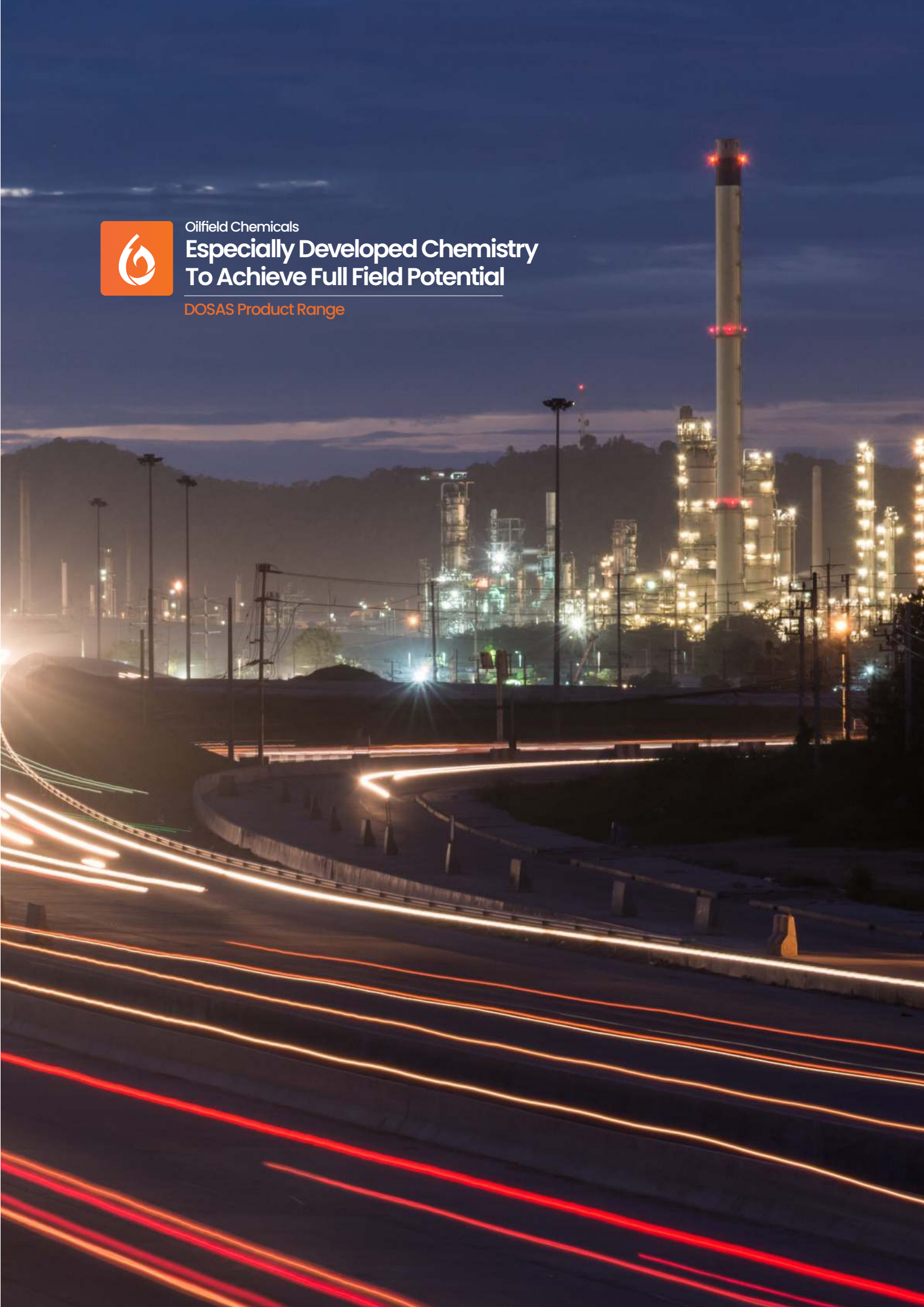


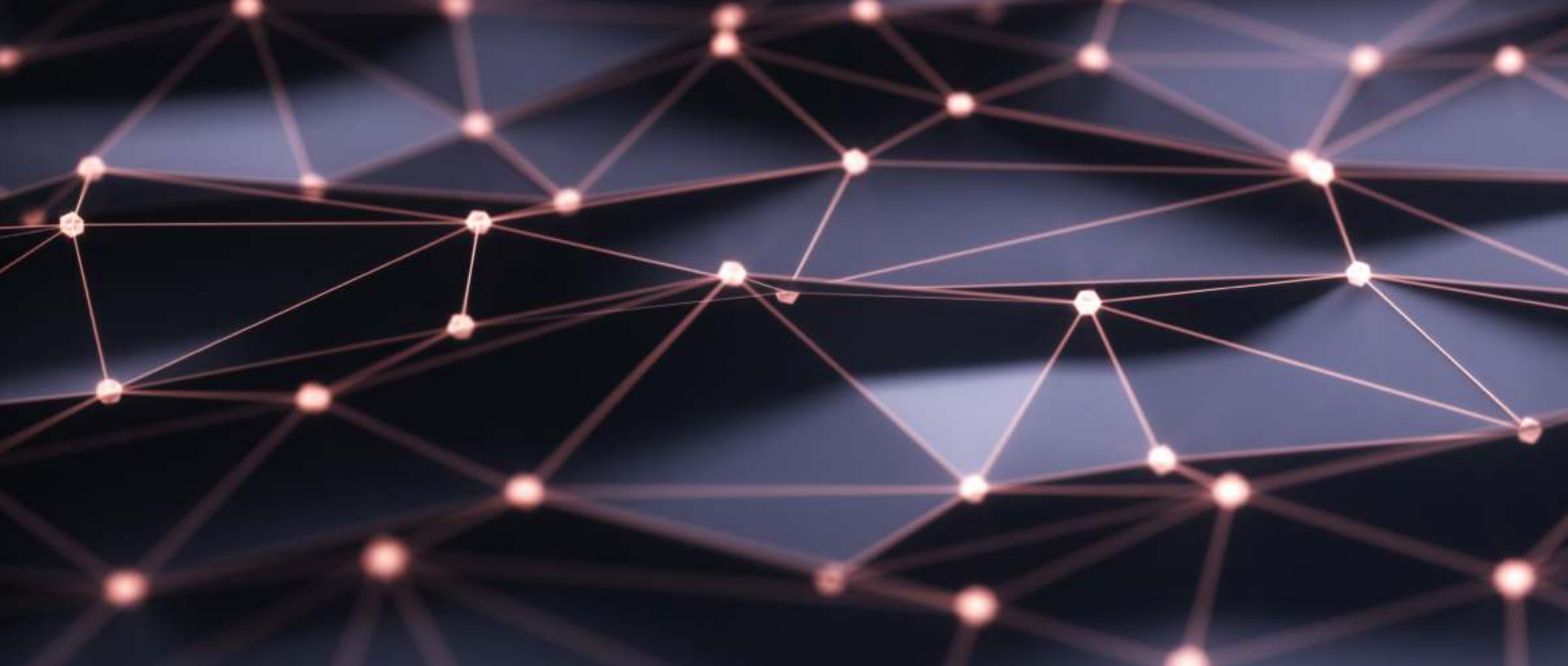


Oilfield Chemicals

Especially Developed Chemistry To Achieve Full Field Potential

DOSAS Product Range





Inside

A broad product range for a wide spectrum of oilfield applications

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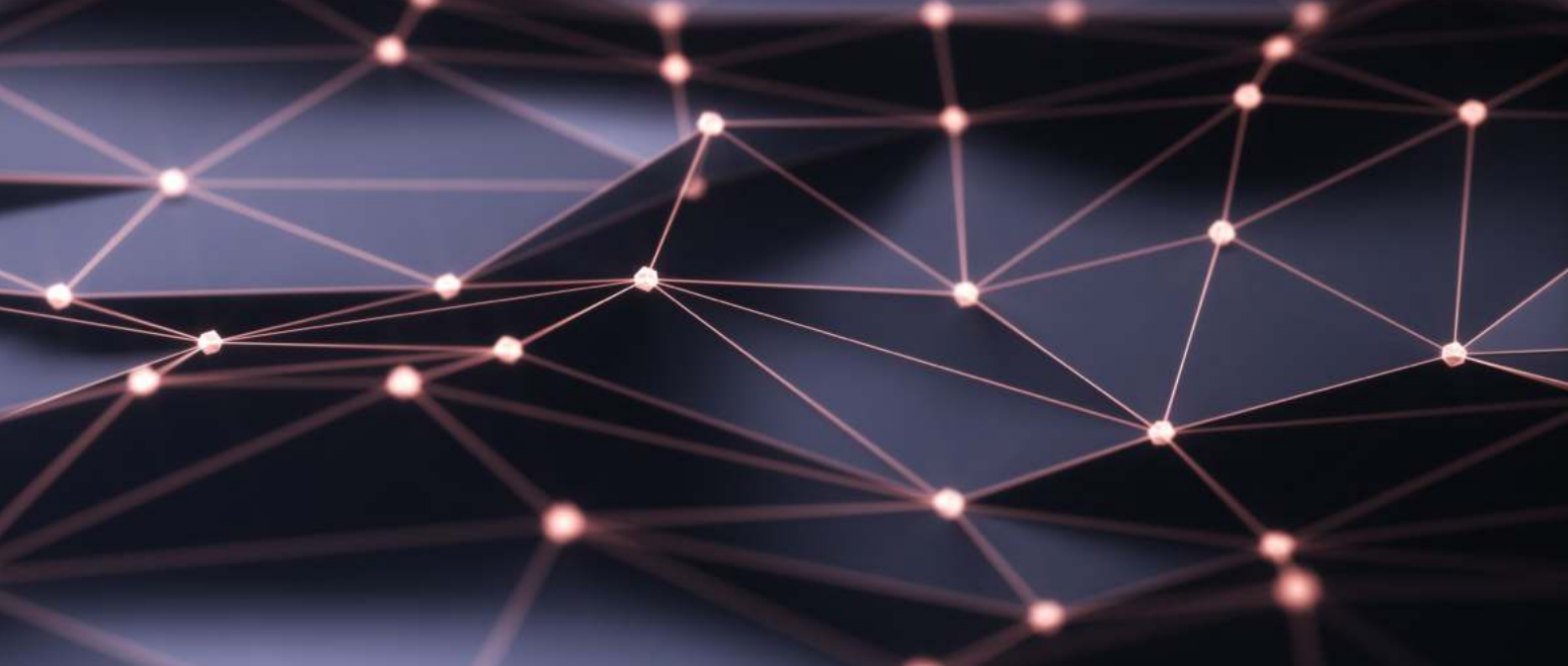
We Are DOSAS, Pioneer of Innovative Chemistry

At DOSAS, we aim to provide innovative chemical solutions for resource efficiency, increase production and make the most out of their existing hydrocarbon resources. We take pride in engaging our customers, identifying their unique challenges and helping them capture opportunities.

Capture Value From Innovative Chemistry

DOSAS is a global specialty and intermediate chemical company that has been serving a broad range of industries. DOSAS's Research and Development team of 22 chemists brings innovative solutions to the market and work alongside our customers to help them be successful in markets and be more efficient in delivery of their products and technologies. As we deliver solutions, we will expand our product portfolio with diverse chemistries that benefit the environment, promote human well-being, and meet the needs of a growing population. DOSAS is proud that more than 40 percent of our products offer energy-related savings, bio-renewability and reduced environmental impact.

DOSAS is fueled by the science of tomorrow to help our customers succeed today. We will continue our resolute focus on operating responsibly with integrity.



Research and development is one of the most important areas of our business, to apply innovative methods in every aspect of our operations. By investing in research and development, our company is investing in technology and future capabilities, transforming these into new processes, products and services. We assure that we are qualified to respond to the newest demands and developments, and carry out detailed workflows for more complex production challenges, in order to develop tailor-made chemistry with the optimum efficiency.

Problem Check

Detection and analysis of the problems by responding to specific customer request.

Dedicated Lab Test

Checks and tests on samples and chemical compounds with the professional team.

Continuous Assistance

Test interventions and component answers with dedicated staff and customized chemical products

Create the Future by Today's Act

Create the Future by Today's Act

We are applying unrivaled scientific expertise to enable cleaner air, improved health, and more efficient use of our planet's natural resources; and our story doesn't end here. Though continued investment in research and development, we're tackling the world's big challenges into our third century and beyond.

In order to act today for the future of our planet, we have responsibilities whether socially, economically, or environmentally, at different steps. At DOSAS, we significantly consider sustainability for our product impacts. We value the secure, neat, healthy, and noble quality of life on the earth.



Solution for **STIMULATION**

Reconnect Your Reservoir, Access Untouched Reserves, and Improve Production

Stimulation is a crucial stage in well completion that creates a highly conductive flow path between the reservoir and the wellbore. It allows oil and gas to flow freely into the well and to the surface. It also removes the severe plugging in sandstone and carbonate formations. As technology and treatment techniques have evolved, the needs and requirements placed on the chemistry.

Well's productivity enhancement is achievable with hydraulic fracturing and matrix acidizing in both conventional and unconventional reservoirs in sand, carbonates, or shale. Understanding how reservoir and fluid variability impacts the success of a stimulation job is part of our strategy.

Stimulation application conditions have their own unique requirements and challenges. Especially when it comes to controlling the rheology of the applied fluids, water-based or oil-based.

Diverting Agent

Diverting agents are used in stimulation applications to reroute fluid into new regions of the formation.

Conventional acid fracturing generally creates fractures only along the direction of maximum horizontal stress, resulting in partial connection among fissures and vugs, small swept volume by acid fluid, and limited yield increase.

To ensure a successful acid stimulation job, correct placement of the acid in matrix treatments is critical. Proper treatment design and planning are essential to ensure that the acid is not only placed in the right interval, but also across the entire interval. This is extremely important in the long horizontal sections found in today's shale formations.

Diverting acid fracturing is proved to be an effective solution to create multiple fractures, increase connectivity of fissures and vugs, enlarge swept volume, and hence substantially improve stimulation efficiency.

DOSAS provides a full range of diverting agents designed to help optimally place the acid treatment along the wellbore. Our solutions include products that temporarily plug high-flow perforations and divert the treating fluid to new regions of the formation. The diverter plug is typically designed to degrade or dissolve after the treatment is successfully placed.

Viscoelastic surfactant solutions (VES) have been identified as possible non-Newtonian fluids to improve the uniformity of flow distribution in the reservoir. They show not only shear-thickening behavior in the rock matrix, but also shear-thinning in and near the wellbore. This unique behavior makes VES a suitable candidate for a conformance control.

Currently, viscoelastic surfactants have been used in many oilfield applications. The main advantage of these kind of systems is their polymer-free nature. Also, they require a minimum amount of additives and can be used in both sweet and sour wells.

VES fluids break upon contact with hydrocarbon, therefore can maintain a temporary shut off effect when placed in a water bearing zone, for diverting fluid away from this zone ahead of a stimulation treatment. In-situ viscosifying occurs in the high permeability water zone rather than the oil zone.

Viscosifying acid systems enable the fluid system to:

- Effectively divert acid in carbonate environments from a high permeability zone to the next, achieving uniform stimulation.
- Promote wormhole architecture
- Minimize face dissolution
- Maximize hydrocarbon revenues for the treated well

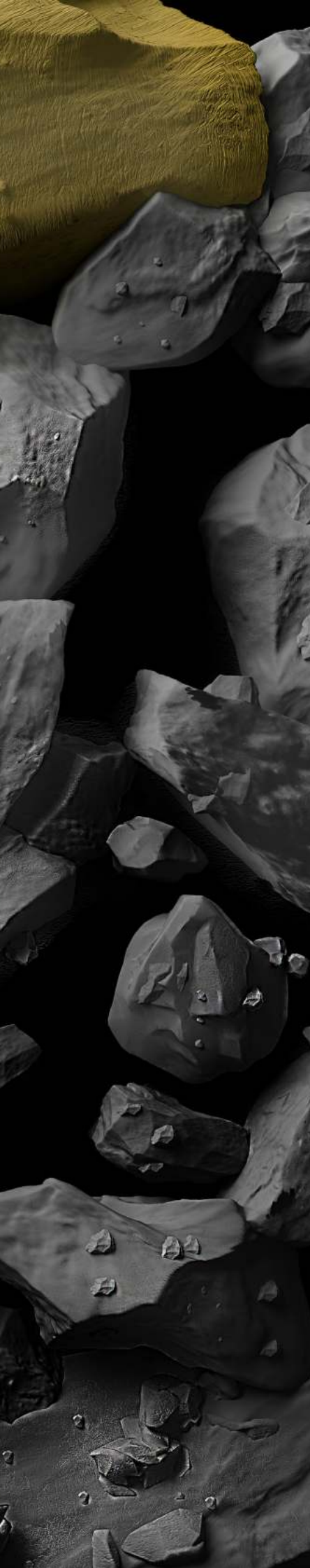
Our VES DosVesta™ Diverting Agent Solution show good compatibility at elevated temperature, with standard industry corrosion inhibitors, particularly DOSAS Corrosion Inhibitor CorFix™ ACI, Specifically designed for use in acidizing with hydrochloric acid or mud acid (Hydrochloric acid and hydrofluoric acid mixes).

Table 1. Diverting Agent

GENERAL INFORMATION			TYPICAL PROPERTIES	
Product	Physical Form	Chemistry	Solubility	Temperature Range
DosVesta™ A-20	Liquid	Amphoteric Surfactant	Soluble in 15% HCl	<93 °C



Maximize Productivity
Minimizing Formation Damage



Clay Control

Formation damage from fines migration can occur during stimulation operations, particularly in sandstone. To prevent fines migration and clay swelling, various clay stabilization chemical treatments have been designed.

Clays are ubiquitous to hydrocarbon bearing formations and must be considered carefully when designing a stimulation treatment. When water sensitive clay is contacted by non-formation water it can swell or disintegrate into fine particles. Both actions reduce the effectiveness of the stimulation treatment by reducing flow paths of formation fluids.

ClayPro™ is a suite of clay control solutions that can help stabilize clay-sensitive formations and prevent fines migration. These ClayPro™ solutions were designed for use in applications such as acidizing, gravel packing, and fracturing treatments, as well as in coiled-tubing operations. Further laboratory testing is recommended to determine which clay control product performs best with the fluid design and to determine the optimal loadings.

Table 2. Clay Control

GENERAL INFORMATION				TYPICAL PROPERTIES	
Product	Function	Physical Form	Chemistry	Solubility	pH
ClayPro™ PPA	Permanent Clay Stabilizer	Liquid	Poly quaternary amine	Aqueous solutions	6.1-7.1
ClayPro™ TCS	Temporary Clay Stabilizer	Liquid	Nitrogen-based compounds	Soluble in water	9-10
ClayPro™ PCS	Permanent Clay stabilizer	Liquid	Low molecular weight polymer	Soluble in water	4-8

Acid Retarder

The techniques of matrix and fracture acidizing of sandstone and carbonate reservoirs are used to stimulate production rates in oil and gas reservoirs. Our acidizing portfolios expedite and enhance hydrocarbon recovery in acidizing and fracturing operations to help clients see a maximized return on their wells.

Retarded acid extends reservoir contact compared with conventional hydrochloric acid. The low reaction rate of the acid allows it to travel deep into the reservoir before completely spending. The use of hydrochloric acid as the reactive component gives the fluid a high dissolution capacity.

There are several ways to retard the reaction rate of acid in carbonate reservoirs:

- The acid can be emulsified
- It can be gelled
- The rate can be control by foam.

Acid Retarder is a highly effective surfactant slowing the reactivity of hydrochloric acid with Limestone and Dolomite. The acid retardation is caused by filming the action which partially blocks the hydrogen cation migration to the reaction sites on the carbonate surface. Acid Retarder can be added to any acid including a common 28% hydrochloric acid used in oil field acidizing. The use of retarded acid will result in differential etching of the fracture face far from the wellbore. This is extremely important in low permeability reservoirs where the benefits of stimulation are directly related to live acid penetration.

Acid Retarder significantly reduces the over-etching that occurs near the wellbore in hot formations, achieving nearly 10-fold penetration over a regular hydrochloric acid.

Due to the delaying acid reaction, the rock dissolving power of acid is extended over a considerable distance out into the formation. Retarded acid provides for more uniform rock removal along the length of the fracture.

Acid Emulsifier

Acid Emulsifiers to retard the rate of reaction for deeper penetration of acid into the formation.

Emulsified acids improve function by providing deeper penetration of acid into reservoirs, which in turn enhances wormhole development and serves to improve hydrocarbon production.

The acid emulsifier is a type of retarder for acidizing and acid fracturing in stimulation operation. This type

of product can retard the acid reaction rate at the different concentrations of HCl up to 40-fold.

Acid Foamer

Foaming is an important characteristic for a range of oilfield processes, with the need for effective foam stability over a wide range of temperatures and water compositions. Acid foaming is a highly effective surfactant slowing the reactivity of hydrochloric acid with Limestone and Dolomite. The acid retardation is caused by filming the action which partially blocks the hydrogen cation migration to the reaction sites on the carbonate surface.

DOSAS' acid foaming agent can be added to any acid including a common 28% hydrochloric acid used in oil field acidizing. The use of retarded acid will result in differential etching of the fracture face far from the wellbore. This is extremely important in low permeability reservoirs where the benefits of stimulation are directly related to live acid penetration.

Acid Gelling Agent

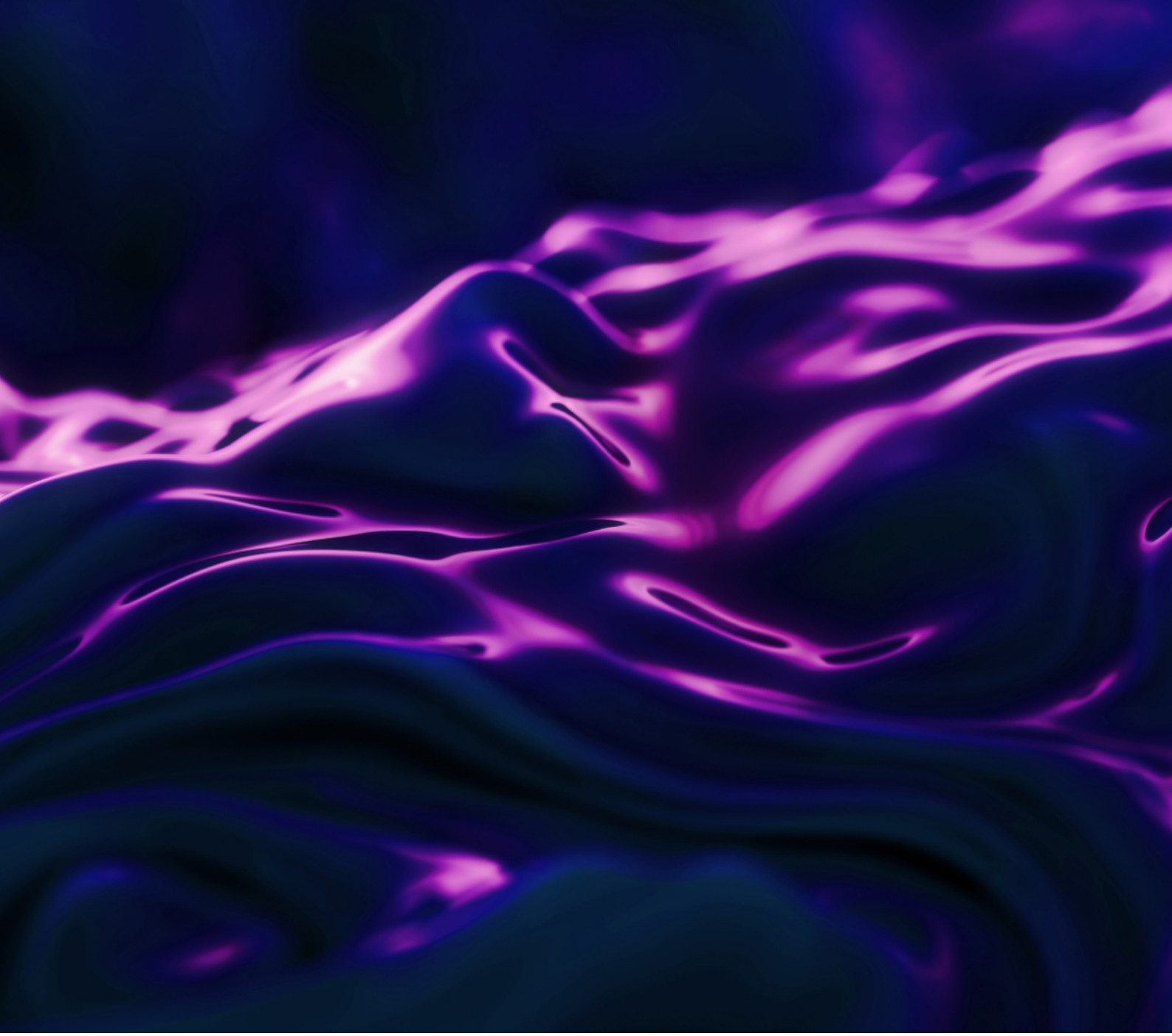
Fracture acidizing of carbonate formations is a proven method to increase hydrocarbon production. It can also be used in sandstone formation with acid solubility greater than 75%. Acid gelling agents effectively improve an acid's fluid efficiency and increase the treating distance (fracture conductivity) of these treatments. Surfactants and polyacrylamides are used to develop stable viscosities for acidizing.

Gelling the acid allows greater fracture penetration by increasing fracture width, slowing reaction rate, and reducing fluid loss. Various polymers and other thickening agents have been evaluated as gelling agents for hydrochloric acid (HCl). These materials were compared on the basis of thickening efficiency, acid stability, and residue formation upon spending of the acid.

DOSAS' acid gelling agents are designed to thicken acids for stimulation jobs to improve acid coverage and increase production and permeability within the well.

Achieving consistent viscosities for HCl in both matrix and fracture acidizing operations is as simple as employing DOSAS' acid gelling agents. These gelling agents achieve the stable, dense, and homogenous acid gels you seek, which result in a number of benefits:

- Improves protection of tubular
- Decreases the rate of friction during pumping
- Increases formation penetration depth
- Hinders formation face reaction



Increasing Production Starts with the Right Solutions

Table 3. Acid Retarder

GENERAL CHARACTERISTICS				TECHNICAL CHARACTERISTICS		
Product	Function	Physical Form	Chemistry	Viscosity	pH	Flash Point
HiFlow™ 700	Acid Gelling Agent	Liquid	Cationic Surfactant	500-2500 cP	3.2	> 94 °C
HiFlow™ 500	Acid Gelling Agent	Liquid	Cationic Surfactant	780 cP	3.5-6.5	-
FoamPro™ 100	Acid Foamer	Liquid	Amphoteric Surfactant	30.5 cP at 23 °C	6-8	> 100 °C
FoamPro™ 200	Acid Foamer	Liquid	Cationic Surfactant	-	6-9	> 100 °C
Emulcide™ 110	Acid Emulsifier	Liquid	Non-ionic Surfactant	530 cP at 100 °C	9-10	180 °C
Emulcide™ 220	Acid Emulsifier	Liquid	Non-ionic Surfactant	3000 cP at 25 °C	5-7	> 95 °C

Flowback Surfactant

We support our customers to be more successful with SurFlox™ Flowback Surfactants to have cost-effective operations

All oil and gas well stimulation processes, and particularly hydraulic fracturing, require a post-stimulation flow period to prepare the well for long-term production. In fact, flowback is the first stage of production, after a well has been opened.

DOSAS' flowback surfactants provide excellent surface tension reduction, resulting in maximum fracturing fluid removal and avoiding emulsion formation at initial oil and gas recovery. During flowback, the previously built-up high pressure is dissipated by back flowing a mixture of fluids, including the injected fracturing fluid, to the surface. The latter often becomes trapped in small capillaries inside the porous rock, preventing a maximum flow of oil and gas.

This is caused by surface tension and adhesion forces working inside the small inter-granular rock pore spaces, often exacerbated by the gelling agents used in common fracturing fluids.

SurFlox™ series help to prevent water blockage, improve oil flow, and alter wettability of the formation to neutral-wet. It ultimately results in incremental return on investment in oil field assets by driving higher oil and gas production.

DOSAS' flowback Surfactants help operators improve hydrocarbon production by enhancing the clean-up of fluids after stimulation.

The surfactant portfolio exhibits outstanding surface active agents including cationic/amphoteric blend and nonionic, based on their different nature relevant to application.

DOSAS Surfactants Product Range

We offer a variety of different flowback surfactants which can be formulated to match diverse crude oils and conventional and unconventional field conditions. Flowback series can be used between 0.5 to 2 gallons per thousand gallons (gpt) of frac fluid.

The following listing of DOSAS Flowback Surfactant can be used as a surfactant in water, acid, or heavy

brines. It is effective in acid, spent acid (CaCl_2 brine) and KCl (Clay stabilizer) water as well as having the desirable property of creating a water-wet surface condition in both limestone and sandstone formations.

They promote fracturing fluid cleanup of the proppant pack and rock matrix by lowering the by their lowering the surface and interfacial tensions to levels previously unattainable with conventional surfactants.

Flowback Surfactant Enhancer

Measurement of surface tension in the acidic medium gives conclusive evidence of the excellent performance of DOSAS' flowback products in lowering the surface tension at 0.5 gpt flowback products in 2% wt KCl brine.

Surface tension reducer is ideal for tight gas producing formations, where water blockage is a common damage condition.



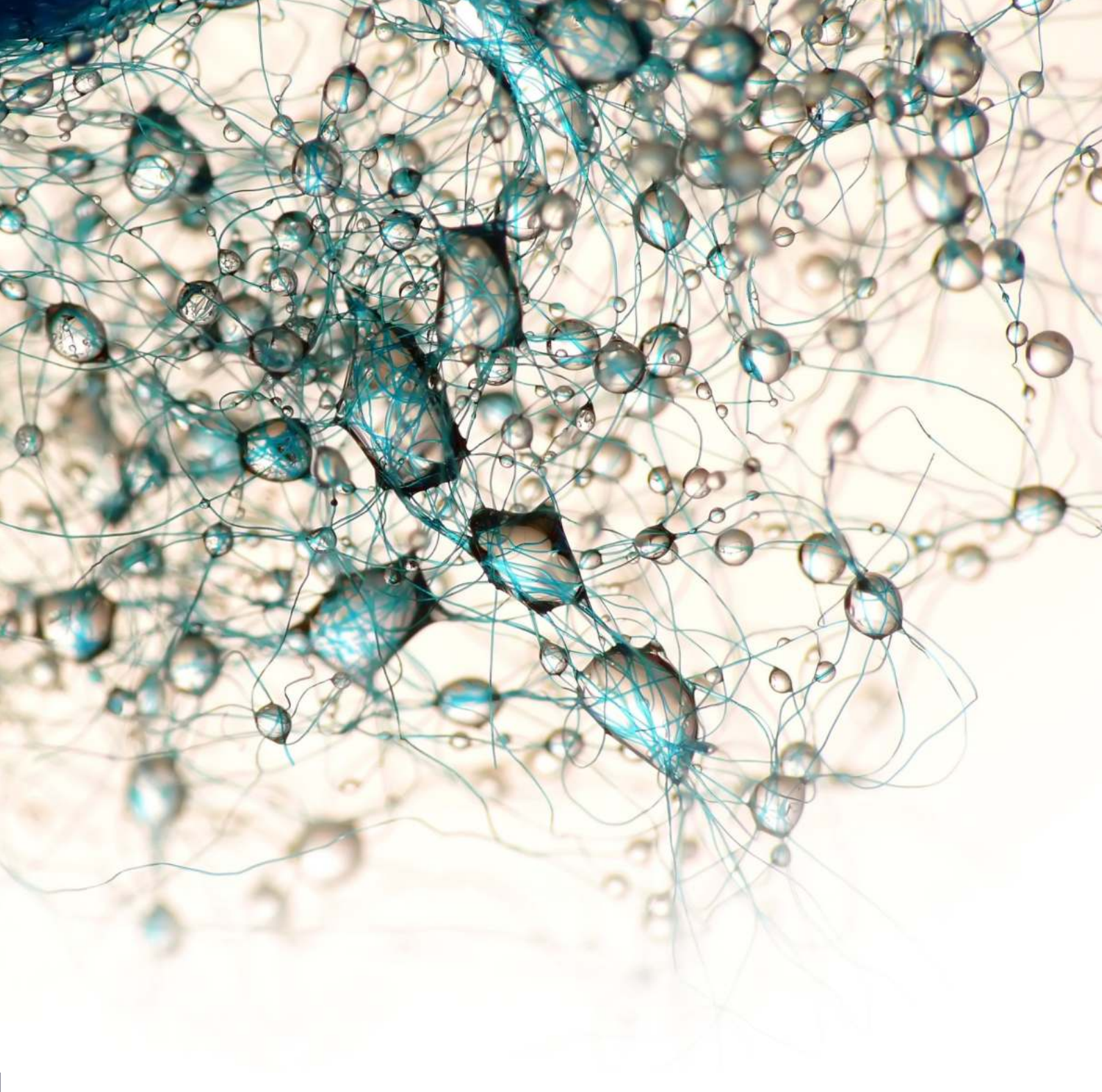


Table 4. Flowback Surfactant

GENERAL CHARACTERISTICS		TECHNICAL CHARACTERISTICS						
Product	Chemistry	Interfacial Tension (mN/m)	Surface Tension (mN/m)	Contact Angle (°)	HLB	Pour Point (°C)	Cloud Point (°C)	Flash Point (°C)
SurFlo [™] 28	Amphoteric	1.4	29.0	29.0	-	-	-	>70
SurFlo [™] 92	Sugar-based	1.9	31.0	26.0	-	-	-	>70
SurFlo [™] 69	Non-ionic	3.5	26.51	35.0	13.1	8	64	159
SurFlo [™] 109	Non-ionic	-	26.90	26.0	10.5	-5	64-67	>150
SurFlo [™] 77	Non-ionic	-	27.0	26.0	9.3	-26	55	>165
DosSurf [™] 100 Nano	Non-ionic & Amohoteric	0.3	27.0	26.0	-	8-10	-	>93

Breaker

Different polymers have been used as agents to viscosity water-based fracturing fluids, such as starches and cellulose derivatives. Guar gum and its two main derivatives are presently the most common fracturing gelling agents which increase the viscosity of the fracturing fluids. Breakers are designed to reduce the viscosity of fracturing fluid by cleaving the thickening agent molecules into smaller fragments. Furthermore, certain gel breakers are deactivated by high salt concentrations.

The performance of the oxidizers depends on many factors, such as time, temperature, breaker concentration, and polymer loading. Optimal breakers must generate minimum or no unbroken gel residues to help prevent causing any formation damage to the propped fracture.

The inappropriate use or ineffective breakers can cause significant damage in the proppant pack and a reduced PI.

Ideally these materials would be totally inactive during the treatment and then instantly “spring to action” when pumping stops, rapidly breaking the fluid back to a low viscosity preparing the fracture and formation for flow. This is very difficult to achieve as the breaker activity is very dependent on fluid temperature which varies with time.

We offer Encapsulated gel breaker, designed to release in a specific time frame and at specified temperature. The operator is free to specify its time/temperature/release rate. You can call it a controlled release oxidizer.

Encapsulated breaker is designed to be used in higher temperature hydraulic fracturing applications. The active ingredient contained in the product slowly releases over time, which delays the break of the fracturing fluid, allowing for inclusion of increased breaker concentrations in the fluid compared to conventional breaker without compromising early time fluid stability. The delay in the release from this product will allow the breaker to be concentrated in the propped fracture, rather than leaking off into the formation with the leakoff fluid.

DosBRK™ Breaker

DOSAS offers a series of live and encapsulated oxidizing breakers that are specifically formulated for use in hydraulic fracturing applications, at the end of jobs, and during flushes. Further laboratory testing is recommended to determine which breaker performs best with the fluid design, and to determine the optimal loadings.

DosBRK™ Breakers help to return stimulation fluid viscosity to a low viscosity fluid state once the proppant is placed. This helps minimize the return of proppants—keeping the majority of proppant in the fractured zone—and maximize the return of fluids to the surface.

Breaker Testing

Breaker schedule requirements are determined by breaker testing in thermostatic water baths. Breakers are added in various quantities to the complete fracturefluid system, and heated to reservoir temperature, to assess the effect on the fluid. Breaker quantity should break fluid after fracture has been placed.



A Commitment to Continual Innovation

Table 5. Gel Breaker

GENERAL CHARACTERISTICS				TECHNICAL CHARACTERISTICS	
Product	Function	Physical Form	Chemistry	Particle Size Distribution	Temperature Range
DosBRK™ 800	Live Breaker	Granules	Oxidizing Breaker	< 1400 µm	20-70 °C
DosBRK™ 140	Encapsulated Breaker	Granules	Oxidizing Breaker	420 - 1400 µm	60 °C
DosBRK™ 200	Encapsulated Breaker	Granules	Oxidizing Breaker	420 - 1400 µm	60-95 °C
DosBRK™ 212	Encapsulated Breaker	Granules	Oxidizing Breaker	420 - 1400 µm	> 95 °C

PUT OUR INSIGHT INTO YOUR **OPERATIONAL CHALLENGES**

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