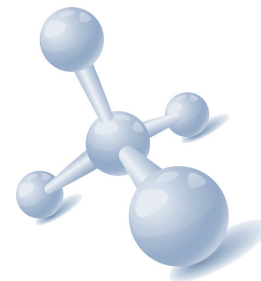


# Solutions

## for surfactant flooding



### Alkaline Surfactant Polymers (ASP) and Surfactant Polymers (SP)

#### APPLICATION

In order for a fluid to mobilize oil in a reservoir, the viscous forces of displacing liquid must overcome capillary forces keeping the oil in place. As a waterflood matures, an increasing percentage of the remaining oil resides in areas in which the capillary forces outweigh the viscous forces. Using surfactant or surfactant-alkali formulations in conjunction with polymer can mobilize the oil in these regions and dramatically decrease the residual oil saturation.

An important consideration ASP/SP projects is to contact as much of the reservoir rock as possible. Residual oil can only be mobilized in that part of the reservoir that is contacted by the ASP/SP solution. There are a number of technologies that could aid in efficient implementation of a surfactant flood, such as reservoir conformance. A well designed conformance improvement program before the ASP/SP flood will result in a more even flood front. The breadth of solutions offerings from TIORCO provides the possibility of combining various solutions in well managed projects.

#### DESCRIPTION

One of the technologies available for increasing recovery from reservoirs with high waterflood residual oil saturation is Alkaline-Surfactant-Polymer (ASP) floods. Although “ASP” is the most widely used term for chemical processes designed to reduce residual oil saturation, it may be advisable to use only alkaline-polymer, alkaline-surfactant-polymer, or surfactant-polymer. The optimal chemical program depends on the reservoir rock and fluid characteristics.

#### ADVANTAGES

As shown, TIORCO offers an integrated approach for ASP projects. We believe our “turnkey” approach improves project efficiency and, therefore, lower overall project cost.

Improving Reservoir Conformance Before ASP Injection	YES
Crude Oil Screening	YES
Laboratory Core Floods	YES
Equipment Design	YES
Field Implementation and Post-Treatment Evaluation	YES

#### CRITICAL DESIGN FACTORS

- Reservoir heterogeneity
- Crude oil screening
- Laboratory evaluation of core floods
- Field implementation

#### OTHER SURFACTANT SOLUTIONS

Surfactants can be used in other EOR projects based on the approach chosen or based on specific reservoir related issue that are being addressed. A few of these examples are:

- Foams for improved sweep efficiency in gas floods – Immiscible, CO<sub>2</sub> and steam
- Wettability alteration
- Imbibition approach
- Foams for mobility control