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Description

This invention relates to water-glycol type energy transmitting fluids having enhanced lubricity and anti-wear properties under high pressure conditions.

Water-based fluids have been used commercially for many years as a means of transmitting energy in hydraulic systems. Among such water-based fluids are the water-soluble glycol or glycol ether-containing compositions (hereinafter "water-glycol" type fluids) disclosed, for example, in US-A- 2,558,030, 2,602,780 and 2,768,141 .

Compared to petroleum-based fluids, water-glycol type fluids generally have low flammibility, and good temperature stability. Moreover, clean-up and disposal are usually more convenient when utilizing water-glycol type fluids as opposed to petroleum-based compositions. However, water-glycol type energy transmitting fluids, such as are disclosed by the above-cited patents, generally have relatively poor lubricating and anti-wear properties in high pressure applications.

Various lubricity and/or anti-wear additives have been suggested in attempts to improve the performance of water-glycol type energy transmitting fluids.

U.S. - A - 2,917,699 discloses the use of alkali metal soaps of an organic aliphatic acid as an anti-wear agent in water-glycol type hydraulic fluids.

U.S. - A - 4,493,777 discloses a water-based hydraulic fluid having incorporated therein as an antiwear or lubricity agent, the metal or amine salt of an organo sulfur, phosphorous, boron or carboxylic acid.

U.S. - A - 3,992,312 discloses a water-glycol base hydraulic fluid comprising from about 30-60 weight percent of water; from about 5-30 weight percent of a water-soluble polymer containing (1) a residue of a polyamide having active hydrogen atoms and (2) oxyalkylene groups bonded to the residue; and from about 15-60 weight percent of a glycol, said fluid being disclosed as having good lubricating and wear preventing qualities.

U.S.-A- 4,434,066 discloses a water-glycol type fluid composition comprising in the agueous composition having a viscosity of at least 10 mm^2/s at 40 °C at least 0.1 percent of a carboxylic acid lubricant agent and an anti-wear additive which comprises a combination of an hydroxyl-substituted aromatic acid component and a nitroaromatic compound component and optionally up to 50 % glycol or glycol ether and a polymeric viscosity control agent.

U.S. - A - 4,390,439 discloses the use of neodecanoic acid to improve to anti-wear and corrosion-inhibiting properties of hydraulic fluids having a water content of from about 60 to about 99 weight percent.

The disclosures of the prior art regarding the enhanced lubricity and anti-wear benefits of additive containing fluids notwithstanding, prior to this invention the lubricity and wear characteristics of water-glycol type fluids have limited the use of such fluids to systems operating at pressures of less than 207 bar (3,000 psi).

Accordingly, it is an object of this invention to provide a water-glycol type energy transmitting fluid having enhanced high pressure performance.

Summary of the Invention

This invention relates to an energy transmitting fluid with a viscosity of 10 - 200mm^2/s at 40 °c suitable for use in systems operating at pressures up to at least 345 bar (5,000 psi) comprising - based on the total weight of the fluid

(a) from 30 to 40, preferably from 34 to 37 percent by weight, of water;
(b) from 35 to 60 percent by weight of diethylene glycol;
(c) from 0.8 to 5.0 percent by weight of an aliphatic carboxylic acid having 9 to 12 carbon atoms;
(d) from 10 to 20 percent by weight of a water-soluble polymeric viscosity control agent;
(e) from 0.4 to 4 percent by weight of at least one corrosion inhibitor; and
(f) from 0.01 to 2 percent by weight of a metal deactivator.

It has been found that the particular combination of water, diethylene glycol and carboxylic acid herein disclosed is effective in enhancing the high pressure performance of water-glycol type energy transmitting fluids, rendering such fluids suitable for use in systems operating at pressures up to at least 345 bar (5,000 psi), preferably up to at least 483 bar (7,000 psi) and most preferably up to at least 690 bar(10,000 psi).

In accordance with the present invention there is provided a water-glycol composition having a viscosity of from 10 to 200 mm^2/s (centistokes) at 40 °C comprising water, diethylene glycol, an aliphatic carboxylic acid having 9 to 12 carbon atoms, a water-soluble polymeric viscosity control agent, at least one corrosion inhibitor, and a metal deactivator.

The aliphatic carboxylic acid component of the composition of this invention is selected from the group consisting of saturated and unsaturated, linear and branched carboxylic and polycarboxylic acids having 9 to 12 carbon atoms and mixtures thereof. Representative of the carboxylic acids suitable for use herein are nonanoic, decanoic, neodecanoic, undecanoic, and dodecanoic acids, and mixtures thereof. For purposes of this invention, the C_9 to C_{12} carboxylic acid is generally present in the above described composition in an amount of from 0.8 to 5.0 percent by weight, preferably from 1.0 to 2.0 percent by weight, and, most preferably, from 1 to 1.6 percent by weight, all based upon the total weight of the composition. At concentrations of less than about 0.8 percent by weight, the C_9 to C_{12} carboxylic acids are generally unable to provide the lubricity required for high pressure applications.

For purposes of this invention linear carboxylic acids, having 10 to 12 carbon atoms, inclusive, constitute a preferred class of carboxylic acids.

The polymeric viscosity control agents of the composition of this invention include poly(alkylene oxide) polymers, alkylene oxide adducts of alkyl phenols, polyalkyl methacrylates, urethane polymers, polyamide esters, and polyamide alkoxylates, with poly(alkylene oxide) polymers being a preferred class of polymers.

The poly(alkylene oxide) polymers suitable for use herein contain oxyethylene groups or a random or block distribution of both oxyethylene groups and higher oxyalkylene groups such as oxypropylene and oxybutylene groups and have average molecular weights of from 400 to 40,000, or even higher. The amount of oxyethylene groups in the molecule is such that the Poly(alkylene oxide) polymers are soluble in water at 25° C and the amount of oxypropylene or higher oxyalkylene groups is such that the poly(alkylene oxide) remains liquid at 25° C up to an average molecular weight of 40,000 and higher. The oxypropylene/oxyethylene ratio may vary from zero to about unity. These poly(alkylene oxide) polymers may be made by processes well known in the art by reacting ethylene oxides or mixtures of ethylene oxide and propylene oxide or higher alkylene oxide with a compound having at least 1 active hydrogen atom up to as many as 6 such active hydrogen atoms including, for example, water, monohydroxylic alcohols such as ethanol and propanol, dihydroxylic alcohols such as ethylene glycol, trihydroxylic alcohols such as glycerine and trimethylpropane, tetrahydroxylic alcohols such as pentaerythritol, hexahydroxylic alcohols such as sorbitol, and mono- or poly-functional amines such as butylamine and ethylene diamine. The poly(alkylene oxide) products of such reaction will have linear or branched oxyethylene or oxyethylene-higher oxyalkylene chains and such chains will terminate with hydroxyl groups. Some or all of these hydroxyl groups may be etherified by reaction with a dialkyl sulfate such as diethyl sulfate.

Alkylene oxide adducts of alkyl phenols suitable for use herein include the adducts disclosed, for example, in U.S. -A- 2,768,141 and U.S.-A- 3,379,644.

Polyalkyl methacrylates and polyurethanes such as may be employed herein are disclosed, for example, in U.S. - A - 3,352,783. These polyalkyl metharylates generally result from the polymerization of alkyl methacrylates in which the alkyl groups have an average of from 3 to 10 carbon atoms.

Included among the polyamide esters suitable for use herein are the polymers disclosed in U.S. - A - 3,341,573. Suitable polyamide alkoxylates are disclosed, for example, in U.S. -A- 3,992,312.

For purposes of this invention, random copolymers of ethylene oxide and 1,2-propylene oxide having a viscosity of up to 100,000mm²/s at 100° C, preferably of from 5,000 to 50,000 mm²/s at 100° C and comprising from 65 to 85 weight percent of oxyethylene groups are preferred.

It will be apparent to the art-skilled that the relative quantities of viscosity control agent and diethylene glycol provided to the energy transmitting compositions of this invention are subject to variation depending upon the desired viscosity of the energy transmitting composition and the particular viscosity control agent employed therein. Preferably, the diethylene glycol and viscosity control agent are present in the compositions of this invention in amounts sufficient to provide such compositions with a viscosity of from 35 to 80 mm²/s at 40° C. In general, composition viscosities within the previously described ranges of preference are achieved by utilizing a Poly(alkylene oxide) viscosity control agent in an amount of from 10 to 20 percent by weight of the composition, and diethylene glycol in an amount of from 35 to 60 percent by weight of the composition.

The optimum viscosity of the fluid compositions of this invention is subject to variation and depends in part on the type of pump employed in a given operation. For example, vane pumps typically operate at pressures up to 207 bar (3,000 psi) and employ as the fluid of choice a composition having a viscosity of from 60 to 80 mm²/s at 40° C, whereas, the fluid of choice in axial piston pumps, which generally operate at pressures of from 345 (5,000 psi) to 414 bar (6,000 psi) typically has a viscosity of from 35 to 50 mm²/s at 40° C.

Included among the corrosion inhibitors suitable for use in the compositions of this invention are alkyl amines such as, for example, propylamine, butylamine, hexylamine, n-octylamine, cyclohexylamine, dimethylaminopropylamine, and the like; alkanolamines such as, for example, ethanolamine, diethanolamine, triethanolamine, N,N-dimethylethanolamine, arylamines such as aminotoluene; as well as other amine-type corrosion inhibitors such as for example, ethylene diamine, isopropylaminoethanol, tripropylamine, morpholine, pyridine, 1,4-bis(2-aminoethyl)pyperdine, imidazoline, 2-heptadecyl-1-(2-hydroxyethyl)- imidazoline; and mixtures thereof. In addition to the amine type corrosion inhibitors, other corrosion inhibitors suitable for use herein include alkali metal nitrites, nitrates and benzoates, alkoxylated fatty acids, and mixtures thereof.

The amount of corrosion inhibitor present in the composition of this invention is subject to variation and depends in part upon factors which include choice of inhibitor(s) and the severity of the application in which the fluid is employed. In general the total amount of inhibitor present in the composition of this invention ranges from 0.4 to 4.0 percent by weight, based upon the total weight of the composition. As used herein a " corrosion inhibiting amount" of inhibitor is at least that amount of one or more inhibitors which is effective in achieving the degree of corrosion protection required by a particular application.

The metal deactivators used herein function primarily as chelating agents for copper and copper alloys. Representative of the metal deactivators suitable for use in the compositions of this invention are tolyltriazole, benzotriazole, mercaptobenzothiazole sodium mercaptobenzothiazole, disodium 2,5-mercaptothiadiazole, mercaptobenzoimidazole, and mixtures thereof. In general, the total amount of metal deactivator present in the composition of this invention is from 0.01 to 2.0 percent by weight, based upon the total weight of the composition.

In addition to the components previously described, the energy transmitting fluids of this invention may further comprise one or more additional components as are conventionally used in water-based fluids. When present, the total amount of all such additional components typically constitutes from 0.001 to 2 % percent of the total weight of the fluid composition.

Exemplary of such additional components are foam inhibitors, such as silicones of the emulsion type, polyoxyalkylene type nonionic surfactants, and the like; alkaline compatible dyes; sequestering agents such as aminocarboxylic acids and derivatives thereof including ethylenediaminetetraacetic acid (EDTA)-diethylenetriaminepentaacetic acid, the sodium or copper salts thereof, and oxycarboxylic acids and derivatives thereof such as tartaric acid and sodium glyconate; and such other additives as would not interact with the previously described components to adversely affect the lubricity of the resultant composition.

In preparing the water-based compositions of the invention, each of the components used may be added in any order of addition, or combinations of some, of them may be prepared prior to incorporating same in the composition. In general, each of the components to be used should be in water-soluble form such as the alkali metal or ammonium salts thereof, or should be capable of being solubilized in situ. The compositions of this invention may be prepared from concentrates which in use are diluted to provide the water contents previously described.

In accordance with a preferred embodiment this invention, there is provided an energy transmitting fluid suitable for use in systems operating at pressures up to at least 345 bar (5,000 psi)consisting essentially of:

(a) from 34 to 37 percent by weight, of water,

(b) from 35 to 40 percent by weight, of diethylene glycol,

(c) from 1.0 to 2.0 percent by weight, of a linear aliphatic carboxylic acid having 9 to 12 carbon atoms, preferably decanoic and/or dodecanoic acid,

(d) from 12 to 16 percent by weight, of a water-soluble polyalkylene oxide viscosity control agent, preferably a copolymer of ethylene oxide and propylene oxide having a viscosity of from 40,000 to 60,000 mm^2/s at 100 °C and comprising from 70 to 80 percent by weight, based upon the total weight of the copolymer, of ethylene oxide groups,

(e) from 1.4 to 3.5 percent by weight, of at least one amine-type corrosion inhibitor, preferably a combination of from 0.6 to 1.5 percent by weight, of morpholine and from 0.8 to 2.0 percent by weight, of isopropylaminoethanol, and,

(f) from 0.04 to 0.1 percent by weight, of a metal deactivator, preferably tolyltriazole.

Examples

The following Examples are illustrative of the present invention. Unless otherwise indicated, all of the percentages referred to in the following Examples are by weight.

Examples 1 to 3 and Comparative Examples C_1 to C_2

The high pressure performance of the fluids formulated to the specifications of Table 1 was evaluated by means of the procedure described in ASTM D 2882-83 entitled "Standard Method for Indicating the

Wear Characteristics of Petroleum and Non-Petroleum Hydraulic Fluids in a Constant Volume Vane Pump". The operational conditions employed in the test were as follows:

The procedure described in ASTM D2882-83 was repeated six times for each formulation. Following each run of a given test a fluid wear rate was obtained. Wear rates are given as the total weight loss of the pump's cam ring and vanes over the operational period of the test.

Wear rates provided in Table 1 represent an average value of six replicate test runs. A formulation was considered to pass the test if each of the six replicate runs provided wear rates of less than 1 gram/100 hours. If a given run provided a wear rate in excess of 1 gram/100 hours testing was discontinued and the formulation was considered to have failed the test.

Pump -	Vickers V-104C vane pump
Pump Speed -	1200 rpm
Pump Pressure -	131 bar (1900 psig)
Fluid Temperature -	65°C
Fluid Quantity -	7.57 l (2 gallons)
Operational Period -	100 hours

Table 1

Ingredients,	Formulations (weight %)[1] C_1	C_2	1	2	3[3]
Deionized Water	35.0	40.5	36.0	38.00	40.00
Ethylene Glycol	49.3	43.3	-	-	-
Diethylene Glycol	-	-	48.8	46.5	46.5
UCON®* 75H 380,000[4]	12.5	13.6	12.0	12.3	12.6
Morpholine	0.8	0.8	0.8	0.8	0.8
Isopropylaminoethanol	1.0	1.2	1.0	1.0	1.0
Decanoic Acid	1.3	1.2	1.3	1.3	1.3
Tolyltriazole	0.1	-	0.1	0.1	0.1
Sodium mercaptobenzo-thiazole	-	0.1	-	-	-
Wear Rate (mg/100 h)	-	-	12	12	20
Test Results	Fail	Fail	Pass	Pass	Fail

1 In addition to the ingredients described above, each of the Formulations provided in Table 1 contained less than 0.01 weight percent of benzoic acid.

2 Test results for Formulations C_2 were based on a single pump test run.

3 Five of the 6 runs for Formulation 3 provided wear rates of less than 1 gram/100 hours, the sixth run provided a wear rate in excess of 1 gram/100 hours.

4 A linear polymer of ethylene oxide and propylene oxide commercially available from Union Carbide Corporation containing 75 weight percent oxyethylene, 25 weight percent oxypropylene, and characterized as having an S.U.S. viscosity of 380,000 at 37.8° c (100° F).

Example 4

The performance of a fluid prepared according to the specifications of Formulation 2 of Table 1 at operational pressures 345 bar (5,000 psi) was evaluated by means of the following test procedure, said procedure being divided into a 2-hour start-up period, a 1 hour break-in period and 222-hour test period.

60,6 1 (16 gallons)of test fluid was charged to a Sundstrand Model 22-2132 variable displacement pump equipped with welded pistons. Operational condition employed in the test were as follows:

Input Speed	3100 ± 100 l.p.m.
Load Pressure	345 bar (5000 psi)
Change Pressure	138 ± 14 bar (200 ± 20 psi)
Case Pressure	max. 2.76 bar (40 psi max.)
Stroke	1/2 of Full
Reservoir Temperature	49 ±5°C (120 ± 10°F)
Loop Temperature	77 ±5°C (170 ± 10°F)
Maximum Inlet Vacuum	0.345 bar (5 psi)

At various times during the course of the test flow data readings were taken. Pursuant to this test, a degradation in flow rate is indicative of system wear (i.e. as the system wears the clearance between movable system parts increases and the flow rate of the fluid is decreased). Flow data for this test is reported in Table 2. An examination of the flow data in flow indicates that no significant degradation in flow occurred over the operational period of the test.

At the expiration of the 222-hour test period the system was cooled to a loop temperature of 38° C (100° F) and shut down. After a 24-hour shut-down period the pump was disassembled and examined for wear. Inspection of the test parts indicated that no unusual pump wear or distress occurred.

Table 2

Reading	Flow (gal./min.)	l/min
After break-in	(24.8)	93.9
After 1 test hour	(24.9)	94.2
After 25 test hours	(24.9)	94.2
After 27 test hours	(24.9)	94.2
After 75 test hours	(24.9)	94.2
After 125 test hours	(24.9)	94.2
After 175 test hours	(24.8)	93.9
After 222 test hours	(24.7)	93.5

Claims

1. An energy transmitting fluid with a viscosity of from 10 to 200 mm^2/s at 40° C for transmitting mechanical energy by fluid pressure in systems operating at pressures up to at least 345 bar comprising - based on the total weight of the fluid -
   (a) from 30 to 40 percent by weight of water;
   (b) from 35 to 60 percent by weight of diethylene glycol;
   (c) from 0.8 to 5.0 percent by weight of an aliphatic carboxylic acid having 9 to 12 carbon atoms;

(d) from 10 to 20 percent by weight of a water-soluble polymeric viscosity control agent;
(e) from 0.4 to 4 percent by weight at least one corrosion inhibitor; and
(f) from 0.01 to 2 percent by weight of a metal deactivator.

2. The fluid as in claim 1 wherein the polymeric viscosity control agent is selected from poly(alkylene oxide) polymers, alkylene oxide adducts of alkyl phenols, polyalkyl methacrylates, urethane polymers, polyamide esters, and polyamide alkoxylates.

3. The fluid as in claim 1 or 2 wherein the corrosion inhibitor comprises at least one amine type corrosion inhibitor.

4. The fluid as in claims 1-3 wherein the metal deactivator is selected from tolyltriazale, benzotriazole, mercaptobenzothiazole, sodium mercaptobenzothiazole, disodium 2,5-mercaptothiadiazole, mercaptobenzoimidazole and mixtures thereof.

5. The fluid as in claims 1 and 4 wherein the water-soluble polymeric viscosity control agent is a poly-(alkylene oxide) polymer.

6. The fluid as in claim 5 wherein the poly(alkylene oxide) polymer is a random copolymer of ethylene oxide and 1,2-propylene oxide having a viscosity of up to 100,000 mm^2/s at 100 °C.

7. The fluid as in claims 1-6 wherein the carboxylic acid is a linear carboxylic acid having 10 to 12 carbon atoms, preferably is selected from nonanoic, decanoic, neodecanoic, undecanoic, and dodecanoic acid, and mixtures thereof.

8. The fluid as in claims 1-7 containing a combination of morpholine and isopropylamino ethanol as an amine-type corrosion inhibitor.

9. The energy transmitting fluid of claims 1-8 which comprises - based on the total weight of the fluid -
(a) from 34 to 37 percent by weight of water,
(b) from 35 to 50 percent by weight of diethylene glycol,
(c) from 1.0 to 2.0 percent by weight of an aliphatic carboxylic acid having 9 to 12 carbon atoms,
(d) from 12 to 16 percent by weight of a water-soluble poly(alkylene oxide) viscosity control agent,
(e) from 1.4 to 3.5 percent by weight of at least one amine-type corrosion inhibitor, and
(f) from 0.04 to 0.1 percent by weight of a metal deactivator.

10. The fluid as in claim 9 wherein the poly(alkylene oxide) viscosity control agent has a viscosity of from 40,000 to 60,000 mm^2/s at 100°C and comprises from 70 to 80 percent by weight of ethylene oxide groups.

Revendications

1. Fluide de transmission d'énergie ayant une viscosité de 10 a 200 mm^2/s à 40 °C, destiné à transmettre de l'énergie mécanique par la pression d'un fluide dans des circuits fonctionnant à des pressions s'élevant jusqu'à au moins 345 bars, comprenant - sur la base du poids total du fluide -
(a) 30 à 40% en poids d'eau ;
(b) 35 à 60% en poids de diéthylèneglycol ;
(c) 0,8 à 5,0% en poids d'un acide carboxylique aliphatique ayant 9 à 12 atomes de carbone ;
(d) 10 à 20% en poids d'un agent polymérique hydrosoluble de réglage de viscosité ;
(e) 0,4 à 4% en poids d'au moins un inhibiteur de corrosion ; et
(f) 0,01 à 2% en poids d'un désactivateur de métaux.
2. Fluide suivant la revendication 1, dans lequel l'agent polymérique réglant la viscosité est choisi entre des polymères du type poly(alkylène-oxyde), des produits d'addition d'oxydes d'alkylènes d'alkylphénols, des polyméthacrylates d'alkyle, des polymères du type uréthanne, des polyamide-esters et des polyamidealkoxylates.
3. Fluide suivant la revendication 1 ou 2, dans lequel l'inhibiteur de corrosion comprend au moins un inhibiteur de corrosion de type amine.
4. Fluide suivant les revendications 1 a 3, dans lequel le désactivateur de métaux est choisi entre le

tolyltriazole, le benzotriazole, le mercaptobenzothiazole, le sel de sodium du mercaptobenzothiazole, le sel disodique du 2,5-mercaptothiadiazole, le mercaptobenzimidazole et leurs mélanges.
5. Fluide suivant les revendications 1 et 4, dans lequel l'agent polymérique hydrosoluble de réglage de viscosité est un polymère du type poly(alkylène-oxyde).
6. Fluide suivant la revendication 5, dans lequel le polymère du type poly(alkylène-oxyde) est un copolymère statistique d'oxyde d'éthylène et d'oxyde de 1,2-propylène dont la viscosité s'élève à 100 000 mm^2/s à 100° C.
7. Fluide suivant les revendications 1 à 6, dans lequel l'acide carboxylique est un acide carboxylique linéaire ayant 10 à 12 atomes de carbone et est choisi de préférence entre l'acide nonanoïque, l'acide décanoïque, l'acide néodécanoïque, l'acide undécanoïque et l'acide dodécanoïque, et leurs mélanges.
8. Fluide suivant les revendications 1 à 7, contenant en association de la morpholine et de l'isopropylaminoéthanol comme inhibiteur de corrosion du type amine.
9. Fluide suivant la revendication 8, dans lequel le désactivateur des métaux est présent en une quantité de 0,01 à 2,0% sur la base du total du fluide.
10. Fluide de transmission d'énergie suivant les revendications 1 à 8, qui comprend - sur la base du poids total du fluide -
(a) 34 à 37% en poids d'eau,
(b) 35 à 50% en poids de diéthylèneglycol,
(c) 1,0 à 2,0% en poids d'un acide carboxylique aliphatique ayant 9 à 12 atomes de carbone,
(d) 12 à 16% en poids d'un agent hydrosoluble de type poly(alkylène-oxyde) réglant la viscosité,
(e) 1,4 à 3,5% en poids d'au moins un inhibiteur de corrosion du type amine et
(f) 0,04 à 0,1% en poids d'un désactivateur de métaux.
10. Fluide suivant la revendication 9, dans lequel l'agent réglant la viscosité du type poly(alkylène-oxyde) a une viscosité de 40 000 à 60 000 mm^2/s à 100° C et comprend 70 à 80% en poids de groupes oxyde d'éthylène.

Ansprüche

1. Energieübertragungsflüssigkeit mit einer Viskosität von 10 bis 200 mm^2/s bei 40° C zur Übertragung mechanischer Energie durch Flüssigkeitsdruck in Systemen, die bei Drucken bis hinauf zu zumindest 345 bar arbeiten, enthaltend - bezogen auf das Gesamtgewicht der Flüssigkeit -
   (a) 30 bis 40 Gew.-% Wasser;
   (b) 35 bis 60 Gew.-% Diethylenglykol;
   (c) 0,8 bis 5 Gew.-% einer aliphatischen Carbonsäure mit 9 bis 12 Kohlenstoffatomen;
   (d) 10 bis 20 Gew.-% eines wasserlöslichen polymeren die Viskosität einstellenden Mittels;
   (e) 0,4 bis 4 Gew.-% zumindest eines Korrosionsinhibitors und
   (f) 0,01 bis 2 Gew.-% eines Metall-Desaktivators.

2. Flüssigkeit nach Anspruch 1, wobei das polymere die Viskosität einstellende Mittel ausgewählt ist aus Poly(alkylen-oxid)polymeren, Alkylenoxidaddukten von Alkylphenolen, Polyalkylmethacrylaten, Polyurethanen, Polyamidestern und Polyamidalkoxylaten.

3. Flüssigkeit nach Anspruch 1 oder 2, wobei der Korrosionsinhibitor zumindest einen Amin-Inhibitor enthält.

4. Flüssigkeit nach Anspruch 1 bis 3, wobei der Metall-Desaktivator ausgewählt ist aus Tolyltriazal, Benzotriazol, Mercaptobenzothiazol, Natriummercaptobenzothiazol, Dinatrium-2,5-mercaptothiadiazol, Mercaptobenzoimidazol und deren Gemische.

5. Flüssigkeit nach Anspruch 1 und 4, wobei das wasserlösliche polymere die Viskosität regelnde Mittel ein Poly(alkylenoxid)polymer ist.

6. Flüssigkeit nach Anspruch 5, wobei das Poly(alkylenoxid)-polymer ein statistisches Copolymer von Ethylenoxid und 1,2-Propylenoxid mit einer Viskosität bis zu 100 000 mm2/s bei 100° C ist.

7. Flüssigkeit nach Anspruch 1 bis 6, wobei die Carbonsäure eine lineare Carbonsäure mit 10 bis 12 Kohlenstoffatomen ist, bevorzugt Nonansäure, Decansäure, Neodecansäure, Undecansäure, Dodecansäure und deren Gemische.

8. Flüssigkeit nach Anspruch 1 bis 7, enthaltend eine Kombination von Morpholin und Isopropylaminoethanol als Amin-Korrosionsinhibitor.

9. Flüssigkeit nach Anspruch 1 bis 8, enthaltend - bezogen auf das Gesamtgewicht der Flüssigkeit -
   (a) 34 bis 37 Gew.-% Wasser,
   (b) 35 bis 50 Gew.-% Diethylenglykol,
   (c) 1 bis 2 Gew.-% aliphatische Carbonsäure mit 9 bis 12 Kohlenstoffatomen,
   (d) 12 bis 16 Gew.-% wasserlösliches Poly(alkylenoxid) als die Viskosität einstellendes Mittel,
   (e) 1,4 bis 3,5 Gew.-% zumindest eines Amin-Korrosionsinhibitors und
   (f) 0,04 bis 0,1 Gew.-% eines Metall-Desaktivators.

10. Flüssigkeit nach Anspruch 9, wobei das Poly(alkylenoxid) als die Viskosität einstellendes Mittel eine Viskosität von 40 000 bis 60 000 mm^2/s bei 100 °C besitzt und 70 bis 80 Gew.-% Ethylenoxidgruppen enthält.