

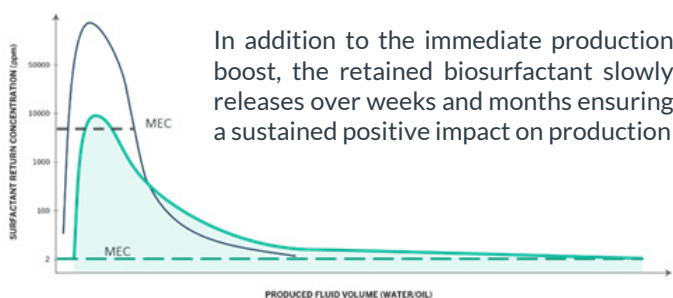
Zymol Frac

Environmentally friendly biosurfactant additive designed to boost completions fluid performance and delay production decline

Creating the frac in the formation is often only part of achieving optimum production especially in tight unconventional reservoirs. Zymol Frac, is an environmentally friendly product that offers an effective means of maximizing production potential and hydrocarbon recovery.

Harnessing advances in biotechnology, Zymol Frac is an easy to handle, biodegradable biosurfactant, that delivers four key attributes to stand clear of other surfactant offerings:

1. True “nano-scale” micelles, allow not only extensive formation penetration but also effective recovery of oil in the tightest of rocks. Zymol Frac is an order of magnitude smaller than traditional nano surfactants.
2. Critical Micelle Concentration (CMC) is vastly lower than alternative surfactants, resulting increased efficiency with less product.
3. Unique adsorption/desorption characteristics allow Zymol Frac to bind to formation much more effectively and release in controlled manner. Up to 50% of Zymol biosurfactants are retained by the minerals in unconventional (shale) reservoirs.
4. A much reduced minimum effective concentration (MEC) meaning the benefits of 1, 2 & 3 can deliver ongoing results longer than other surfactant technologies



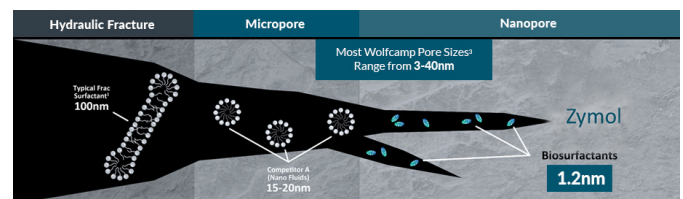
Features

- Extremely low critical micelle concentration (CMC) <50 ppm
- Very small micelle (1-2 nm)
- Low interfacial tension
- Unique adsorption-desorption characteristics
- Bio-static (no bacteria growth)

Benefits

- Effective at low concentration
- Small micelles penetrate even the smallest of nano-networks
- Changes wettability to water wet
- Long lasting treatment
- No corrosion caused by bio-film build-up

Zymol Frac can be used across a wide range of stimulation treatments including hydraulic fracturing and matrix acidization to deliver all of the required surfactant benefits; such as reducing interfacial tension and changing the wettability of the rock. Choosing Zymol Frac as a component of your stimulation, can deliver both immediate and long lasting results, that can enhance production and delay decline.



Technical Specification

pH	5.5 - 7.5	Mild to Neutral
Viscosity	1 - 2 cP (at 20°C)	Easy pumping
Static Surface Tension	28.0 - 35.0 mN/m	Reducing capillary pressure
Critical Micelle Concentration (CMC)	<50 ppm	Active even at low dosage
Interfacial Tension	<1 mN/m	Highly mobilizing oil
Contact Angle	5 - 40°	Highly water wetting
Thermal & Hydraulic Stability	Stable to 300°F	Longevity and sustained performance
Fluid Compatibility	Compatible with Oils and Brines	Non-emulsifying
HSE	Non-Hazardous	Sustainable & Biodegradable