



FLOWBACK AID SURFACTANTS

The flowback aid surfactants product line provides excellent surface tension reduction, resulting on maximum fracking fluid removal and avoiding emulsion formation at initial oil and gas recovery. These nonionic surfactants also improve the flow of hydrocarbons by keeping the surfaces water-wet.

High cloud point, low contact angle, very low emulsifying tendency

Product	Chemical Description	Active Content	HLB	Freezing Point (°F)	Cloud Point ¹ (°F)	Surface Tension ² (Mn/M)	Cmc, 77°F (G.l ⁻¹)
ALKOMOL® L 603	Lauryl Alcohol Alkoxylate	>99%	9.3	23	103.5	31.22	0.0279
ALKONAT® L 50	Lauryl Alcohol Ethoxylate	>99%	10.8	44.3	156.9 ³	28.18	0.021
ALKONAT® L 70 WA	Lauryl Alcohol Ethoxylate	90%	12.4	53.6	127.4	28.92	0.032
ALKOSYNT® 9160	C9-11 Alcohol Ethoxylate	>99%	12.5	37.4	131.7	28.09	0.392
ALKOSYNT® ID 60	Isodecyl Alcohol Ethoxylate	>99%	12.5	<6.8	149.4	26.47	0.773
ALKOSYNT® IT 90	Isotridecyl Alcohol Ethoxylate	>99%	13.4	35.6	145.4	27.42	0.060
ULTRAMINA® TA 120	Tallow Fatty Amine Ethoxylate	>98%	13.3	<6.8	>197.6	36.80	0.057

¹110%wt in water; ²1%v surfactant in 2%wt KCl brine; ³20%p/p em EBDEG 25%.

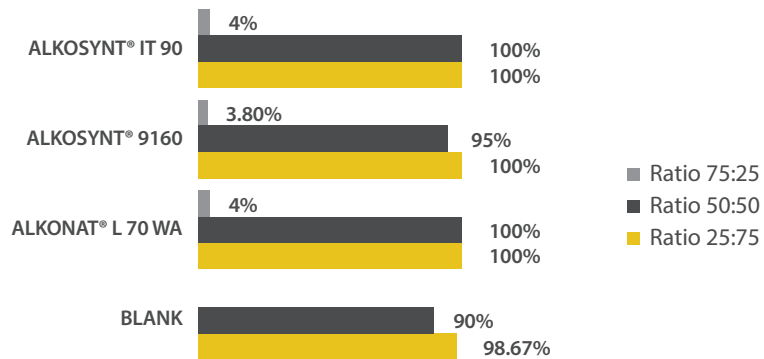
Features and benefits

- Decrease in the surface tension of frac fluids
- Enhancement of water-based frac fluids flowback
- Improvement of well clean-up in fracturing and acidizing jobs
- Stimulation of fluid penetration into rock formation to enhance fluid recovery
- Reduction of formation damage created by phase trapping

FLOWBACK AID PORTFOLIO - EMULSION TESTS

Products Compatibility After 60 Min Test

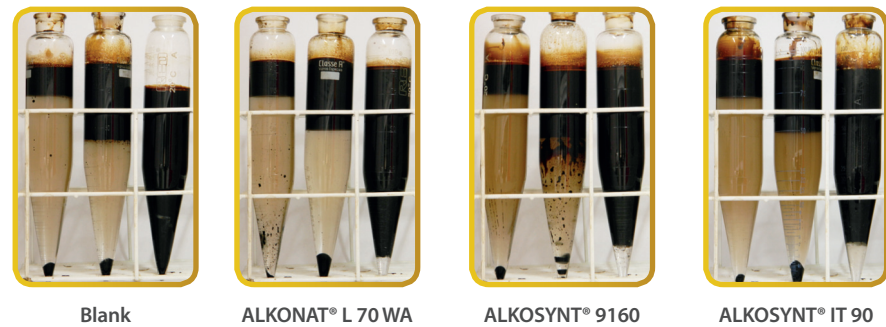
(CRUDE:BRINE RATIOS)



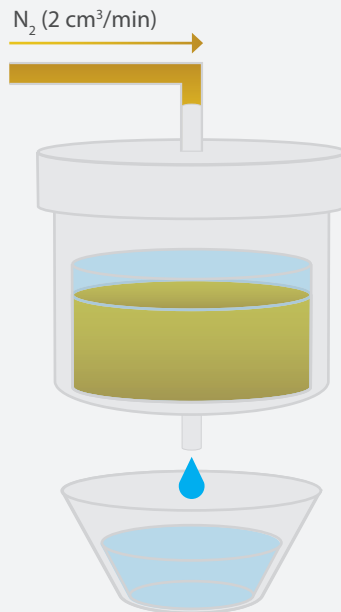
56°API Crude with 0.2% BS&W | 5% CaCl₂+KCl brine dosed with 0.5 gpt

Crude-Brine Ratios: 25:75, 50:50 and 75:25

NOTE: The crude oil presents high concentration of solids in suspension.



Fluid Recovery Test



- 0.33 lb (150 g) of sand 50/150 mesh
- 0.33 lb (150 g) of 2% KCl brine w/ 2 gpt of flowback aid
- 1 hour for fluid recovery

Simulation of fracturing fluid recovery from a representative sand pack

Evaluation of flowback aid ability to enhance cleanup of spent fluids

