

Flowback Surfactant KMA001S

1. Introduction

Surface active reagents were generally used in aqueous-based stimulation fluids to lower the interfacial tension that restricts fluid flow in the rock matrix. KMA001S surfactant lowers the capillary pressure by both improving the wettability of the pore throat and reducing the interfacial tension.

Both laboratory testing and field results have shown that KMA001S can provide superior cleanup due to the wetting properties and surface tension reduction that leads to lower capillary pressures. The use of KMA001S results in less swabbing time, faster cleanup and more complete recovery of the stimulation fluids.

2. Physical Properties and Hazards

Additives	Form	S.G.	Water Solubility	Health Hazard	Physical Hazard	pH
KMA001S	Light brownish liquid	1.00-1.05	Soluble	Eyes, skin, inhalation	Fire	N/A

3. Chemical Properties and Application

KMA001S promotes the cleanup of the fluid from the rock matrix because the contact angles resulting from the use of KMA001S are higher than those for other conventional cleanup surfactants. In addition, the surface and interfacial tension values from the use of KMA001S are also lower than most conventional surfactants used. This leads to significantly lower capillary pressures which reduces the force required to initiate flow of the stimulation fluid and therefore, KMA001S should provide better and quicker fluid recovery following a stimulation treatment.

KMA001S are compatible with all additives used in most matrix stimulation and acid fracturing fluids. Lab testing indicates that KMA001S can be used for temperature applications up to 350°F (177°C).

KMA001S can reduce the surface tension to as low as 22 Dynes/cm.

4. Treatment

The CMC value for KMA001S is low. However, 1-2 gal/Mgal is the generally recommended concentration for most stimulation fluids.

5. Packaging

KMA001S is supplied in 55 gallons high density polyethylene (HDPE) drums. Keep it away from extreme conditions such as places near flames or direct sunlight.

H₂S Scavenger KMA009

1. Introduction

Major problems are generally encountered when acidizing sour oil or gas wells. Sulfide scales or minerals presented in the formation or production tubular will react with acids to release H₂S, which is corrosive and hazardous. H₂S scavenger is generally required while acidizing sour gas or oil wells to inhibit corrosion and resolve safety concerns. H₂S scavenger KMA009 is used in acid fluids to control corrosion effect of H₂S that may present due to acid reaction with sulfide scales or formation minerals. KMA009 will remove H₂S in acids by reaction to form non-corrosive or non-hazardous compounds.

2. Physical Properties and Hazards

Additives	Form	S.G.	Water Solubility	Health Hazard	Physical Hazard	pH
KMA009	Colorless to light yellow liquid	1.05-1.15	Dispersible	Eyes, skin	Fire	N/A

3. Chemical Properties and Application

Sulfide minerals present in the formation or sulfide scales deposited at tubulars will react with acids while acidizing sour gas or oil wells. KMA009 is a mixture of organic compound that can be easily dispersed in acids, brines, or solvents. The active ingredients in KMA009 will react with H₂S to form stable and non-corrosive compounds.

KMA009 is effective in most acid systems such as HCl and mud acids. It can be used at temperature up to 350°F and for protection time up to 24 hours.

The loading of KMA009 depends on formation mineralogical property and scaling conditions of wellbore. The acidizing design must also include procedures to flush away produced gas from tubing or casing before acid comes in contact with formation or scales.

KMA009 is compatible with most additives in acids. It is also readily biodegradable and presents lower toxicity to organisms than other H₂S scavengers.

4. Treatment

Typical concentrations range from 2 to 10 Gal/1,000 Gal (2 to 10 L/m³) of acid. Laboratory testing is required to determine the optimum concentration that will provide enough protection time at well conditions.

5. Packaging

KMA009 is supplied in 55 gallons high density polyethylene (HDPE) drums or 265 gallons HDPE totes. Keep it away from extreme conditions such as places near flames or direct sunlight.

H₂S Scavenger Aid KMA009B

1. Introduction

One of the major problems that is generally encountered when acidizing sour oil or gas well is the production of H₂S. Sulfide scales or minerals presented in the formation or production tubular will react with acids to release H₂S, which is corrosive and hazardous. H₂S Scavenger and Scavenger Aid are generally required while acidizing sour gas or oil wells to inhibit corrosion and resolve safety concerns.

H₂S Scavenger Aid KMA009B is used in acid fluids in combination with H₂S Scavenger to control corrosion effect of H₂S that may be present due to acid reaction with sulfide scales or formation minerals. KMA009B will remove H₂S in acids by reaction to form non-corrosive or non-hazardous compounds.

2. Physical Properties and Hazards

Additives	Form	S.G.	Water Solubility	Health Hazard	Physical Hazard	pH
KMA009B	Colorless to yellowish liquid	1.06-1.11	Miscible	Eyes	Fire	8.5-9.5 (1%)

3. Chemical Properties and Application

Sulfide minerals present in the formation or sulfide scales deposited at tubulars will react with acids while acidizing sour gas or oil wells. KMA009B is a mixture of organic amino compounds that can be easily dispersed into acids, brines, or solvents.

KMA009B is effective in most acid systems such as HCl and mud acids. It can be used at temperatures up to 350°F and for protection time up to 24 hours.

The loading of KMA009B depends on the formation of mineralogical property and scaling conditions of wellbore. The acidizing design must also include procedures to flush away produced gas from tubing or casing before acid comes in contact with formation or scales. KMA009B is compatible with most additives in acids.

4. Treatment

Typical concentrations range from 2 to 10 Gal/1,000 Gal (2 to 10 L/m³) of acid. Laboratory testing is required to determine the optimum concentration that will provide enough protection time at well conditions.

5. Packaging

KMA009B supplied 55 gallons high density polyethylene (HDPE) drums. Keep it away from extreme conditions such as places near flames or direct sunlight.

SGA Iron Control Agent KMA022B

1. Introduction

The reaction of hydrochloric calcium carbonate is very vigorous and is even faster at very high temperature. This will result in the stimulation of the highest permeable area without stimulating other sections of the productive zone. To get a uniform stimulation of the entire target zone, several methods are employed, and diversion using an in-situ gelled acid is very effective.

In-situ gelled acids generally use a cationic polyacrylamide crosslinked with a trivalent metal ion such as iron. In the acidic medium, the metallic ion will not crosslink with the polymer. When the acid is spent it reacts with CaCO_3 and the pH will go up, resulting in very high viscosity for the fluid. This viscosity will help to divert the newly pumped acid into unstimulated zones and result in the uniform stimulation of the entire pay zone.

The metal crosslinked polyacrylamide is very viscous and needs to be broken down to low viscosity for the well to clean up and produce. The KMA022B added into the formulation at a pH above 5 will chelate with the crosslinked metal resulting in the de-crosslinking and breaking of the gel.

2. Physical Properties and Hazards

Additives	Form	S.G.	Water Solubility	Health Hazard	Physical Hazard	pH
KMA022B	Colorless liquid	1.10-1.15	Soluble	Toxic	Irritant	<1.5

3. Chemical Properties and Application

For the in-situ gelled acid system, KMA022B is mixed with the Cationic polyacrylamide and iron crosslinker solution. The resulting diverting acid is a thin solution. When the acid is spent, and the pH raises around 3, the metal crosslinks with the polymer and results in high viscosity. On further expenditure, at a pH above 5, the Iron Control Agent KMA022B will chelate with iron, and thus de-crosslinks the system resulting in the breakdown and loss of viscosity.

Normally, 15 to 28% HCl is pumped in stages with the in-situ gelled acid system to get a uniformly stimulated well-bore. KMA022B is dispersible in acids. KMA022B is compatible with most additives and acid systems. Lab testing is required when acids other than HCl based are used. Special attention is required for KMA022B design for sour gas (H_2S and CO_2) wells.

4. Treatment

Typical concentration of KMA022B used in the field ranges from 8 to 12 Gal/Mgal.

5. Packaging

KMA022B is supplied in 55 gallons high density polyethylene (HDPE) drums. Keep it away from extreme conditions such as places near flames or direct sunlight.

SGA Crosslinker KMA024

1. Introduction

The reaction of hydrochloric calcium carbonate is very vigorous and is even faster at very high temperature. This will result in the stimulation of the highest permeable area without stimulating other sections of the productive zone. To get uniform stimulation of the entire zone, several methods are employed, and diversion using an in-situ gelled acid is very effective.

In-situ gelled acids are generally a cationic polyacrylamide crosslinked with a trivalent metal ion crosslinker such as KMA024 is used. In the acidic medium, the metallic ion will not crosslink with the polymer. When the acid is spent, it reacts with CaCO_3 , the pH will go up, and results in very high viscosity. This viscosity will help to divert the newly pumped acid into unstimulated zones and result in the uniform stimulation of the entire pay zone.

The polyacrylamide crosslinked with KMA024 is very viscous and needs to be broken down to low viscosity for the well to produce. The KMA022B added in to the formulation at a pH above 5 will chelate with the crosslinked metal resulting in the de-crosslinking and breaking of the gel.

2. Physical Properties and Hazards

Additives	Form	S.G.	Water Solubility	Health Hazard	Physical Hazard	pH
KMA024	Red brown liquid	1.30-1.40	Soluble	Eyes, skin, mouth	Corrosive	< 1.5

3. Chemical Properties and Application

For the in-situ gelled acid system, iron crosslinker KMA024 is mixed with the cationic polyacrylamide and a breaker. The resulting diverting acid is a thin solution. When the acid is spent, and the pH rises to around 3, the metal crosslinker KMA024 reacts with the polymer and results in high viscosity. On further expenditure, at a pH above 5, the iron control agent KMA022B will calculate with iron, and thus de-crosslink the system resulting in low viscosity. Normally, 15% to 28% HCl is pumped in stages with the gelled acid system to get a uniformly stimulated wellbore. KMA024 is dispersible in acids. KMA024 is compatible with most additives and acid systems. Lab testing is required when acids other than HCl-based are used. Special attention is required for KMA024 design for sour gas (H_2S) wells.

4. Treatment

The minimum concentration of crosslinker KMA024 used in the field is 2.5 Gal/1,000 Gal.

5. Packaging

KMA024 is supplied in 55 gallons high density polyethylene (HDPE) drums. Keep it away from extreme conditions such as places near flames, direct sunlight and excessive moisture.

Acid Gelling Agent KMA027G

1. Introduction

KMA027G is an effective gelling agent for gelled acid systems. When high concentrations of this cationic polyacrylamide are used with acid, the fluid exhibits viscosity. If we need sufficient viscosity to divert the acid to untreated zones, crosslinking of KMA027G with trivalent metal crosslinkers such as iron is necessary. The viscosity of KMA027G developed in acids will lubricate the interface between tubular and pumping fluids and change the flowing status of the fluids, which leads to lower friction pressure.

2. Physical Properties and Hazards

Additives	Form	S.G.	Water Solubility	Health Hazard	Physical Hazard	pH
KMA027G	White liquid	1.05-1.15	Soluble	Eyes	Dust, water slick	6.0-7.0 (1%)

3. Chemical Properties and Application

KMA027G is a cationic polyacrylamide emulsion in oil that is used in delayed gelled acid formulations. It can be dispersed in acids continuously or batch mixed. KMA027G is compatible with most acid additives including surfactant, corrosion inhibitor, and iron control additives. Typically, the KMA027G concentration used for gelling acids ranges from 20 to 30 gpt and is dependent on the well bottom hole temperature. Formation damage caused by KMA027G is generally minimal because of the de-crosslinker used in the formulation to remove iron when the pH goes above 4 during acid spending.

4. Treatment

The 20 to 30 Gal/Mgal loading is generally used to make Delayed Gelled Acid. The loading level depends on the formation bottom hole temperature and the concentration of acid used. Typically, the higher the temperature is, the higher the loading level is required to achieve the required performance.

5. Packaging

KMA027G is supplied in 55 gallons high density polyethylene (HDPE) drums or 265 gallons HDPE totes. It should be stored in shaded areas with good ventilation. Keep it away from high temperature and direct sunlight.

Inhibitor Aid KMA030

1. Introduction

Destructive reactions between metals and acids cause serious corrosion problems in acidizing operations. Corrosion inhibitors are generally required in acids to minimize these destructive reactions without introducing adverse effect on reactions between acids and formations. For high temperature or chemically aggressive environment, inhibitor aid is also required to prevent tubulars and downhole tools from strong acid corrosion and pitting. KMA030 is an effective inhibitor aid used in hydrochloride and mud acid systems to prevent tubular or equipment from serious acid corrosion.

2. Physical Properties and Hazards

Additives	Form	S.G.	Water Solubility	Health Hazard	Physical Hazard	pH
KMA030	Colorless liquid	1.20-1.25	Soluble	Eyes, skin, inhalation	Fire	2.0-3.0 (1%)

3. Chemical Properties and Application

KMA030 is an organic acid which can be used for most strong acid systems to prevent tubular and tool materials from acid corrosion.

KMA030 is soluble in acids. The decomposition products from KMA030 at well conditions create a barrier between acids and metal surfaces and therefore corrosion chemical reactions are stopped. KMA030 is effective for most metals including carbon steel and chrome steel. It can also be used in most acids such as hydrochloride and hydro fluoride. Minimal corrosion and pitting problems are observed on tubulars and tools using acids containing KMA030. KMA030 is compatible with most additives and acid systems. Attention is required for KMA030 design if it is used for sour gas (H₂S and CO₂) wells or protection of special tubular or tool materials.

4. Treatment

1-10% Volume is typically enough for most cleanup and acidizing jobs. 3-5% Volume is considered the optimum concentration in most fluid design.

5. Packaging

KMA030 is supplied with 55 gallons high density polyethylene (HDPE) drums or 265 gallons HDPE totes. Keep it away from extreme conditions such as places near flames or direct sunlight.

High Temperature Inhibitor Aid KMA031

1. Introduction

Destructive reactions between metals and acids cause serious corrosion problems in acidizing operations especially at high temperatures. Corrosion inhibitors are generally required in acids to minimize these destructive reactions without introducing adverse effect on reactions between acids and formations. For high temperature or chemically aggressive environment, inhibitor aid is also required to prevent tubulars and downhole tools from strong acid corrosion. KMA031 is an effective inhibitor aid used in hydrochloride and mud acid systems to prevent tubular or equipment from serious acid corrosion at very high temperatures.

2. Physical Properties and Hazards

Additives	Form	S.G.	Water Solubility	Health Hazard	Physical Hazard	pH
KMA031	Colorless to white crystals	2.55-2.75	Soluble	Eyes, skin, inhalation	Fire	7.0-8.0 (1%)

3. Chemical Properties and Application

KMA031 is an inorganic salt which can be used in most strong acid systems to prevent tubular and tool materials from acid corrosion at very high temperatures.

KMA031 is soluble in acids. KMA031 is effective for most metals including carbon steel and chrome steel. It can also be used in most acid systems made using hydrochloride. Very low corrosion and pitting problems are observed on tubulars and tools using acids containing KMA031.

KMA031 is compatible with most additives and acid systems. Attention is required for KMA031 design if it is used for sour gas (H₂S and CO₂) wells or protection of special tubular or tool materials.

4. Treatment

5 to 30 lbs/1000 gal is the typical concentration of the Corrosion Inhibitor Aid used in most acidizing jobs. A lab test at the BHST is highly recommended before any acid treatment using this additive.

5. Packaging

KMA031 is supplied in 25 kg plastic lined paper bags. Keep it away from extreme conditions such as places near flames, direct sunlight and moisture.

Corrosion Inhibitor KMA034C

1. Introduction

KMA034C is quinoline quaternary ammonium salt, acetylenic alcohols, 2-benzoylallyl alcohol, and fatty alcohol polyoxyethylene ether based and the mixture in aqueous alcohol solvent system. It has excellent performance even at bottom hole temperatures (BHST) up to 400°F, and the higher temperature the more stable it performs.

2. Physical Properties and Hazards

Additives	Form	S.G.	Water Solubility	Health Hazard	Physical Hazard	pH
KMA034C	Dark brown liquid	0.92-0.97	Soluble	Mucosa, eye and skin	None	3.0-7.0

3. Chemical Properties and Application

KMA034C is a high concentration acid corrosion inhibitor, which can be used in 5% to 28% HCl solutions, gelling acid, crosslinked acid and mud fluid systems, and with low dosage ratio. KMA034C performs excellent dispersibility in water and acid fluids, resulting in good inhibitor distribution and protection.

Organic acid-based intensifier is recommended to enhance the protection when applied temperature higher than 350°F. Intensifiers such as formic acid, formamide or potassium iodide is helpful for lower dosage ratio and high temperature.

4. Treatment

The recommended concentration range is 2 to 35 Gal/1,000 Gal (2 to 35 L/m³) of the total acid blend. Concentration is dependent on acid type, strength, bottom hole temperature, contact time, and additional additives. By adding KMA034C with the water during the loading operation, the product can be better dispersed in the resultant acid solution.

5. Packaging

KMA034C is packed in 55 gallons HDPE drums or 265 gallons HDPE totes. Keep it away from extreme conditions such as places near flames or direct sunlight.