ELGIN

The Effective Application of Micro-Emulsions for the Treatment of Oily Wastes

OSAS® Environmental Services

June 1, 2022

Natural Resource Recycling • Product Classification • Fluid Recovery
Dewatering • Waste Management • Material Handling • Liquid/Solid Separation

Growing Problem

It is Estimated the 9 Billion Metric Tons of Oily Wastes Have Been Stock-Piled Globally

Asia

Middle East

Europe

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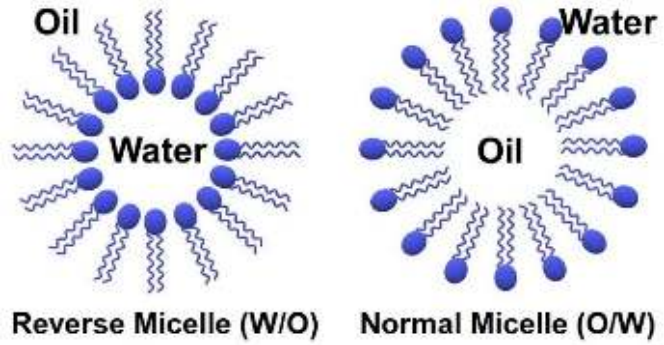
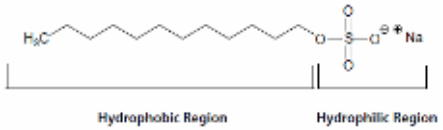
Micro-Emulsion Chemistry Capabilities

Used to Free Bound Oils from Water & Solid Complexes Commonly Found in Oily Wastes



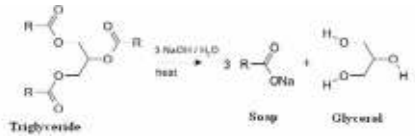
Acts as a Strong Detergent

Lowers the interfacial surface tension of solids.



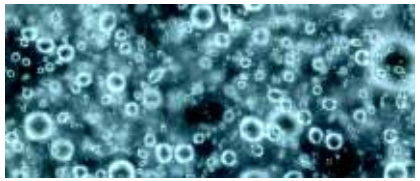
Acts as a Strong Cleaner

Water-wets all solids to act as a cleaner.



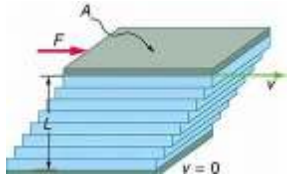
Breaks Viscous Emulsions

Solubilizes oil and water to break emulsions.



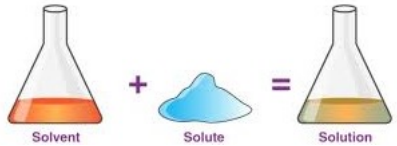
Lowers Viscosity

Mobilizes and creates fluidity of waste streams to improve processing.



Powerful Solvent

Provides solvation to the mixture.



Provides fora chemistry that is capable of treating a multitude of waste streams.

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Micro-Emulsion Applications

The Number of Market Applications Continue to Grow

Micro-Emulsions have significant value in any industry in which there are complex emulsions of oil, water and/or solids that can yield free oil.

Micro-Emulsion Competing Technologies

There are Several Less Effective Treatment Options:

Sequential Chemical

Alternative chemical treatments will use a combination of emulsion breakers, dewatering polymers, and pH adjustment chemicals in order to achieve the desired results.

Traditionally requires a number chemical and mechanical processes to be managed in concert.

Thermal Processing

Thermal technology can include thermal oxidation, thermal desorption (direct or indirect) or passive heating (normally followed by gravitational settling.

One of the most impractical methods for waste management creates millions of metric tons of carbon emissions.

Sequential Centrifugation

This process will typically involve a sequence of centrifuges, including high-speed horizontal decanter centrifuges followed by high-speed disk stack centrifuges.

Tends to provide modest results due to the emulsification of solids and liquids.

Land Farming / Stabilization

Solids are typically stabilized by the addition of an additive and then land-farmed to allow for natural attenuation over a long period of time.

Requires the addition of fixating or stabilizing agents that bulk up the solids volume then to be managed over extended periods of time.

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Though “dilution” has been considered a possible alternative, it is inherently a manipulated means to achieve compliance under any environmental standard.

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Micro-Emulsion Chemistry Benefits

There are Several Benefits Derived from Effective Application of Micro-Emulsions:

Discharge Compliance

Ability to achieve stringent discharge compliance. In many cases the addition of a micro-emulsion system enables "zero discharge" or "closed loop systems".

Stackable Solids Discharge

When properly managed, broken emulsions will allow discharge as a stackable solid that can be land applied (a.k.a. land farming) or disposed of via unlined landfills.

Hydrocarbon and Water Recovery

Micro-emulsion systems are capable of producing solids-free recoverable oil and water. For many scenarios, these recovered fluids will offset the cost of operation or create a profit.

Provides High Throughput

Micro-emulsion systems are capable of treating large volumes with minimal energy input. This presents one of the lowest carbon footprint treatment options available treating up to 50MT/hr with less than 500KW.

It is the combined value of each of the noted benefits that drives the expanding deployment of micro-emulsions for managing oily wastes.

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Deployment of Micro-Emulsions

Chemical Dosing Systems Do Influence Effectiveness

Planning is Key

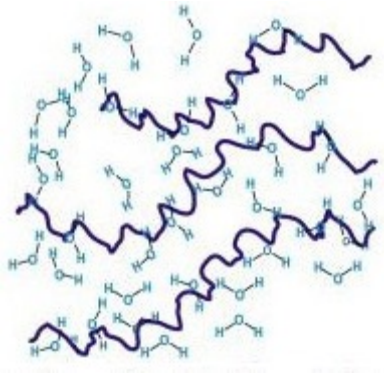
Even With Proper Pre-Treatment, the Introduction of Micro-Emulsions Must be Planned:

Dosage & Dilution Bench Testing

The micro-emulsion dosage is slurry specific. It should not be assumed that one application is the same as the next. Bench-testing will define the best micro-emulsion and the dosage necessary to achieve the desired reaction.

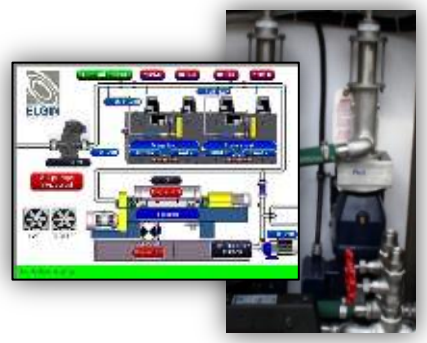
Micro-Emulsion Preparation

Micro-emulsions are provided in neat or concentrated forms. However, unlike polymers, hydration (a.k.a. activation) is not required. Micro-emulsions can be injected neatly into the chemical injection system.



Precision Control & Measurement

Under-dosing and over-dosing will reduce the effectiveness of your treatment plan. Under-dosing will provide a fraction of the effectiveness needed.



Controlled Mixing & Residence Time

Proper introduction of micro-emulsions is necessary to ensure complete chemical reactions; Contact is required. Further, micro-emulsions require controlled residence time to achieve the desired treatment results. Too much residence time or mixing can spoil the reaction.

System automation must not be overlooked. Though “poor boy” systems can be affordable, they will drive up the cost of labor and increase the risk of improper dosage.

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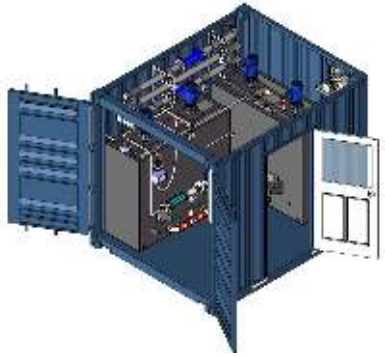
Turn-Key Injection System Options

There are Countless Configurations Available to Meet Every Possible Application:



Depending on the site conditions, and the characteristics of the oily wastes, bespoke turn-key injection system fitting your site-specific needs can be provided.

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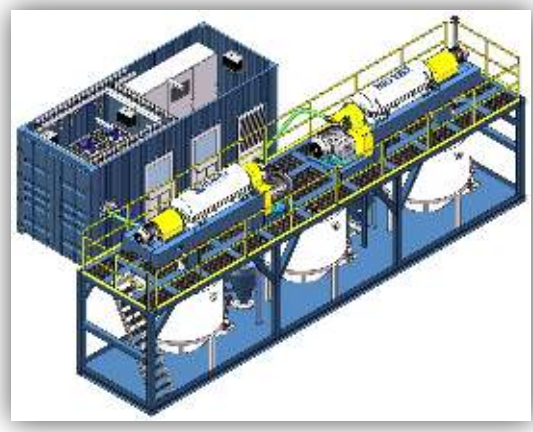
Turn-Key Treatment System Options

There are Countless Configurations Available to Meet Every Possible Application



Depending on the site conditions, volume of product to be treated, and the characteristics of the oily wastes, a bespoke turn-key system fitting your needs can be engineered.

Indications of Success

Identifying a Successful Micro-Emulsion Assisted Process

Visual Indicators for Success

Proper Bench-Testing is the Key to Achieving Results

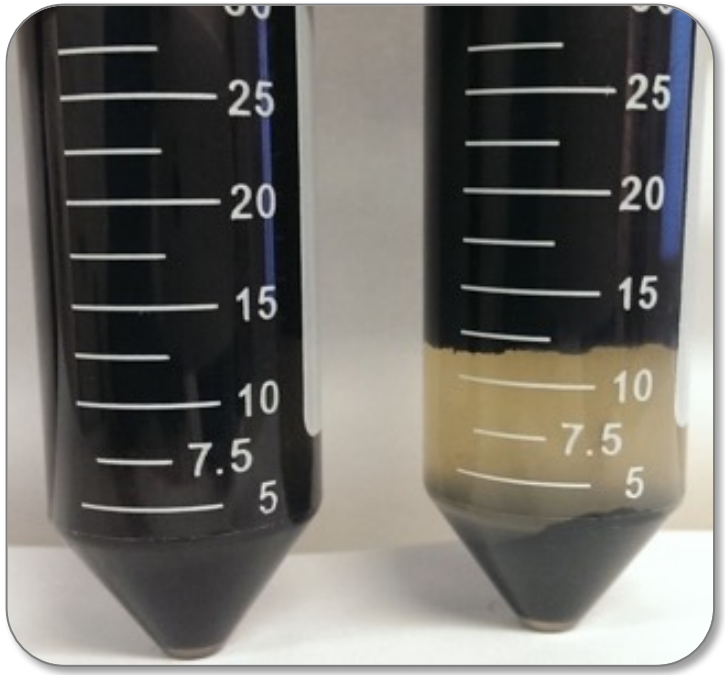
Slop Oil

This slop waste was easily broken down into an oil, water and solids phase after using a 1% dose of SAS SlopTreat™.

Oil-Based Drill Cuttings

Oil-based cuttings were treated with SAS 116B™ to achieve an OOC% <1.0%.

Refinery Oil Sludge



This refinery waste was easily broken down into an oil, water and solids phase after using a 1% dose of SAS SludgeTreat™.

A successful reaction will provide a clean separation of oil, water and solids.
Solids will tend to sink, where the oils will float to the fluid column.

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Micro-Emulsion Assisted Separation Economics

Driven By Interconnected Financial and Environmental Objectives

Water and Base Oil Reclamation

Micro-emulsion assisted separation systems recover water and oil extracted from solid/liquid wastes, therefore reducing carbon footprint. When recovered, the water and oil can turn a cost center into a profit center by turning waste into oil production.

Waste Solids Volume Reduction

By reclaiming fluid from oily wastes, the overall volume (or weight) of the waste is lowered, therefore lowering transport and disposal costs by the same percentage of fluid recovery, generating savings. This directly reduces the carbon footprint of the associated activities.

Waste Solids Declassification

Depending on the application, or even on the region in which the activity is occurring, the reduction of the water and oil content can lower the disposal hazard classification of the oily wastes.

Though many micro-emulsion assisted separation systems are deployed to achieve regulatory compliance, the best systems will recover valuable oil and generate a financial return or help avoid disposal costs.

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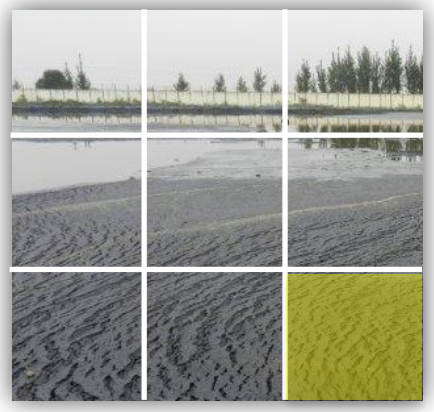
Micro-Emulsion Carbon-Footprint Implications

Modest Treatment Objectives Will Net Major CO_2 Reductions

Conservative Estimate of Treatable Volumes

If just 1/3 of the estimated 9 billion metric tons of stock-piled oily waste could be treated and just 1/3 of that contained recoverable oil and water, then 1 billion metric tons of material would avoid landfill.



Average Dump Truck Load Capacity

If the average dump truck can support 15 metric tons of waste, then approximately 66.7 million transport loads would be eliminated.

Average Dump Truck Diesel Mileage

If the average landfill were just 10 miles (16 km) away and the average dump truck mileage were 10 miles (16 km) per gallon, then each load would consume approximately 1 gallon (3.8 liters) of diesel.

Resulting Carbon Footprint Reduction

Based on these assumptions, this would equate to approximately 66.7 million gallons (250 million liters) of diesel fuel that would no longer need to be consumed equating to 600,000 metric tons of CO_2 of emissions eliminated.

This does not account for the potential CO_2 reduction implications that could be derived from the 1 billion metric tons of recovered oil and water.

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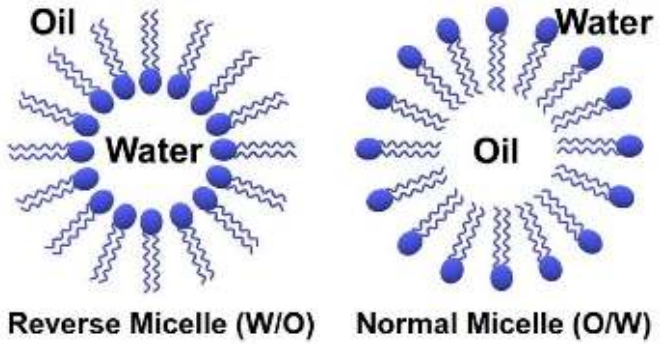
Parting Thoughts

The Link Between Employee Education, Equipment Efficacy and Environmental Equity



As with all technology, its effectiveness is inherently limited by the quality of the personnel we entrust to deploy and operate It. The more we do to educate, certify and retrain our most valuable assets, the more our organizations, and the world we live in, will benefit.

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