



Weatherford®

Controlled Pressure Drilling®

KLEAN-FOAM® Foamer-Surfactant Drilling-Fluid System

Weatherford's *KLEAN-FOAM* foamer-surfactant drilling-fluid system is a water-based, recyclable, high-foam, corrosion-inhibitive system that provides superior tubular-good protection in aerated applications, such as underbalanced and air drilling. Successfully used in over 200 underbalanced wells, the patented system has excellent cutting-carrying capacity, influx resistance, and high recyclability.

The system consists of the *KLEAN-FOAM* blended foaming surfactant, Weatherford's *CORRFOAM*® corrosion inhibitor (a class 1 anodic inhibitor), and Weatherford's *KLEAN-BREAK*™ defoamer.

The *KLEAN-FOAM* blend of fresh and salt water and foam-boosting surfactants gives the system broad applicability. The blend creates a robust foam that is recyclable many times with little addition of treatment chemicals. The *KLEAN-BREAK* defoamer temporarily disables the foaming agent so that the system can pass through the separator and shale shaker for solids removal. Because the defoamer does not permanently disable the foaming agent, the system is recyclable. With the addition of the *CORRFOAM* inhibitor, the system protects against oxygen-, chloride-, and acid-induced corrosion to extend tubular life.

The system can sustain foaming in fresh-to-saturated field brine or production water and in the presence of hydrocarbons. The system can be adapted for drilling in acid-gas, hydrogen sulfide (H₂S) and carbon dioxide, environments. The system can also be adapted for drilling in reactive shale by incorporating Weatherford's *DIONIC*® water-soluble polymer 900, NCL-100 quaternary chloride compound, or CC-120 shale inhibitor.

The system can be applied as a mist or fully integrated, polymer-enhanced, stable foam. The mist can absorb up to 500 bbl/hr (79 m³/h) of water and coat drill cuttings to prevent mud-ring formation. As foam, the system can stabilize downhole pressures and reduce cutting-bed formation by extending the foam stability.

How the *KLEAN-FOAM* System Works

In mist and foam underbalanced drilling, compressed air is usually injected into the drilling fluid. Consequently, the high oxygen concentration of the fluid increases the potential for oxygen-induced corrosion in downhole equipment and drillpipe.

The *KLEAN-FOAM* system can be continuously injected or batch treated into the drilling-fluid stream. The *KLEAN-FOAM* foamer-surfactant creates a robust foam stable in the presence of hydrocarbons, and the *CORRFOAM* inhibitor reacts with available oxygen to form a protective passivation layer on metal surfaces.

At the surface, the *KLEAN-BREAK* defoamer is injected upstream of the separator and shale shaker to disable the foaming agent temporarily so that the cuttings can be removed from the drilling fluid. After the removal, the system reconstitutes for recirculation through the wellbore.



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Applications

The system can be adapted to many drilling conditions:

- Mist, foam, and reactive shale
- Acid gases and high chlorides
- Low-pressure reservoirs
- Extended-reach horizontal wells

Features, Advantages and Benefits

- The system can be easily injected into the fluid stream without special mixing or handling, providing a safe, simple application on the rig.
- The cost-effective system is recyclable and biodegradable, providing environmental protection.

Specifications

Application	Concentration ¹ (% volume/volume)			
	KLEAN-FOAM Foamer-Surfactant	CORRFOAM® Class 1	Shale Stabilization (DIONIC® 900, CC-120, or NCL-100)	Weatherford's WFT 9801 Hydrogen Sulfide Scavenger
Mist	0.10 to 0.50	0.05 to 0.20	—	—
Foam	0.25 to 1.00	0.10 to 0.50	—	—
Shale	0.10 to 1.00	0.05 to 0.50	0.25 to 2.00	—
Acid gas	0.10 to 1.00	0.05 to 0.50	—	Depends on H ₂ S concentration

¹The pH of the system is maintained at 9.5 to 10.5 with caustic soda, soda ash, potassium carbonate, and lime. For shale drilling, the pH is maintained at neutral (~7.0) to reduce reactive shale swelling.



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