



# Lubrizol Well Stimulation

## Acidizing Additives Application Guide

Product Name	Chemical Type	Key Function	Primary Application
<b>Acid Corrosion Inhibitors</b>			
ENVIROHIB™ 600	A dispersion package of quinoline-quaternary surfactants and a synergistic blend of an acetylenic alcohol replacement	Environmentally-friendly corrosion inhibitor for use in hydrochloric (HCl) and hydrochloric-hydrofluoric (HCl-HF) acids for well temperatures up to 300°F (149°C). Typically used in higher acid concentrations. Nonylphenol, DMF and acetylenic alcohol free.	Typical concentration range is 1-20 gal/1000 gallons.
ENVIROHIB™ 2001	Thiourea polymer based corrosion inhibitor	Environmentally-friendly corrosion inhibitor for use in hydrochloric (HCl) and hydrochloric-hydrofluoric (HCl-HF) acids for well temperatures up to 300°F (149°C). Effective in lower acid concentrations and in organic acids. Nonylphenol, DMF, arsenic and quaternary amine free.	Typical concentration range is 1-20 gal/1000 gallons.
ENVIROHIB™ HT	Thiourea polymer based corrosion inhibitor	Environmentally-friendly corrosion inhibitor for use in hydrochloric (HCl) and hydrochloric-hydrofluoric (HCl-HF) acids for well temperatures higher than 300°F (149°C). Effective up to 275°F (140°F) without an intensifier. Nonylphenol, DMF, arsenic, BTEX and quaternary amine free.	Typical concentration range is 1-20 gal/1000 gallons.
<b>Acid Corrosion Inhibitor Intensifiers</b>			
All F90	Formic acid	Enhances performance of Envirohib™ 600 and Envirohib™ 2001 at temperatures over 250°F (121°C) or with Envirohib™ HT at temperatures < 300°F (149°C).	Typical concentration range is 20-80 gal/1000 gallons.
<b>Acid Emulsifier</b>			
AE 8	Polyolefin amide alkeneamine blend	Used to prepare high acid internal phase emulsions with xylene, diesel and mineral oil to retard the rate of reaction for deeper penetration of live acid into the formation.	Typical concentration range is 2-10 gal/1000 gallons of total emulsified fluid.
<b>Anti-Sludging Agent</b>			
AS 10	Anionic, surfactant based anti-sludge additive	Prevents asphalt sludge and emulsions when treating with HCl acid. Promotes rapid return of the treating fluid to the wellbore on flowback.	Typical concentration ranges from 1-5 gal/1000 gallons.
<b>Acid Gelling Agent</b>			
StimThix A200	Liquid emulsion polymer	Base gelling agent for cross-linked hydrochloric acid (HCl) systems. Used in matrix acidizing or acid fracturing applications up to at least 250°F (121°C).	Typical concentration range is 0.5-2 gal/1000 gallons.

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<b>Iron Control Agents</b>			
ICA 400	Organic salt solution	Prevents the precipitation of iron by sequestering both ferric and ferrous iron into a soluble and stable colloidal suspension. Effective in temperatures > 200°F (93°C).	Typical concentration range is 2-10 gal/1000 gallons.
ICA 501	Citric solution	Controls secondary iron precipitation. Effective in temperatures up to 200°F (93°C).	Typical concentration range is 5-50 gal/1000 gallons.

<b>Foaming Agents</b>			
AMPHOAM® 75	Anionic surfactant	Provides stable foams in water and acid at elevated temperatures. Does not plate out on the pipe or formation which assists in flowback and reduces well cleanup time.	Typical concentration range is 1-10 gal/1000 gallons.
CHEMBETAINE™ CAS	Cocoamidopropyl sultaine	High foaming surfactant and foam stabilizer that is used to improve water injectivity. Foam booster and wetting agent.	Typical concentration range is 1-10 gal/1000 gallons.

<b>Non-Emulsifiers</b>			
NE 006	Nonionic water soluble non-emulsifier	Prevents the formation of emulsions within a broad range of crude oils and condensates.	Typical concentration range is 1-3 gal/1000 gallons.
NE 40	Environmentally friendly nonionic water soluble non-emulsifier	Prevents the formation of emulsions within a broad range of crude oils and condensates. For use in treatments where a low freeze point is not required. Freeze point is 23°F (-5°C).	Typical concentration range is 0.5-1.0 gal/1000 gallons.
NE 201T	Nonyl phenol resin with additional surfactants	Functions as a non-emulsifier and as a surface and interfacial tension reducer.	Typical concentration range is 1-2 gal/1000 gallons.
NE 50	Cationic surfactant	Functions as a non-emulsifier and as a surface tension reducer. Possesses excellent detergent properties to clean fracture and wellbore areas.	Typical concentration range is 1-3 gal/1000 gallons.

<b>Fluid Recovery Surfactant</b>			
FRS 200	Alcohol ethoylete-based nonionic surfactant	Used for water and acid treatments in low temperature applications up to 150°F (66°C).	Typical concentration range is 0.5-2 gal/1000 gallons.

<b>Acid Dispersant</b>			
CHEMBETAINE™ CAS	Cocoamidopropyl sultaine	Provides stability for acid packages and aids in dispersing mineral oils and acid.	Typical concentration range is 2-5 gal/1000 gallons.

<b>Hydrogen Sulfide Control</b>			
SULFA-CLEAR™ 8640	Aqueous cyclic tertiary amine polymer blend	Used as a sulfide scavenger. Also provides odor control due to unique mercaptan scavenging capability.	Typical concentration range is 10-80 gal/1000 gallons depending on acid strength.