



— RAVAGO CHEMICALS NORTH AMERICA

Sidere Technology, Inc

Microbial Enhanced Oil Recovery

BERO™ Bio-Enzyme | Product Data Sheet

With approximately two decades of industry experience behind it, Ravago Energy Services (RES) is built upon long-standing industry relationships and the reputation of providing value-added, technical solutions to the issues and challenges our customers face in the Oil and Gas industry. We are proud to partner with Sidere Technology, Inc to bring BERO™ Bio-Enzyme our customer base in the Exploration & Production (E&P) Sector.



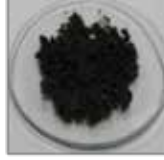

What does BERO™ do?

BERO™, Bio-Enzyme for Microbial Enhanced Oil Recovery (MEOR)

1. It is a water-soluble bio-enzyme product with the strong ability to release the hydrocarbon (oil) on the surface of reservoir rock particles.
2. It peels off the crystal substances, paraffin, asphaltenes on the rock particles after injected into the reservoir



Benefits

<p>A. When applied, BERO™ creates a biological reaction. It directly affects pollutants without changing the characteristics of the crude oil.</p>		
	<p>Static Oil Washed Without BERO™</p>	<p>Static Oil Washed With BERO™</p>
<p>B. It can absorb on the surface of the rock tightly and keep the rock surface humid.</p>		
	<p>Oil Sand Without BERO™ Oil Wash</p>	<p>Oil Sand With BERO™ Oil Wash</p>

Specifications

PROPERTY	BERO™
Appearance	Brown (tawny) semitransparent concentrated liquid with the smell of an enzyme
Main Components	Polymeric biological enzyme, stabilizer and water
pH	5-7 (sometimes slightly acidic)
Density	1g/cm3
Boiling Point	100°C
Temperature Resistance	<200°C

Application Requirement

Payzone Porosity >10%
Permeability > 1md
Formation Pressure > 150 psi
120oF < Formation Temperature < 356°F
Salinity of formation water <21x104mg/L
Sandstone formation priority, then the limestone and other carbonate rocks

Introduction to BERO™

OILFIELD DEVELOPMENT PROCESS

Well Drilling	Well Completion	Primary Oil Recovery		Secondary Oil Recovery			Tertiary Oil Recovery				
		Flowing	Drilling	Re-Fracturing	Waterflooding			Chemical Flooding		Thermal Recovery	Acidification
					Initial Stage	Middle Stage	Later Stage	Polymer Flooding	Surfactant Flooding	Gas Drive	
				Bero Fracturing Fluid			Bero Depressurization Augmented Injection	Sp Flooding, Asp Flooding		Microbe	Bero Stimulation
								Bero Flooding			

- Add BERO™ to the current fracturing fluid system to improve the effect of fracturing and increase the production.
- In the later period of Waterflood, the water injection rate decreases as the injection pressure rises. Injecting BERO™ into the formation from injection well could reduce the injection pressure, thus the injection rate could rise.
- BERO™ could replace chemical flooding in the tertiary recovery. Inject BERO™ into the formation from injection well to change the rock's wettability, improving oil's flowing.
- Acid could remove the inorganic plugging and increase production. BERO™ stimulation could remove the organic plugging, change the rocks' wettability and increase production.



Technology Comparison

BERO™	Microorganism (Bacteria etc.)
BERO™ is protein-based non-active preparation.	Microorganism is bacteria after optimized culture.
Stimulation cycle is longer, its original efficiency would basically maintain after injecting to the reservoir (about 12 months).	Stimulation cycle is shorter, its original efficiency would greatly reduce due to survival rate after injecting to the reservoir.
BERO™ could adapt to different formation water quality, and no effect on BERO™ when the pH value of water changes.	Be sensitive to formation water quality, and its death coefficient would increase by 20% if the limited pH value increases by a numerical value.
BERO™ has good temperature resistance, and it could work normally at -220°C	The reservoir temperature could not be higher than 100°C
BERO™ could totally adapt to water salinity without any special requirements.	Microorganisms have strict requirements for water salinity as it could only work under the circumstance lower than 1.5×105mg/L.
BERO™'s requirement towards reservoir: Porosity≥10%	Microorganism's requirement towards reservoir: connectivity rate 50%
It only takes more than 3 months cycle to use BERO™ towards wells with recent acidification treatment.	It takes a longer cycle and strict determination of residual concentration in reservoir towards wells with recent acidification treatment.
BERO™ could remove plugging and increase production when polymer injected to the wells.	It's not suitable for microorganism when polymer injected to the wells, and the reservoir should be adapted to conditions for microbial operations.
BERO™ could remove plugging (organic block)towards wells and waterflooding.	Microorganism could only be used in waterflooding.
BERO™ The cost of BERO™ is lower than microorganism, which is proved by the experiment in the laboratory and practice in wells.	The cost of microorganism is higher as the amount of usage increases greatly due to low survival rate, which is proved in the practice.

Responsible Chemical Distribution



Ravago Chemicals is an active and certified member of NACD (National Association of Chemical Distributors) Responsible Distribution Process.

As a member of this association, we are committed to continuously improve performance in every phase of chemical storage, handling, transportation and disposal.

To learn more about the NACD and their chemical distribution initiatives visit www.nacd.com

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Ravago Chemicals North America



Dedicated
Customer Service &
Support



Expert
Warehousing &
Logistics



Technical Service
and Support



Responsible Chemical
Distribution

About Sidere Technology, Inc.

Headquartered in Houston, Texas, along with their application laboratories and global distribution centers, Sidere Technology, Inc, works together with global manufacturers to support clients to source ingredients and additives, strengthen the supply chain and develop new products.

ABOUT US

About Ravago Chemicals North America

Ravago Chemicals represents market-leading specialty chemical and ingredient producers that allow us to deliver creative technical solutions along with the highest level of service to more than 15,000 active customers across more than 24 countries worldwide. We are a family company and place a high value on our long-standing relationships with our suppliers, customers, and our colleagues.



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