSTRACT**

Viscoelastic surfactant based aqueous fluid systems are described that are useful in fracturing subterranean formations penetrated by a wellbore. The preferred thickening agents are quaternary ammonium halide salts derived from certain waxes, fats and oils. The thickening agent is used in conjunction with an inorganic water soluble salt such as ammonium chloride or potassium chloride, and an organic stabilizing additive selected from the group of organic salts such as sodium salicylate. The resulting fluids are stable to a fluid temperature of about 225° F.

6 Claims, No Drawings

HYDRAULIC FRACTURING PROCESS AND COMPOSITIONS

This invention relates to the art of fracturing a subterranean formation penetrated by a wellbore. The invention pertains specifically to the use of aqueous viscoelastic surfactant based fluids as hydraulic fracturing fluids, particularly in formations having high temperature and high permeability.

BACKGROUND OF THE INVENTION

Hydraulic fracturing is a term that has been applied to a variety of methods used to stimulate the production of fluids such as oil, natural gas, brines, etc., from subterranean formations. In hydraulic fracturing, a fracturing fluid is injected through a wellbore and against the face of the formation at a pressure and flow rate at least sufficient to overcome the overburden pressure and to initiate and/or extend a fracture(s) into the formation. The fracturing fluid usually carries a proppant such as 20–40 mesh sand, bauxite, glass beads, etc., suspended in the fracturing fluid and transported into a fracture. The proppant then keeps the formation from closing back down upon itself when the pressure is released. The proppant filled fractures provide permeable channels through which the formation fluids can flow to the wellbore and thereafter be withdrawn.

Hydraulic fracturing has been used for many years as a stimulation technique and extensive work has been done to solve problems present at each stage of the process. For example, a fracturing fluid is often exposed to high temperatures and/or high pump rates and shear which can cause the fluids to degrade and to prematurely "drop" the proppant before the fracturing operation is completed. Considerable effort has, therefore, been spent trying to design fluids that will satisfactorily meet these rigorous conditions.

High permeability formations such as those having permeabilities in excess of 50 millidarcy and particularly in excess of 200 millidarcy, present special challenges, especially when the reservoir temperature is above 130° F. In these situations, the amount of fluid lost to the formation can be very high, resulting in increased damage and decreased fracture length. Further, the difference in permeability between the formation and the fracture is less than that realized in less permeable formations. Improved fracture cleanup is therefore necessary in order to maximize well productivity.

A wide variety of fluids has been developed, but most of the fracturing fluids used today are aqueous based liquids which have been either gelled or foamed. These fluids have typically been engineered for use in low permeability formations and are generally not well suited for use in higher permeability formations.

Aqueous gels are usually prepared by blending a polymeric gelling agent with an aqueous medium. Most frequently, the polymeric gelling agent of choice is a solvatable polysaccharide. These solvatable polysaccharides form a known class of compounds which include a variety of natural gums as well as certain cellulosic derivatives which have been rendered hydratable by virtue of hydrophilic substituents chemically attached to the cellulose backbone. The solvatable polysaccharides therefore include galactomannan gums, glycomannan gums, cellulose derivatives, and the like.

The solvatable polysaccharides have a remarkable capacity to thicken aqueous liquids, small amounts of these materials being sufficient to increase the viscosity of such aqueous liquids from 10 to 100 times or more. In some instances, the aqueous liquid thickened with polymers alone has sufficient viscosity to suspend the proppant during the course of the fracturing process and represents a satisfactory fracturing fluid. In other instances, principally in higher temperature applications, however, it is necessary to crosslink the polysaccharide in order to form a gel having sufficient strength and viscosity to retain the proppant in suspension throughout the pumping operation and placement in the subterranean formation. A variety of crosslinkers has been developed to achieve this result within different pH ranges.

The borate ion has been used extensively as a crosslinking agent for hydrated guar gums and other galactomannans to form aqueous gels used in fracturing and other areas. For example, U.S. Pat. No. 3,059,909 describes a crosslinked system which has been used extensively in the oil and gas industry as a fracturing fluid. A fracturing process which comprised crosslinking guar-containing compositions on-the-fly with a borate crosslinker is described in U.S. Pat No. 3,974,077. The borate crosslinked systems require a basic pH (e.g., 8.5 to 10) for crosslinking to occur. Borate crosslinked guar fluids, particularly fluids using less than 30 pounds guar per 1000 gallons of fluid have been used successfully in higher permeability formations up to a temperature of about 275° F. With increased guar loadings, such fluids can be effective up to a temperature of about 350° F.

Other crosslinking agents have been developed using certain transition metals. U.S. Pat No. 3,202,556, describes aqueous solutions of galactomannan gums which are crosslinked at a pH of from 5 to 13 with antimony or bismuth crosslinkers. U.S. Pat. No. 3,301,723, describes the use of certain titanium, zirconium, and other transition metals as crosslinking agents for galactomannans at a pH also in the range of from about 6 to about 13. In these patents, a basic pH is used to prepare crosslinked materials having utility in the explosives industry.

U.S. Pat. No. 3,888,312 describes the use of titanium crosslinkers with solvatable polysaccharides in fracturing fluids. The use of such crosslinked gels may act to overcome the high friction loss experienced during the pumping of many high-viscosity fracturing fluids previously known. U.S. Pat No. 3,301,723, also points out that crosslinked gels formed using titanium, chromium, iron and zirconium crosslinkers have a high surface tension i.e., stickiness and tackiness are absent, ready workability and other desirable physical characteristics.

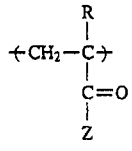
A disadvantage associated with the above systems is related to the use of guar or guar derivatives as thickening agents. Such polymers are derived from natural sources, and usually contain insoluble materials that tend to remain in the formation or fracture after the fracturing treatment, and reduce the permeability of the formation or the fracture. Damage to the formation can be particularly important when the formation permeability exceeds about 100 mD. In such cases, whole fluid can penetrate the rock and fill the pore spaces. To minimize this problem, fracturing fluids have been developed that leave little or no residue.

Typical low-residue fluid systems comprise linear solutions of hydroxyethylcellulose (HEC). Like guar polymers, HEC is derived from natural sources; however, highly refined material is commercially available that is virtually free of insolubles. A potential problem with HEC is the formation of large incompletely hydrated lumps, also

referred to as "fish eyes", and/or microgels during mixing. These insoluble materials result from poor dispersion of the HEC before the particles begin to hydrate, and the impact on formation and fracture permeability is as deleterious as the insoluble residue from guar polymers. In an attempt to avoid this problem, HEC fluids must commonly be sheared and filtered at the wellsite prior to pumping, thereby adding complexity and cost to its use, although this procedure is not 100% successful in addressing the problem.

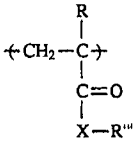
The use of HEC-based fluids in fracturing applications is limited to use at formation temperatures of about 130° to about 150° F. As the temperature increases, the viscosity of these fluids decreases to nearly that of water, even for solutions having HEC loadings of 80 to 120 pounds per 1000 gallons of fluid. Above about 150° F., the high leakoff rate inhibits or even prohibits the extension of the fracture. this is especially true in high permeability formations. As a result of the high HEC polymer loadings, large amounts of polymer are deposited in the formation which impair well productivity.

A different class of thickeners is described in U.S. Pat. No. 4,432,881, and identified as a superior fracturing fluid in U.S. Pat. No. 4,541,935. The thickener composition comprises a water soluble or water dispersible interpolymer having pendant hydrophobic groups chemically bonded thereto. When mixed with a water soluble or water dispersible nonionic surfactant, and a soluble electrolyte, a viscosified fluid stable to high temperature and/or shear is obtained. No problems with fish eyes or microgels are encountered, and conventional field mixing equipment can be used. The preferred interpolymers are vinyl addition polymers in which two or more vinyl monomers with ethylenic unsaturation are reacted together under polymerization conditions. Of these, polymers containing at least one of the water soluble monomers represented by Formula 1 or Formula 2 are preferred.



(1)

R is hydrogen or methyl and Z is $-NH_2$, —OH, —OR' where R' is a C_1–C_4 alkyl group, —NH—R"—SO_3M wherein R" is an alkylene group of from 1 to 24 carbon atoms (preferably C_1 to C_4 alkylene) and M is hydrogen or an ammonium or alkali metal ion.



(2)

R is hydrogen or methyl, X is —O— or —NH—, and R is a hydrophobic group. R"' is preferably an aliphatic hydrophobic group such as an alkyl or alkenyl group of from 6 to about 24 carbon atoms or an inertly substituted such group, etc., and is most preferably an alkyl group of from about 8 to about 24 carbon atoms.

The interpolymers are usually solid polymers having a number average molecular weight of about one million or more.

The nonionic surfactant has a hydrophilic-lipophilic balance (HLB) of from about 10 to about 14. Such nonionic surfactants constitute a known class of compounds having many members. The preferred materials are ethoxylated alkanols having from about 8 to about 24 carbon atoms in the alkanol moiety. The preferred water soluble electrolytes are the sodium, potassium and ammonium halides.

Viscoelastic surfactants are employed as viscosifiers in the context of gravel packing fluids. Such systems contain virtually no insoluble residue. Gravsholt in "Viscoelasticity in Highly Dilute Aqueous Solutions of Pure Cationic Detergents," *J. Colloid & Interface Sci.* (57)3(1976), 575–77 indicates that certain quaternary ammonium salts impart viscoelastic properties to aqueous solutions. Gravsholt showed that cetyl trimethyl ammonium bromide would not impart viscoelastic properties to water but that cetyl trimethyl ammonium salicylate and certain other aromatic containing quaternary amines would. In U.S. Pat. No. 3,292,698, a mixture of cyclohexyl ammonium chloride and undecane-3-sodium sulfate was taught to induce viscoelastic properties to a formation flooding liquid containing less than about 3.5 percent by weight of sodium chloride. Higher levels of sodium chloride were said to destroy the viscoelastic properties of the fluid. UK Pat. No. 1,443,244, discloses a specific ethoxylated or propoxylated tertiary amine employed to thicken and aqueous solution of a strong mineral acid. U.S. Pat. No. 3,917,536 teaches that certain primary amines may be employed in subterranean formation acidizing solutions to retard the reaction of the acid on the formation. The amine may be more readily dispersed into the acid solution with the use of a dispersing agent such as a quaternary amine.

In particular Canadian Pat. No. 1,185,779, discloses a high electrolyte-containing aqueous wellbore service fluid which has improved viscosity characteristics over a wide range of wellbore conditions, including improved ease of preparation at the wellside and better shear stability and consistent viscosity over a wide temperature range. These improved aqueous wellbore service fluids are acknowledged as being useful in well known wellbore services such as perforation, clean-up, long term shut-in, drilling, placement of gravel packs and the like.

SUMMARY OF THE INVENTION

The present invention provides a fracturing fluid for use in high temperature, high permeability formations which has a low leakoff rate, adequate viscosity to effect fracture extension and proppant transport and little or no residue remaining upon completion of the fracturing operation.

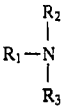
In accordance with the invention, a process for fracturing a subterranean formation penetrated by a wellbore comprises providing an hydraulic fracturing fluid having a composition as set forth below and injecting the hydraulic fracturing fluid through the wellbore and against the formation at a flow rate and pressure at least sufficient to initiate and/or extend a fracture into the formation. The hydraulic fracturing fluid comprises:

A. an aqueous base fluid;

B. an effective amount of an inorganic water soluble salt to stabilize a subterranean formation by inhibiting hydration;

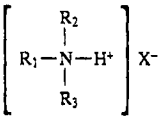
C. an effective amount of at least one thickener in the fluid, the thickener being at least one member selected from the group consisting of

(i) an amine corresponding to the formula



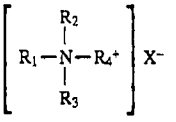
wherein R_1 is at least about a C_{16} aliphatic group which may be branched or straight chained and which may be saturated or unsaturated, R_2 and R_3 are each independently, hydrogen or a C_1 to about C_6 aliphatic group which can be branched or straight chained, saturated or unsaturated and which may be substituted with a group that renders the R_2 and/or R_3 group more hydrophilic;

(ii) salts of the amine corresponding to the formula



wherein R_1, R_2 and R_3 are the same as defined hereinbefore and X^{31} is an inorganic anion, and;

(iii) a quaternary ammonium salt of the amine corresponding to the formula



wherein R_1, R_2, R_3 and X^- are the same as defined hereinbefore and R_4 independently constitutes a group which has previously been set forth for R_3 and R_3, none of R_1, R_2, R_3 or R_4 are hydrogen, and the R_2, R_3 and R_4 groups of the amine salt and quaternary ammonium salt may be formed into a heterocyclic 5- or 6-member ring structure which includes the nitrogen atom of the amine;

D. an effective amount of a stabilizing organic additive selected from the group consisting of an organic salt, a C_4 to C_{12} aliphatic alcohol and mixtures thereof.

Further in accordance with the invention, the process of fracturing as set forth above comprises providing an hydraulic fracturing fluid as set forth above wherein the selected thickener is selected from a group consisting of: erucyl trimethyl ammonium chloride; N-methyl-N,N-bis(2-hydroxyethyl) rapeseed ammonium chloride; oleyl methyl bis(hydroxyethyl) ammonium 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 iodidc; bis(hydroxyethyl) soya amine; N-methyl, N-hydroxycthyl tallow amine; bis(hydroxyethyl) octadecyl amine; 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; N,N-dihydroxypropyl hexadecyl amine, N-methyl, N-hydroxyethyl hexadecyl amine; N,N-dihydroxyethyl dihydroxypropyl oleyl amine; N,N-dihydroxypropyl soya amine; N,N-dihydroxypropyl tallow amine; N-butyl hexadecyl amine; N-hydroxyethyl octadecyl amine; N-hydroxyethyl cosyl amine; cctylamino, N-octadecyl pyridinium chloridc; N-soya-N-cthyl morpholinium ethosulfate; methyl-1-oleyl amido ethyl-2-oleyl imidazolinium-methyl sulfate; and methyl-1-tallow amido ethyl-2-tallow imidazolinium-methyl sulfate and combinations thereof.

Still further in accordance with the invention, the process of fracturing as set forth above for use in high temperature formations comprises providing an hydraulic fracturing fluid as set forth above wherein the selected thickener is erucyl methyl bis(2-hydroxyethyl) ammonium chloride.

It is therefore an object of this invention to provide a fracturing fluid for use in high temperature, high permeability formations which has low leakoff into the formation during the fracturing process

It is another object of this invention to provide a fracturing fluid with little or no residue following completion of the fracturing treatment.

It is yet another object of this invention to provide a fracturing fluid which avoids the use of damaging polymer thickeners, particularly in high permeability formations.

DETAILED DESCRIPTION OF THE INVENTION

These and other objects of the invention are accomplished through the manner and form of the present invention to be described hereinafter and illustrated in a number of examples. It will be understood that the description and examples are presented solely for the purpose of illustrating the preferred embodiments of the invention and should not in any way be construed as a limitation on the scope and applicability of the invention.

The present invention comprises an aqueous viscoelastic surfactant based fracturing fluid. The fluid comprises water, an inorganic salt stabilizer, a surfactant/thickener and an organic salt or alcohol. The fracturing fluid may optionally contain a gas such as air, nitrogen or carbon dioxide to provide an energized fluid or a foam. A small group of surfactants having unique viscoclastic properties make them of high interest for use in fracturing applications but which find particular utility in forming fracturing fluids for fracturing treatment of high permeability subterranean formations. In contrast to such fluids as HEC, which are typically used in such formations and which have a high leakoff rate which is highly sensitive to increasing pressure since they do not build filter cake, the surfactants used in the present invention create fluids which have a low leakoff rate which is also substantially insensitive to pressure. As a result, at high pressures such as are used during a fracturing operation, little fluid is lost to the formation. This reduces the total volume of fluid needed to provide the desired fracture with an associated cost savings. Further, since leakoff is minimized, longer fracture length extension is practicable. Finally, at low pressures, these low molecular weight surfactant systems flow out of the formation more easily with low residue and superior cleanup resulting in improved well productivity.

The viscosifiers commonly used in the petrolcum industry are polymeric structures starting with molecular weights of hundreds of thousands to several million grams per mole. These large, chemically bonded structures are often crosslinked to further increase molecular weight and effective viscosity per gram of polymer added to the fluid. These large molecules are quite stable and can filter out on the sand grains of the formation to reduce conductivity or permeabil-

ity of the reservoir. This decreases well productivity. As a result, expensive and often corrosive breakers have been designed to destroy the molecular backbone of these polymeric structures. This reduces the molecular weight of the polymer, ideally making it more soluble in the surrounding fluids and easier to remove from the formation, thereby improving reservoir productivity. These breakers are typically oxidizers or enzymes. They are at best only partially effective with typical reservoir cleanup less than 80% complete and more usually much less than 50% complete.

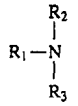
In dramatic contrast, viscoelastic surfactants are relatively small molecules. Each molecule is typically less than 500 grams per mole—less than 0.1% the size of the polymers used. These small molecules will associate under certain conditions to form structures which resemble the polymer molecules but which are not stable structures. The individual molecules of surfactant begin to associate much like the steps of a spiral staircase. These structures are always in an equilibrium state of breaking and reforming. As dynamic structures, these polymer-shaped micelles are readily destroyed by shear, presence of hydrocarbons or increased temperature. All of these features are found in the reservoir. Therefore, the viscoelastic surfactants rapidly return to their original small independent molecule state once they are pumped into the reservoir and are no longer needed to provide viscosity which is needed to transport particles into the formation.

By careful design, the well treatment conditions which allow the polymer-shaped micelles to form under surface conditions, remain stable while they are pumped down the wellbore and through the perforations into a fracture or open perforation cavity but then the micelles break back to the individual components in the reservoir rock. Therefore, no corrosive, expensive breaker is required and cleanup is often superior to that of the polymer systems, typically higher than 80%.

In addition to the viscoelastic surfactant, the aqueous fracturing fluid in accordance with the invention requires a sufficient quantity of at least one water soluble inorganic salt to effect formation stability. Typically, water soluble potassium and ammonium salts, such as potassium chloride and ammonium chloride are employed. Additionally, calcium chloride, calcium bromide and zinc halide salts may also be used. Formation stability and in particular clay stability is achieved at a concentration level of a few percent by weight and as such the density of the fluid is not significantly altered by the presence of the inorganic salt unless fluid density becomes an important consideration, at which point, heavier inorganic salts may be employed.

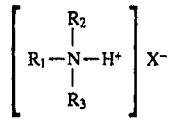
In accordance with the invention, a sufficient quantity of at least one surfactant/thickener soluble in said aqueous salt solution is employed to effect, in combination with an organic salt and/or alcohol, sufficient viscosity to suspend proppant during placement, wherein the thickener is at least one member selected from the group consisting of:

(a) an amine corresponding to the formula



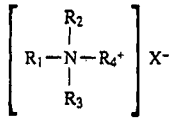
wherein R_1 is at least about a C_{16} aliphatic group which may be branched or straight chained and which may be saturated or unsaturated, R_2 and R_3 are each independently, hydrogen or a C_1 to about C_6 aliphatic group which can be branched or straight chained, saturated or unsaturated and which may be substituted with a group that renders the R_2 and/or R_3 group more hydrophilic;

(b) salts of the amine corresponding to the formula



wherein R_1, R_2 and R_3 are the same as defined hereinbefore and X^- is an inorganic anion, and;

(c) a quaternary ammonium salt of the amine corresponding to the formula



wherein R_1, R_2, R_3 and X^- are the same as defined hereinbefore and R_4 independently constitutes a group which has previously been set forth for R_3 and R_3, none of R_1, R_2, R_3 or R_4 are hydrogen, and the R_2, R_3 and R_4 groups of the amine salt and quaternary ammonium salt may be formed into a heterocyclic 5- or 6-member ring structure which includes the nitrogen atom of the amine;

A sufficient quantity of a water soluble organic salt and/or alcohol is employed to effect, in combination with the thickener, the desired viscoelastic properties. Preferably the organic salt is a water soluble carboxylate salt such as sodium or potassium salicylate or the like. Preferably the alcohol is a cosurfactant, typically a C_4 to C_{12} aliphatic alcohol.

One preferred aqueous hydraulic fracturing fluid contains up to a few percent of an inorganic salt such as KCl or NH_4Cl and a selected amount of an organic salt such as sodium salicylate. A preferred thickening agent for the above defined hydraulic fracturing fluid is a quaternary ammonium salt, erucyl methyl bis (2-hydroxyethyl) ammonium chloride.

The thickening agent employed in the invention comprises at least one of the thickening agents defined hereinbefore. It has been found that with certain solutions, a mixture of two or more thickeners may be preferred.

In instances where the thickening agent is an amine acid salt or a quaternary ammonium salt, the associated anion should be an inorganic anion. Preferably, X^- is an inorganic anion such as a sulfate, nitrate, perchlorate or halide. A halide (Cl, Br or I) is preferred, Cl and Br being most preferred.

The organic salt constituent of the fracturing fluid is preferably a water soluble compound involving typically a sodium or potassium salt of an organic anion. The anion may be an aromatic organic anion such as a salicylate, naphthalene sulfonate, p- and m-chlorobenzoates, 3,5 and 3,4 and 2,4-dichlorobenzoates, t-butyl and ethyl phenate, 2,6 and 2,5-dichlorophenates, 2,4,5-trichlorophenate, 2,3,5,6,-tetrachlorophenate, p-methyl phenate, m-chlorophenate, 3,5,6-trichloropicolinate, 4-amino-3,5,6-trichloropicolinate, 2,4,-dichlorophenoxyacetate, toluene sulfonate, α,β-napthols, p.p'bisphenol A or cocoamidopropyl dimethyl amine oxide. The thickening agent should be chosen such that the anion is compatible with the electrolyte present in the aqueous solution such that undesirable precipitates are not formed. Also the specific anion chosen will depend to some degree on the specific amine structure.

The thickening agent is employed in an amount which in combination with the other ingredients is sufficient to increase the viscosity of the aqueous fluid enough to maintain proppant in suspension during fluid placement. The exact quantity and specific thickener or mixture of thickeners to be employed will vary depending on the concentration of and specific soluble salt(s) employed to make up the solution, the viscosity desired, the temperature of use, the pH of the solution, and other similar factors. The concentration of the surfactant thickener can range from about 0.05 to about 6 percent by weight of the fluid. Simple laboratory procedures can be employed to determine the optimum concentrations for any particular set of parameters. For example, when a non-protonated amine is employed as the thickener, the pH of the aqueous fluid can affect to some degree the effectiveness of particular amines. More acidic solutions are required for some amines to be dissolved therein. It is thought that this is because the amine must become protonated before it will become effectively dissolved in the fluid.

The thickeners are selected from a group of surfactant materials capable of forming rod-shaped micelles as opposed to typical surfactant materials which tend to form spherical micelles or sheet-like structures. Further, in order to be useful in the present invention, the selected surfactant must be able to form the rod-shaped micelles over a broad range of concentrations, such as 1 to 8 percent by weight in the aqueous fluid. The number of surfactant materials which can be successfully used in the invention decreases with increasing temperature. Temperature applicability is primarily a function of the molecular weight of the longest aliphatic carbon chain on the amine functionality but is also sensitive to the formation in which the resultant fluid is to be used.

Alternative thickeners which may be employed either singly or in combination in accordance with the invention include erucyl trimethyl ammonium chloride; N-methyl-N, N-bis(2-hydroxyethyl) rapeseed ammonium chloride; oleyl methyl bis(hydroxyethyl) ammonium 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; bis(hydroxyethyl) soya amine; N-methyl, N-hydroxyethyl tallow amine; bis(hydroxyethyl) octadecyl amine; 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; N,N-dihydroxypropyl hexadecyl amine, N-methyl, N-hydroxyethyl hexadecyl amine; N,N-dihydroxyethyl dihydroxypropyl oleyl amine; N,N-dihydroxypropyl soya amine; N,N-dihydroxypropyl tallow amine; N-butyl hexadecyl amine; N-hydroxyethyl octadecyl amine; N-hydroxyethyl cosyl amine; cetylamino, N-octadecyl pyridinium chloride; N-soya-N-ethyl morpholinium ethosulfate; methyl-1-oleyl amido ethyl-2-oleyl imidazolinium-methyl sulfate; and methyl-1-tallow amido ethyl-2-tallow imidazolinium-methyl sulfate.

To prepare the aqueous hydraulic fracturing fluid in accordance with the present invention, the thickener is added to an aqueous solution in which has been dissolved a quantity of at least one water soluble inorganic salt to provide formation stability and at least one water soluble organic salt to provide selective control of the loss of particle suspension properties. Standard mixing procedures known in the art can be employed since heating of the solution and special agitation conditions are normally not necessary. Of course, if used under conditions of extreme cold such as found in Alaska, normal heating procedures should be employed. It has been found in some instances preferable to dissolve the thickener into a lower molecular weight alcohol prior to mixing it with the aqueous solution. The lower molecular weight alcohol, for instance isopropanol, functions as an aid to solubilize the thickener. Other similar agents may also be employed. Further, a defoaming agent such as a polyglycol may be employed to prevent undesirable foaming during the preparation of the fracturing fluid if a foam is not desirable under the conditions of the treatment. If a foam or gas-energized fluid is desired, any gas such as air, nitrogen, carbon dioxide and the like may be added.

In addition to the water soluble salts and thickening agents described hereinbefore, the aqueous hydraulic fracturing fluid may contain other conventional constituents which perform specific desired functions, e.g., corrosion inhibitors, fluid-loss additives, and the like. The proppant can then be suspended in the fracturing fluid.

The fluids defined herein can be employed in standard fracturing treatments, employing techniques and equipment well known in the art. The following examples illustrate the preparation and properties of aqueous viscoelastic surfactant-based hydraulic fracturing fluids.

EXAMPLE 1

Three 500-ml beakers were filled with 200 ml of three percent (by weight) ammonium chloride solution. Three percent erucyl methyl bis(2-hydroxyethyl) ammonium chloride surfactant was added to the first solution. Four and five percent (by weight) of the surfactant were added to the other two, respectively. The systems were stirred until all of the surfactant dissolved. Rheological measurements were performed at 130°, 150° and 180° F. using a Fann 35 rotational viscometer The solution containing five percent surfactant was tested at 200° and 225° F. with a reciprocating capillary viscometer. The results are given below.

Fluid	Viscosity (cp) @ 170 sec^{-1}		
Temperature (°F.)	3% surfactant	4% surfactant	5% surfactant
130	105	165	213
150	96	144	198
180	72	144	174
200	—	—	54
225	—	—	17

EXAMPLE 2

In a manner similar to Example 1, five percent (by weight) erucyl methyl bis(2-hydroxyethyl) ammonium chloride surfactant was added to 200 ml of four percent (by weight) potassium chloride solution. Rheological measurements were performed in the manner described in Example 1. The results are given below.

Fluid Temperature (°F.)	Viscosity (cp) @ 170 sec^{-1} 5% surfactant
130	168
150	162
180	138
200	84
225	45

EXAMPLE 3

In a manner similar to Example 1, five percent (by weight) erucyl methyl bis(2-hydroxyethyl) ammonium chloride surfactant and 0.2% (by weight) sodium salicylate stabilizer were added to 200 ml of three percent (by weight) ammonium chloride solution. Rheological measurements were performed in the manner described in Example 1. The results are given below.

Fluid Temperature (°F.)	Viscosity (cp) @ 170 sec^{-1} 5% surfactant + 0.2% sodium salicylate
130	132
150	132
180	117
200	101
225	40

EXAMPLE 4

In a manner similar to Example 1, five percent (by weight) erucyl methyl bis(2-hydroxyethyl) ammonium chloride surfactant and 0.2% (by weight) sodium salicylate stabilizer were added to 200 ml of four percent (by weight) potassium chloride solution. Rheological measurements were performed in the manner described in Example 1. The results are given below.

Fluid Temperature (°F.)	Viscosity (cp) @ 170 sec^{-1} 5% surfactant + 0.2% sodium salicylate
130	174
150	159
180	159
200	90
225	53

EXAMPLE 5

The previous examples have illustrated the viscosifying effect of the undiluted surfactant. For proper execution of this invention at the wellsite it is typically necessary to prepare an easily pourable system by diluting the surfactant with a solvent such as isopropyl alcohol. A mixture was prepared with the following weight-percent composition: erucyl methyl bis(2-hydroxyethyl) ammonium chloride (75%); sodium salicylate (3%); isopropyl alcohol (15%); water (7%).

In a manner similar to Example 1, six percent (by volume) of the mixture described above was added to 200 ml of three percent (by weight) ammonium chloride. Rheological measurements were performed at 175°, 200° and 225° F. using a reciprocating capillary viscometer. The results are given below.

Fluid Temperature (°F.)	Viscosity (cp) @ 170 sec^{-1} 6% (by volume) surfactant mixture
175	150
200	50
225	20

EXAMPLE 6

In a manner similar to Example 5, a mixture was prepared with the following weight-percent composition: N-methyl-N,N-bis(2-hydroxyethyl) rapeseed ammonium chloride (75%); sodium salicylate (3%); isopropyl alcohol (7%); water (15%).

In a manner similar to Example 1, six percent (by volume) of the mixture described above was added to 200 ml of three percent (by weight) ammonium chloride. Rheological measurements were performed at 110°, 120°, 130°, 140° and 150° F. using a Fann 35 rotational viscometer, and 200° F. using a reciprocating capillary viscometer. The results are given below.

Fluid Temperature (°F.)	Viscosity (cp) @ 170 sec^{-1} 6% (by volume) surfactant mixture
110	187
120	117
130	43
140	23
150	14
200	5

While the invention has been described in the more limited aspects of preferred embodiments thereof, other embodiments have been suggested and still others will occur to those skilled in the upon a reading and understanding of the foregoing specification. It is intended that all such embodiments be included within the scope of this invention as limited only by the appended claims.

Having thus described our invention, we claim:

1. A method of fracturing a subterranean formation comprising the steps of

(A) providing an aqueous viscoelastic surfactant based hydraulic fracturing fluid comprising:

(1) an aqueous medium;

(2) an effective amount of an inorganic water soluble ammonium salt to stabilize a subterranean formation by inhibiting hydration;

(3) an effective amount of at least one thickener in the fluid, the thickener comprising N-methyl-N, N-bis(2-hydroxyethyl) rapeseed ammonium chloride in an amount ranging from about 0.5 to about 6% by weight of the fluid;

(4) an effective amount of an organic stabilizing additive selected from the group consisting of an organic salt, a C_4 to C_{12} aliphatic alcohol and mixtures thereof, and

(B) pumping the aqueous viscoelastic surfactant based fluid through a wellbore and into a subterranean formation at a pressure sufficient to fracture the formation.

2. The method of fracturing as set forth in claim 1 wherein the step of providing comprises providing an aqueous viscoelastic surfactant based fluid further including a particulate proppant suspended therein.

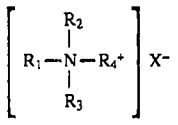
3. A method of fracturing a subterranean formation comprising the steps of

(A) providing an aqueous viscoelastic surfactant based hydraulic fracturing fluid including a thickener comprising:

(1) an aqueous medium;

(2) an effective amount of an inorganic water soluble salt to stabilize a subterranean formation by inhibiting hydration;

(3) an effective amount of thickener comprising a mixture of erucyl methyl his (2-hydroxyethyl) ammonium chloride and a quaternary ammonium salt of the amine corresponding to the formula



wherein R_1 is at least about a C_{16} aliphatic group which may be branched or straight chained and which may be saturated or unsaturated, R_2 and R_3 are each independently, hydrogen or a C_1 to about C_6 aliphatic group which can be branched or straight chained, saturated or unsaturated and which may be substituted with a group that renders the R_2 and/or R_3 group more hydrophilic, and R_4 independently constitutes a group which has previously been set forth for R_3 and R_3, none of R_1, R_2, R_3 or R_4 are hydrogen, and the R_2, R_3 and R_4 groups of the amine salt and quaternary ammonium salt may be formed into a heterocyclic 5- or 6-member ring structure which includes the nitrogen atom of the amine; and

(4) an effective amount of an organic stabilizing additive selected from the group consisting of an organic salt, a C_4 to C_{12} aliphatic alcohol and mixtures thereof, and

(B) pumping the aqueous viscoelastic surfactant based fluid through a wellbore and into a subterranean formation at a pressure sufficient to fracture the formation.

4. The method of fracturing as set forth in claim 3 wherein the step of providing comprises providing an aqueous viscoelastic surfactant based hydraulic fracturing fluid including a thickener comprising at least 60% by weight erucyl methyl bis (2-hydroxyethyl) ammonium chloride.

5. The method of fracturing as set forth in claim 3 wherein the step of providing comprises providing an aqueous viscoelastic surfactant based hydraulic fracturing fluid including a thickener comprising at least 75% by weight erucyl methyl bis (2-hydroxyethyl) ammonium chloride.

6. The method of fracturing as set forth in claim 3 wherein the step of providing comprises providing an aqueous viscoelastic surfactant based fluid further including a particulate proppant suspended therein.

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