



Legend™ Stimulation Fluid Packages

PRODUCT PORTFOLIO

multi-chem®
A HALLIBURTON SERVICE

Enhance Production with Multi-Chem's Stimulation Fluids



Multi-Chem's stimulation chemical portfolio includes a comprehensive array of both standard and custom-formulated chemicals, along with integrated fluid systems, for every well stimulation challenge.

Stimulation treatments, such as hydraulic fracturing or acidizing, are a critical step in oil and gas well development and are used to improve or restore hydrocarbon productivity. This enhanced production is needed to improve well economics and provide a return on investment.

Multi-Chem's experienced team provides optimization of stimulation fluids through proper chemical selection and dosage. Application experience and thorough compatibility testing provides chemical and fluid recommendations that ensure the selected chemicals are compatible, effective, and correctly dosed to prevent under or overtreatment. Delivering on these metrics allows for optimized and efficient chemical spend.

Biocides

Biocides are used in stimulation fluids to reduce microbial activity. Bacteria contamination can cause microbiologically-induced corrosion (MIC), biomass accumulation, biogenic sulfide production, oil carryover and polymer degradation. Multi-Chem offers a wide variety of biocide options to keep microbial counts under control.

- » B-8510
DBNPA; oxidizing biocide which provides short-term protection and fast speed of kill
- » B-8520
Oxazolidine; organic "preservative" biocide which provides long-term protection and slow speed of kill
- » B-8614
14% glutaraldehyde – 2.5% ADBAC quat blend; combo biocide which provides long-term protection and medium speed of kill
- » B-8625
25% glutaraldehyde; organic biocide which provides medium-term protection and medium speed of kill
- » B-8626
25.7% glutaraldehyde – 12.5% ADBAC/DDAC quat blend; combo biocide which provides long-term protection and medium speed of kill
- » B-8630
30% glutaraldehyde; organic biocide which provides medium-term protection and medium speed of kill
- » B-8642
42.5% glutaraldehyde – 7.5% ADBAC quat blend; combo biocide which provides long-term protection and medium speed of kill
- » B-8650
50% glutaraldehyde; organic biocide which provides medium-term protection and medium speed of kill
- » B-8700
THPS – 20% active; organic biocide which provides medium-term protection and medium speed of kill
- » B-8800
THPS – 50% active; organic biocide which provides medium-term protection and medium speed of kill
- » B-8802
THPS-A (added surfactant) – 20% active; organic biocide which provides medium-term protection and medium speed of kill
- » B-8805
THPS-A (added surfactant) – 50% active; organic biocide which provides medium-term protection and medium speed of kill
- » B-8807
THPS-A (added surfactant) – 70% active; organic biocide which provides medium-term protection and medium speed of kill
- » B-8850
50% DDAC quaternary amine, winterized; organic "preservative" biocide which provides very long-term protection and slow speed of kill
- » B-8875
THPS – 75% active; organic biocide which provides medium-term protection and medium speed of kill
- » B-8900
50% DDAC quaternary amine; organic "preservative" biocide which provides very long-term protection and slow speed of kill

- » B-8901
Cocodiamine – 35% active winterized; provides long-term protection and slow speed of kill
- » B-8904
50% ADBAC quaternary amine; organic “preservative” biocide which provides very long-term protection and slow speed of kill
- » B-8905
50% ADBAC quaternary amine; organic “preservative” biocide which provides very long-term protection and slow speed of kill
- » B-8910
50% DDAC quaternary amine; organic “preservative” biocide which provides very long-term protection and slow speed of kill

Breakers

Breakers are used in stimulation fluids to decrease viscosity by breaking down polymer chains. This “broken” polymer is more easily returned to surface during flowback to minimize the amount of potentially damaging residue left in the formation.

- » LD-4075
Solid oxidizing breaker effective at temperatures from 120-180°F; may also be dissolved in water and pumped as a liquid; may be used with an activator at temperatures below 120°F
- » LD-4175
Liquid oxidizing breaker effective at temperatures above 120°F; may be used with an activator at temperatures below 120°F
- » LD-4375
Liquid oxidizing breaker recommended for polysaccharide-based, crosslinked gel systems at fluid temperatures from 75-200°F
- » LD-4475
Solid encapsulated oxidizing breaker designed for fluid temperatures of



120-140°F; slightly permeable coating allows delayed release of breaker into fluid

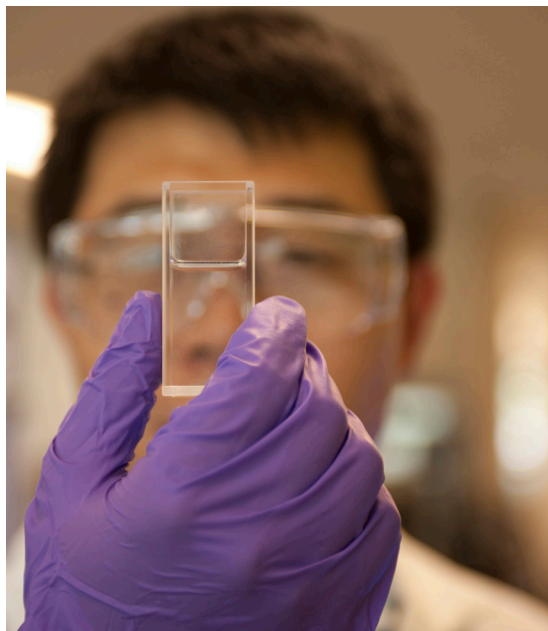
- » LD-4550
Solid oxidizing breaker specifically formulated to break friction reducer (FR) polymer; may also be dissolved in water and pumped as a liquid
- » LD-4575
Solid encapsulated oxidizing breaker designed for fluid temperatures of 140-200°F; slightly permeable coating allows delayed release of breaker into fluid
- » LD-4900
Liquid catalyst to activate oxidizing breakers lower than typical temperature limit
- » LD-4925
Liquid enzyme breaker for 80-140°F and pH up to 9.5
- » LD-4975
Solid enzyme breaker for 80-140°F and pH less than 8.5

Clay Control

Clay control chemicals are used in stimulation fluids to minimize damage caused by the interaction of the treatment fluid and formation clay particles which may be prone to swelling, dispersing and/or migrating. Multi-Chem offers both temporary and permanent clay control measures.

- » LD-6120
Liquid inorganic potassium salt solution; temporary clay swelling control through ion exchange
- » LD-6240
Liquid inorganic salt solution; temporary clay swelling control through ion exchange
- » LD-6250
Medium charge density cationic polymer that permanently adsorbs onto the anionic clay face to prevent swelling and sloughing; highly effective and efficient

- » LD-6360
Organic cation used to prevent clay destabilization and swelling; contains 27% choline chloride, blocking the migration and adsorption of water; contains 27% choline chloride
- » LD-6370
Organic cation used to prevent clay destabilization and swelling; contains 75% choline chloride
- » LD-6380
Water-soluble cationic polymer which preferentially adsorbs onto clay and silica surfaces to prevent swelling and migration; incompatible with most anionic surfactants



Crosslinkers

Crosslinkers are used in stimulation fluids to interconnect polymer chains, thus increasing the molecular weight and fluid viscosity to allow better proppant transport and fracture geometry.

- » LD-3125
Water-based suspension of borate mineral used to provide delayed crosslinking of guar-based polymer in Legend™ G2000 and H2000 fracturing fluids
- » LD-3225
Concentrated solution of borate crosslinking agent used to provide non-delayed crosslinking of guar-based polymer in various Legend fracturing fluids
- » LD-3425
Concentrated solution of borate crosslinking agent with incorporated pH component to provide instant crosslinking of guar-based polymer in Legend G3000 fracturing fluids
- » LD-3525
Concentrated solution of borate crosslinking agent with incorporated pH component to provide delayed crosslinking of guar-based polymer in Legend G4000 fracturing fluids



- » LD-3625
Delayed zirconate-based crosslinker activated by temperature and used in the Legend G5000 fracturing fluids

Friction Reducers

Friction reducers (FR) are used in stimulation fluids to reduce pipe friction pressure generated during hydraulic fracturing treatments. Multi-Chem's line of FR products exhibits excellent storage stability, is tolerant to wide temperature fluctuations, can be viscosified to improve proppant transport, and is effective in fresh water to produced water up to 300,000 ppm TDS.

- » LD-2000
Concentrated anionic FR for fresh

water and produced water up to 60,000 ppm TDS

- » LD-2100
Anionic FR for fresh water and produced water up to 60,000 ppm TDS
- » LD-2125
Cost-effective anionic FR for fresh water and produced water up to 15,000 ppm TDS
- » LD-2150
Cationic FR for fresh water and produced water up to 70,000 ppm TDS
- » LD-2250
Dual-component cationic FR for produced water from 50,000 to 100,000 ppm TDS
- » LD-2350
Dual-component cationic FR for

produced water from 100,000 to 200,000 ppm TDS

- » LD-2450
Dual-component cationic FR for produced water from 200,000 to 300,000 ppm TDS
- » LD-2600
Cost-effective anionic FR for fresh water applications
- » LD-2725
Anionic FR for fresh water and produced water up to 100,000 ppm TDS
- » LD-2775
Anionic, viscosifying FR for fresh water and produced water up to 100,000 ppm TDS
- » LD-2800
Cationic FR for fresh and produced water up to 100,000 ppm TDS
- » LD-2850
Cationic FR for fresh water and produced water up to 200,000 ppm TDS
- » LD-2875
Cationic FR for fresh water and produced water up to 200,000 ppm TDS
- » LD-2900
Premium anionic FR for fresh water and produced water up to 30,000 ppm TDS; excellent proppant transport at elevated concentrations
- » LD-2950
Premium cationic FR for fresh water and produced water up to 250,000 ppm TDS; excellent proppant transport at elevated concentrations
- » LD-2975
Anionic FR for fresh water and produced water up to 150,000 ppm TDS

Gel Stabilizers

Gel stabilizers are used in stimulation fluids to allow crosslinked fluid systems to remain stable at high temperatures and extended pump times.

- » LD-6500
Liquid gel stabilizer which increases

temperature stability of gelled, aqueous-based fluids above 230°F

Gelling Agents

Gelling agents are used in stimulation fluids to add viscosity in order to lower friction pressure by changing fluid from turbulent to laminar flow regime, lower fluid loss, create fracture width, and/or transport proppant.

- » LD-1300
Liquid gel concentrate of high yield guar polymer developed for rapid on-the-fly hydration
- » LD-1800
Liquid gel concentrate of double-derivatized guar polymer, carbo-methylhydroxypropyl guar (CMHPG) developed for rapid on-the-fly hydration; derivatization reduces the amount of residue associated with the polymer

pH Control

pH control chemicals are used in stimulation fluids to adjust the hydration rate, crosslinking rate, gel stability, and gel break time.

- » LD-5100
Buffering agent used to lower pH of fluids to aid in hydration
- » LD-5200
pH control agent used to raise pH quickly and temporarily
- » LD-6620
Buffering agent used to raise pH of fluids to aid in crosslinking

Scale Inhibitors

Scale inhibitors are used in stimulation fluids to minimize scale precipitation that may occur when stimulation fluids come in contact with reservoir fluids. Multi-Chem has vast application experience and technical expertise

to select the best solution based on the treatment and reservoir fluid characteristics. The scale inhibitors are thermally stable to a minimum of 350°F with tagged, non-tagged, neutralized, non-neutralized, polymeric and phosphonate-based options available.

- » LD-7715
Non-tagged polymeric scale inhibitor; inhibits broad spectrum of scales including CaCO_3 , BaSO_4 , CaSO_4 , FeCO_3 , and FeS
- » LD-7720
Neutralized phosphonate scale inhibitor; inhibits a broad spectrum of scales with particularly excellent inhibition of BaSO_4 and CaSO_4 scales
- » LD-7725
Water-based blend of polymers designed to prevent mineral scale deposits (such as calcium carbonate, calcium sulfate and barium sulfate) and is traceable with a simple field test
- » LD-7730
Non-neutralized phosphonate scale inhibitor effective on calcium, magnesium, strontium, barium or iron scales designed for squeezes due to solubility characteristics
- » LD-7735
Water-based phosphonate scale inhibitor designed to provide multifunctional scale inhibition over a wide temperature range; has excellent calcium and iron tolerance designed for continuous or batch treatment
- » LD-7740
Tagged polymeric scale inhibitor designed for use for more environmentally sensitive regions; inhibits broad spectrum of scales including CaCO_3 , BaSO_4 , CaSO_4 , FeCO_3 , and FeS
- » LD-7745
Tagged polymeric scale inhibits broad spectrum of scales including CaCO_3 , BaSO_4 , CaSO_4 , FeCO_3 , and FeS
- » LD-7755
Non-tagged polymeric scale inhibitor;

high calcium tolerance; inhibits broad spectrum of scales including CaCO_3 , BaSO_4 , CaSO_4 , FeCO_3 , and FeS

» LD-7765

Water-based phosphonate scale inhibitor designed to provide multifunctional scale inhibition over a wide temperature range

» LD-7785

Fully neutralized water-based phosphonate scale inhibitor designed to provide multifunctional scale inhibition over a wide temperature range

» LD-7790

Phosphonate scale inhibitor neutralized with non-metal cation; inhibits broad spectrum of scales

» LD-7795

Solid phosphonate scale inhibitor placed during proppant stages for slow, prolonged release; effective up to 400°F

enable more liquids to be returned to surface. Multi-Chem has vast application experience and technical expertise to select the best solution based on the reservoir and produced fluid characteristics.

» Ascend™ Surfactant Solution

Revolutionary, dual-component surfactant solution that incorporates a sacrificial agent to allow surfactant to penetrate further into the rock matrix

» LD-7200

Nonionic, non-emulsifying surfactant formulated for both dry and liquids-rich formations.

» LD-7205

Anionic surfactant formulated for liquids-rich formations which can be used in hydraulic fracturing and matrix acidizing

» LD-7250

Amphoteric surfactant with low CSI score; very good for oils with asphaltenes

» LD-7275

Anionic and nonionic blended surfactant formulated for liquids-rich formations

» LD-7285

Nonionic surfactant formulated for dry gas formations

» LD-7310

Anionic and nonionic blended surfactant formulated for liquids-rich formations

» LD-7330

Winterized anionic and nonionic blended surfactant formulated for liquids-rich formations

» LD-7415

Anionic surfactant formulated for liquids-rich formations; winterized version usable to -40°F

» LD-7535

Anionic and nonionic blended surfactant formulated for liquids-rich formations

» LD-7625

Nonionic, non-emulsifying non-winterized surfactant formulated for dry and liquids-rich formations; good for applications at 35°F and above

» LD-7635

Nonionic, non-emulsifying surfactant formulated for dry and liquids-rich formations with low CSI scores and relatively high flash point compared to similar products

» LD-7645

Nonionic, non-emulsifying surfactant formulated for dry and liquids-rich formations with low CSI scores and

Surfactants

Surfactants are used in stimulation fluids to lower the surface tension and capillary pressure to minimize trapping of the aqueous phase in the matrix and



relatively high flash point compared to similar products

- » LD-7645W
Nonionic, non-emulsifying winterized surfactant to extend lower temperature tolerance; low CSI score and formulated for dry and liquids-rich formations
- » LD-7655
Nonionic, non-emulsifying surfactant formulated for dry and liquids-rich formations with low CSI scores and relatively high flash point compared to similar products
- » LD-7665
Nonionic, non-emulsifying surfactant formulated for dry and liquids-rich formations with low CSI scores and relatively high flash point compared to similar products
- » LD-7665W
Nonionic, non-emulsifying winterized surfactant to extend lower temperature tolerance; low CSI score and formulated for dry and liquids-rich formations



BREAKTHROUGH FRACTURING FLUID SYSTEMS PERFORM IN ALL TYPES OF RESERVOIRS AND TEMPERATURES FROM 100°F TO 400°F

Crosslinked Fluid Systems

Crosslinked fluid systems are combinations of chemicals that create a highly viscous, stable fluid in order to transport proppant into the created fracture geometry. Through specialized gel manufacturing methods and chemical mixtures that include unique combinations of crosslinker and breaker technologies, these breakthrough fracturing fluids perform in all types of reservoirs and in temperatures ranging from 100°F to 400°F

- » Legend G2000 System
Cost-effective delayed borate crosslinked fluid utilizing guar polymer; stable up to 200°F; good shear stability and adjustable crosslinked time; compatible with a wide range of water sources
- » Legend G3000 System
Instant borate crosslinked fluid utilizing guar polymer; stable up to 150°F; efficient fluid system with crosslinked viscosities achieved at relatively lower gel loadings; excellent proppant transport
- » Legend G4000 System
Delayed borate crosslinked fluid utilizing guar polymer; stable up to 200°F; efficient fluid system with crosslinked viscosities achieved at relatively lower gel loadings; excellent proppant transport
- » Legend G5000 System
Delayed zirconate crosslinked fluid utilizing double-derivatized CMHPG polymer; excellent clean up and performance at high temperature; stable up to 400°F



Sales of Halliburton products and services will be in accord solely with the terms and conditions contained in the contract between Halliburton and the customer that is applicable to the sale.

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