Stepan
OILFIELD SOLUTIONS

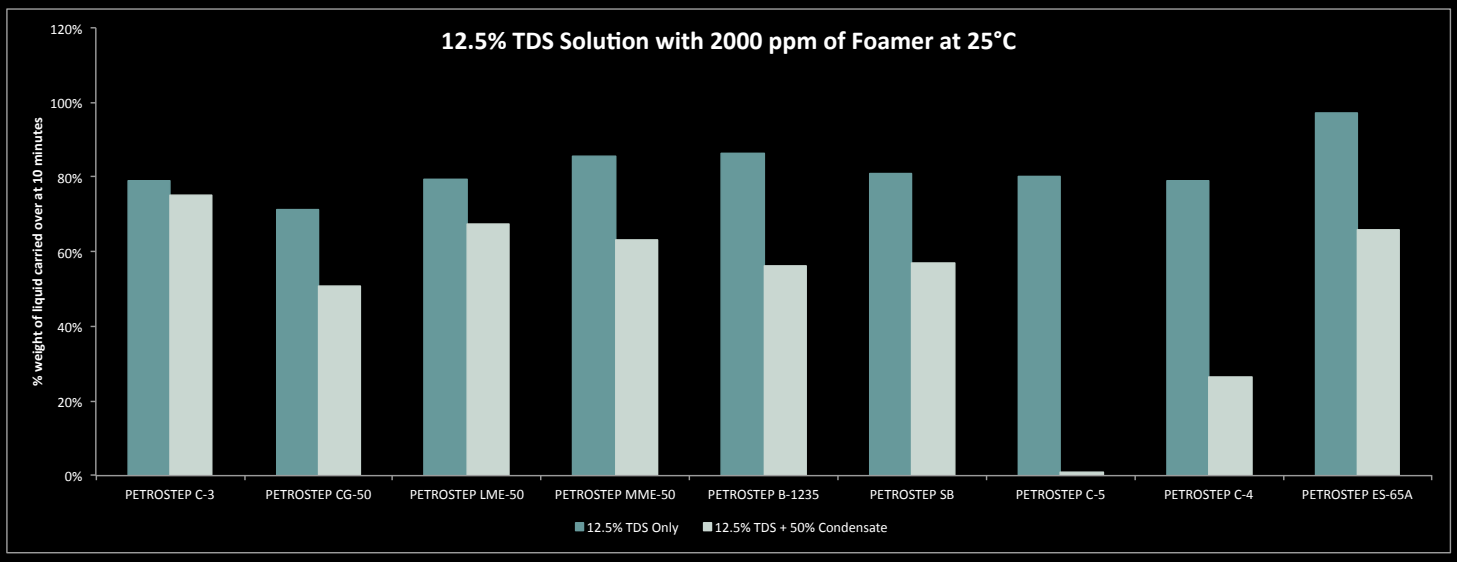
PETROSTEP® OILFIELD FOAMERS

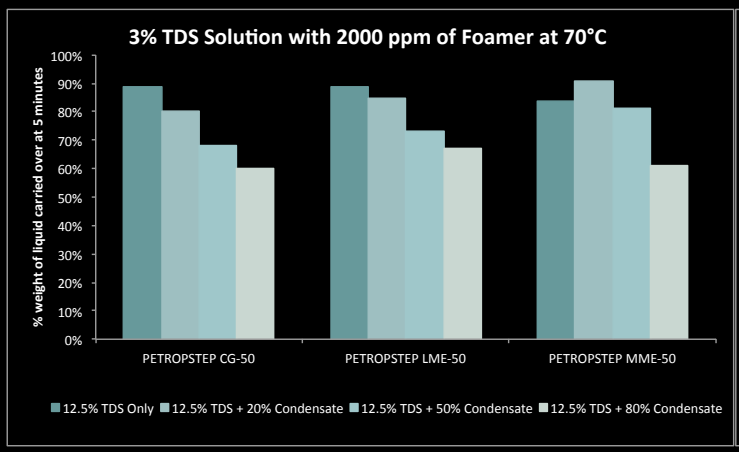
PRODUCT	APPLICATIONS	CHEMICAL THERMAL STABILITY	BRINE TOLERANCE (% WEIGHT)	CONDENSATE TOLERANCE (% VOLUME)	% SOLIDS	POUR POINT	FLASH POINT
AMPHOTERICS							
PETROSTEP C-3	BETAINE DERIVED FROM CAPRYLATE/ CAPRATE METHYL ESTERS, USED IN A WIDE RANGE OF FOAMING APPLICATIONS. FOAMS EXCEPTIONALLY WELL IN HIGH BRINE SYSTEMS.	GOOD	EXCELLENT	EXCELLENT	44	-10°C	>94°C
PETROSTEP CG-50	BETAINE COMPATIBLE WITH MOST OTHER SURFACTANTS. EXHIBITS GOOD FOAMING IN A VARIETY OF CONDITIONS.	GOOD	EXCELLENT	GOOD	44	-8°C	>94°C
PETROSTEP LME-50	BETAINE WITH HIGH BRINE TOLERANCE, COMPATIBLE WITH MOST OTHER SURFACTANTS. CAN POTENTIALLY BE USED IN GAS WELL DELIQUIFICATION, DRILLING AND COMPLETION FLUIDS. ALSO EXHIBITS A LOW POUR POINT.	GOOD	EXCELLENT	EXCELLENT	43	-36°C	>94°C
PETROSTEP MME-50	BETAINE THAT EXCEPTIONALLY WELL IN A BROAD RANGE OF CONDENSATE AND BRINE SYSTEMS.	GOOD	EXCELLENT	EXCELLENT	41	-9°C	>94°C
PETROSTEP B-1235	BETAINE WITH HIGH THERMAL STABILITY.	EXCELLENT	EXCELLENT	GOOD	38	-10°C	>94°C
PETROSTEP SB	HYDROXYSULTAINE COMPATIBLE WITH MOST OTHER SURFACTANTS AND EXHIBITS GOOD FOAMING IN A VARIETY OF CONDITIONS.	GOOD	EXCELLENT	GOOD	50	-12°C	>94°C
ALPHA OLEFIN SULFONATES							
PETROSTEP C-1	CAN BE USED AS A DRILLING FOAMER WITH EXTENDED STABILITY IN FRESH-WATER APPLICATIONS.	GOOD	FAIR	GOOD	40	-4°C	>94°C
PETROSTEP C-5	CAN BE USED IN GAS WELLS AS A FOAMER OR DRILLING FOAMER BASE. EXCELLENT FOAMER IN FRESHWATER, LOW BRINE SYSTEMS, AND HARD AND SOFT WATER.	GOOD	GOOD	GOOD	46	-8°C	>94°C
ALKYL ETHER SULFATES							
PETROSTEP C-4	CAN BE USED FOR A VARIETY OF APPLICATIONS INCLUDING FOAM DRILLING, FOAM FRACTURING AND UNLOADING GAS WELLS.	GOOD	GOOD	GOOD	50	-25°C	28°C
PETROSTEP ES-65A	COMPATIBLE WITH MOST OTHER SURFACTANTS. PERFORMS WELL OVER A BROAD RANGE OF HYDROCARBON AND BRINE LEVELS. THERMAL STABILITY IS LIMITED TO LESS THAN 93°C AND IS ADVERSELY AFFECTED BY LOWER pH.	GOOD	EXCELLENT	GOOD	65	<-21°C	28°C

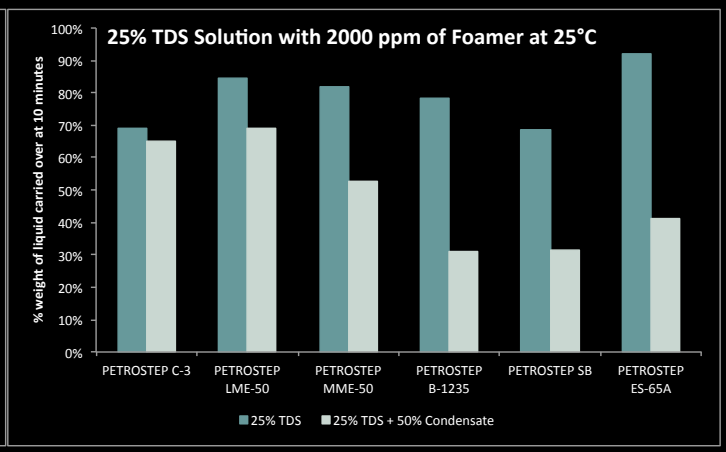
Solids: Percent of non-volatiles in the surfactant.
Ranking: Excellent>Good>Fair. Ranking is based on comparative performance results of Stepan's Foam Column tests.
Brine Tolerance: Relative ability of the surfactant treated at 2,000 ppm to foam in a brine solution.
Pour Point: Lowest possible temperature at which a surfactant can still be pourable.
Flash Point: Temperature at which a surfactant's vapor will cause combustion (PMCC Method).
Condensate tolerance: Relative ability of the surfactant treated at 2,000 ppm to foam in fresh water and condensate mixed solution.
Condensate used for tests: Dearomatized distillates with a density of 0.77 g/mL.
Condensate Tolerance: Ability of the surfactant to foam in the presence of condensate (low aromatic mineral spirits).
Temperature Stability: Relative ability of the surfactant to be stable in a high-temperature environment. It is based on the temperature at which the surfactant decomposes and the chemical breaks down.

Foam Column Test

The Foam Column test is designed to simulate downhole foam performance utilizing a specialized 3-inch reflux column. A nitrogen gas line is connected at the bottom of the column through an adaptor containing a glass frit to generate foam with the surfactant/brine/condensate solution. The test is run at 25°C for 10 minutes or 70°C for 5 minutes (with 2,000 ppm active surfactant in 3%, 12.5% and 25% total dissolved solids (TDS) brine solution). Low aromatic mineral spirits are used to mimic the effect of the condensate. The percent carry-over (brine plus condensate) is then calculated to replicate how well the PETROSTEP oilfield foamers remove accumulated fluids. The higher the percent carry-over, the better the performance of the foamer. Stepan's method is used as a screening tool and recommendations are based on specific applications.







For more information about the PETROSTEP oilfield foamers and other products, email oilfield@stepan.com or contact your Stepan Oilfield Solutions sales representative.

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