



Stimulation chemical solutions



Oilfield applications

Nouryon

Oilfield solutions: A wellspring for sustainable success now and in the future



We are continuously innovating to deliver solutions that satisfy the evolving demands of our oilfield customers.

Tap into decades of global oilfield experience, an internationally integrated supply chain, and a dedicated customer support team to achieve high performing oilfield solutions.

Combining a wealth of expertise with an innovative portfolio, we provide you with the tried-and-tested and custom solutions you need to enhance your drilling, production, stimulation, cementing, and cleaning processes.

With a strong understanding of the growing challenges you face, our Oilfield experts are committed to solving your problems and driving performance in a sustainable way.

Our Oilfield product range features solutions that:

- Add value to oil production in a cost-efficient and sustainable manner by improving water-oil separation processes
- Focus on critical flow assurance issues in oil and gas production
- Help customers develop high-performance oil and water-based drilling formulations
- Address a wide range of stimulation applications
- Act as dispersants, retarder additives, and rheology stabilizers
- Provide support in oilfield cleaning applications like degreasing rig equipment, well-bore cleanup, cuttings cleaning, and removing screen blockage

To learn more about how we can help you, please contact us: oilfield@nouryon.com

Stimulation solutions



Our stimulation chemistries enable oilfield engineers to face daily challenges – from extreme downhole temperatures and high pressures to extended reach wells and expensive tubular metallurgy, plus strict health, safety, and environmental regulations.

Specialized stimulation fluid chemistries

In many cases, conventional technologies no longer meet the requirements of today's oilfield engineers, the industry, or regulatory compliance obligations. That is why we developed a highly differentiated portfolio of stimulation chemistries.

- Non-damaging viscosifiers
- Surfactant-based acid gelling agents
- Acid emulsifiers
- Matrix stimulation fluids
- Viscoelastic diverting agents

When faced with challenging downhole conditions, we can help you maximize the productivity of your stimulation fluids.





Viscoelastic surfactants

Stimulation activities present unique challenges and demand fluid rheologies not seen in other industries. Viscoelastic surfactant (VES) technologies produced by Nouryon form worm-like micelles in depleted acids and saline brines to viscosify the various water-based fluids that can optimize the performance of acidizing operations. This creates non-damaging solutions for acid diversion through our viscoelastic diverting agents and surfactant-based acid gelling agents.

Our VES products, sold under the Aromox® and Armovis® brands, provide significant performance benefits not possible with conventional polymer-based systems. In acidizing or hydraulic fracturing applications, the products self-divert, with depletion creating optimized wormhole networks at temperatures up to 350°F. They have also been used as non-damaging viscosifiers for hydraulic fracturing operations at elevated temperatures.

Function	Chemistry	Recommended products	Key attributes	Appearance
Self-diversion and viscosifier	Zwitterionic surfactant	Armovis® EHS	High temperature VES for self-diverted acidizing. <350°F, sandstone, carbonate	Liquid
		Armovis® EHS-W	High temperature VES for self-diverted acidizing. <350°F, sandstone, carbonate, winterized for storage <50°F	Liquid
	Tallow amidoamine oxide	Aromox® APA-T	Mid temperature VES for self-diverted acidizing. <250°F, sandstone, carbonate	Liquid
		Aromox® APA-TW	Mid temperature VES for self-diverted acidizing. <250°F, sandstone, carbonate. Winterized for storage <50°F	Liquid
	Ethoxylated ammonium chloride	Armovis® LT	Low temperature VES for self-diverted acidizing. <200°F, carbonate	Liquid

Matrix stimulation and scale control

Our Dissolvine® StimWell™ HTF matrix stimulation fluid has all the advantages of conventional acidizing fluids while avoiding their associated disadvantages. It is a bio-based, non-damaging fluid that is fully compliant with OSPAR regulations, making it ideal for environmentally sensitive areas.

Due to its low corrosion profile, nearly neutral flow back, and intrinsic iron control, additives are minimized even with delicate equipment like ESPs. In carbonate formations, our matrix stimulation fluid controls wormhole propagation, decreasing the risk of face dissolution. In damaged sandstone, our fluid dissolves carbonate and iron-based particles without destabilizing innate clays.

Our Dissolvine® StimWell™ DDH scale control agent is a high pH fluid that can also be used for stimulation operations. When the formation has been affected by scale precipitation or barite intrusion during drilling/completion, this non-corrosive and clay compatible agent is designed to dissolve nearly insoluble minerals without causing damage.

When used at very low injection rates, our scale control agent can also create wormholes in calcite, especially helpful in tight formations. Efficiently performing at low concentrations, our Dissolvine® StimWell™ DDH scale control agent improves cost-effectiveness.

Function	Chemistry	Recommended products	Key attributes	Appearance
Matrix stimulation fluid	Glutamic acid, N, N-diacetic acid	Dissolvine® StimWell™ HTF	OSPAR compliant, GLDA based, CaCO ₃ dissolver	Liquid
	Diethylenetriamine pentaacetic acid potassium salt	Dissolvine® StimWell™ DDH	DTPA based, low corrosion sulfate and barite dissolver	Liquid

Acid gelling agents and emulsifiers

Our surfactant-based acid gelling agents offer high viscosity and thermal stability required in acid-fracturing and acid-diversion applications, while being non-damaging to the formation

as compared to polymer-based solutions. Likewise, our acid emulsifiers allow emulsified formulations at a wide range of temperature stability.

Function	Chemistry	Recommended products	Key attributes	Appearance
Acid gelling agents	Oleic alkylamine ethoxylate	Armogel® O	Surfactant-based acid gelling agent stable to temperatures of 200°F	Liquid
	Tallow alkylamine ethoxylate	Armogel® T	Surfactant-based acid gelling agent stable to temperatures of 300°F	Liquid/paste
Acid emulsifier	Coco dimethyl quat	Arquad® 2C-75	Acid emulsifier for <300°F	Liquid
	Tallow dimethyl ammonium chloride	Arquad® 2HT-75		Paste
	Alkyl amine	Armeen® T		Paste
	Alkyl amine	Armeen® OL		Liquid

Acidizing and hydraulic fracturing additives

Our unique portfolio of specialty surfactants and chelating agents offer unique properties that can be tuned to provide an effective and compatible stimulation package. Our high-performance flow back surfactants offer improved performance at higher temperatures while also contributing to other functions,

such as non-emulsification and anti-sludging effects. These products have been compatibility and application-tested to offer advanced performance for acidizing and fracturing. As well, they have been tested in a variety of combinations of acids, crude oils, and brines.

Function	Chemistry	Recommended products	Key attributes	Appearance
Acid corrosion inhibitor	Proprietary surfactant blend	Armohib® CI-31	Film-forming corrosion inhibitor for use in organic acid stimulation fluid	Liquid
	Oligomeric ester quat	Armohib® CI-5150	OSPAR compliant polymeric CI for use in organic acid stimulation fluid	Liquid
Iron Control	Ethylenediamine-tetraacetic acid, tetra sodium salt	Dissolvine® E-39	Most widely used EDTA liquid at 39% strength, forms stable, water-soluble iron chelates in a wide pH range	Liquid
		Dissolvine® NA	Most widely used EDTA solid, forming stable, water-soluble iron chelates in a wide pH range	Micro-granular
	Ethylenediamine-tetraacetic acid, diammonium salt	Dissolvine® AM2-45	Strong iron chelator soluble over a wide pH range, ideal for iron control when presence of other multivalent ions is suspected	Liquid
Wetting and flow back aid	Alcohol alkoxyate	Armoclean® 4350	OSPAR compliant and narrow range ethoxylate, excellent wet-ting agent for calcite that exhibit non-emulsifier properties	Liquid
		Armoclean® 4380	OSPAR compliant wetting agent for sandstone, inherently water soluble. Blends of Armoclean® 4350 and Armoclean® 4380 often gives super edge to wetting and dispersing formulations.	Liquid
		Armoclean® 4100	Excellent wetting agent for silica and calcite. Balanced chemical in between Armoclean® 4350 and Armoclean® 4380.	Liquid
		Ethylan® SN-90	Water soluble surfactant for low surface tension and IFT reduction to aid flow back	Liquid
Hydrotrope	Alkyl polyglycol ether ammonium methyl chloride	Armoclean® 6250	Multi-functional cosurfactant - excellent hydrotrope, effective at very low concentrations	Liquid

Function	Chemistry	Recommended products	Key attributes	Appearance
Non-emulsifier	Resin oxyalkylate	Witbreak® DRA-21	Low RSN alkoxyated resin. Water-in-oil demulsifier interface control.	Liquid
		Witbreak® DRC-168	High RSN alkoxyated resin. Water-in-oil demulsifier.	Liquid
	Diepoxide	Witbreak® DRI-9026	Low RSN, high Mw polymer. Water-in-oil demulsifier.	Liquid
	Polyoxyalkylene glycol	Witbreak® DTG-62	High RSN, high Mw polymer. Water-in-oil demulsifier, interface control.	Liquid
Anti-sludge	Coco dimethyl quat	Arquad® 2C-75	Cationic surfactant, dual function – anti-sludge with further non-emulsifying properties	Liquid
	Alkylaryl sulfonate	Petro® IPSA	Anionic surfactant, asphaltene dispersant and anti-sludge	Liquid
	Ethoxylated fatty alkyl amine	Ethomeen® C/15 Ethomeen® C/25	Hybrid of nonionic/cationic surfactant	Liquid
	Branched DDBSA	Witconic® 1298H	Branched DDBSA, acid form, 98% active	Liquid
Biocides	Benzalkonium chloride	Arquad® MCB	EU BPR supported.	Liquid
		Didecyldimethyl ammonium chloride	Arquad® 2.10-50 Arquad® 2.10-80	EU BPR supported US EPA approval expected H2/2022
	Coco alkyl diamine	Duomeen® C	US EPA approved	Liquid/paste
	Dodecyl dipropylene triamine	Triameen® Y12D	EU BPR supported US EPA approval expected H1/2022	Liquid

Delayed acidizing system

SMCA, the sodium salt of monochloroacetic acid, offers a flexible acidizing fluid system with delayed properties that can be tailored to different conditions in oil and gas wells. It is an in-situ acid generator which slowly releases an organic acid in the well allowing deeper

penetration. Benefiting from the neutral pH upon preparation, the corrosion impact is extremely low. It is a cost-efficient alternative for high temperature application when delayed acidizing is required.

Function	Chemistry	Recommended products	Key attributes	Appearance
In-situ acid generator system for delayed acidizing	Sodium chloroacetate (SMCA)	SMCA acidizing system	Cost efficient solution for delayed acidizing. High performance at elevated temperature with low corrosion and less face dissolution. Easy to handle and needs less additives.	Solid

Contact us for more details
website | nouryon.com/markets/oilfield
email | oilfield@nouryon.com

Nouryon

Nouryon is a global, specialty chemicals leader. Markets and consumers worldwide rely on our essential solutions to manufacture everyday products, such as personal care, cleaning goods, paints and coatings, agriculture and food, pharmaceuticals, and building products. Furthermore, the dedication of more than 7,900 employees with a shared commitment to our customers, business growth, safety, sustainability and innovation has resulted in a consistently strong financial performance. We operate in over 80 countries around the world with a portfolio of industry-leading brands. Visit our website and follow us @Nouryon and on LinkedIn.

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