Treating Challenging Oil Slop & Sludge Waste
Treating Challenging Oil Slop and Sludge Waste

Today’s oil & gas industry faces a number of environmental and waste management responsibilities. As the responsibilities and regulations have become more complex, so too has the complexity of wastes being generated. Today’s drilling contractors, drilling fluid service providers, refineries, and storage facilities are plagued by a combination of end-of-life drilling fluid wastes, slop-oil sludge, mud pit solids, and tank bottoms. Each with its own set of challenges that call for unique, tailored solutions.

There is an estimated nine billion metric tons of heavily oil-contaminated liquid waste on the planet, a number that goes every year. The largest waste streams come primarily from crude oil tank bottom sludge from refineries, tank terminals, pipelines and petrochemical plants. However, end-of-life oil-based drilling fluids, centralized waste management treatment facility sludge, and deep-well injection facility sludge is building at an alarming rate.

Despite the growing volume of difficult these difficult to treat wastes, practical solutions rarely surface. The most common treatment methodologies rely on either a specialized chemical solution or a brute-force mechanical solution. This is understandable, given the fact that the best mechanical or chemical solutions come from solutions providers that specialize in either mechanical or chemical solutions; our industry simply does not foster companies that are specialists in both chemical and mechanical treatment.

In light of the waste management complexities and the limitations of a purely chemical or mechanical treatment process, Elgin Separation Solutions (“Elgin”) and Surface Active Solutions (“SAS”) have teamed up to provide to the market a specialized waste oil treatment solution that combines the best of both the chemical and mechanical worlds.
Innovation Through Team Work

Elgin has been designing and manufacturing customized chemically-assisted mechanical separation systems for decades. By utilizing Elgin’s own line of high-speed decanter centrifuges at the heart of these systems and its unique history working with waste water treatment polymers, Elgin has been able to develop unique and highly customized waste management solutions for customers in over 20 countries.

SAS develops unique, highly effective microemulsion chemicals used for the cleaning of drilling mud, the treatment of oil drilling waste, refinery waste, oil sludge and the recovery of oil from waste. SAS products have been used to clean over 1,000 mud pits around the world by most of the major oil service companies looking to provide greater value to their clients by reducing cleaning times, and getting operations back online faster with less risk to personnel and the environment. Like Elgin, SAS specializes in developing unique & tailor-made chemical solutions for their clients.

For both SAS and Elgin, it is not about being a solutions provider or using buzzwords. It is about efficiently understanding the nature of the waste, the process to be used, and the desired outcome. It is because of this shared vision, and the growing needs of the industry, that a synergistic partnership was inevitable.

By combining the chemical waste treatment specialties developed by SAS and the mechanical solid/liquid separation solutions developed and manufactured by Elgin, these two organizations have put together a single team able to provide a complete solution that focuses on achieving effective results. By
combining a fully containerized chemically-assisted centrifuge and a proprietary microemulsion chemistry, complex oily sludge can be reduced by up to 90%, disposal costs can be reduced typically by 50%, while oil and water can be recovered from the process. This can also increase storage capacity on site and reduce the need for expensive tank cleaning with associated high disposal costs.

**Conventional Treatment System Failures**

At the heart of most treatment systems is a centrifuge, normally a decanter centrifuge. The centrifuge can be found in every corner of the oil and gas industry. When applied correctly, centrifuges can produce impressive results. However, centrifuges rely on a number of factors in order to achieve positive results.

Centrifuges are deployed in order to “cut” solids from the liquid stream; essentially creating two separate streams from the incoming influent. We typically consider the cut to be the “underflow” (a.k.a. “solids discharge”) and the cleaned liquid stream (a.k.a. “centrate” or the “overflow”). The centrate will contain most of the liquid and the finer solids. The cake will contain less liquid and the coarser solids. The ability to achieve this goal is a direct function of the fluid inhibition, formation solids reactivity (defined as the combined measure of the potential for a material to cause a negative impact to the drilling activities by material hydration and/or dispersion), solid/liquid bonding created by highly viscous elements within the feed stream, centrifuge design parameters, and centrifuge operating parameters.

Unless each of these variables are considered, a high quality centrifuge can be rendered useless. When it comes to managing slop oils, tank bottoms and similar natured materials, it is easy to overlook the complex bonding that forms between the oils, solids, and other liquids. Even for those that attempt to dilute, apply heat or maximize G-force input, most rarely achieve the desired results.

Similarly, most chemical treatment options rely on a host of wastewater treatment chemicals, de-emulsification agents, thermal heat input, and large tank volumes in order to obtain enough residence time to allow gravitation separation to occur. Like those systems that rely on mechanical separation via a centrifuge, these chemical treatment options typical result in an under-performing system that results in limited oil recovery and an ever-growing tank farm.
Oily sludge generally contains crude oil, water and solid particles in various proportions depending on its origin and the quality of the original crude oil. The oil element is made up of a wide variety of compounds that are classified into free oil, waxes and asphaltenes. It is the waxes and asphaltenes that, under normal circumstances, act as solid components and are not removed in conventional oil/solids separation techniques such as non-chemically enhanced centrifugation. By breaking the oily sludge down into layers with the use of SAS microemulsions and applying high G-force through a centrifuge, each layer can be treated, reused or disposed of in a more effective and cost efficient manner.

**An Efficient and Cost Effective Option**

It is for the above-referenced reasons that SAS has spent more than a decade perfecting a specialized set of proprietary treatment chemicals, microemulsions. However, it was also during this period that SAS recognized that the proper handling, dosing, and injection of these specialized chemicals was required with a properly tuned mechanical treatment system. Ultimately, the right conditions are required in order to maximize the efficiency of the microemulsion chemistry prior to the introduction to a centrifuge. However, when properly managed, a micro-emulsion enabled centrifuge will produce dramatic results. By combining SAS’s proprietary microemulsions with Elgin’s specialized chemically-assisted, fully packaged, centrifuge treatment systems, a sophisticated and effective treatment solution was born.

When properly operated the Elgin SAS Sludge Treatment Systems can be designed to treat between 12,000 and 36,000 gallons of sludge per day. All that is required is a specialist an Elgin SAS system operator, an electrical power source, waste solids disposal bins and the necessary tank volume to hold the treated centrate.

**System Benefits**

- Recover Oil.
- Minimize disposal cost by up to 50%.
- Reduce waste going to landfill.
- Technical expertise.
- Improve environmental compliance.
- Increase storage tank capacity.
- Packaged containerized unit.
- Reduce transportation costs.
- Operation & maintenance expertise.
- Reduce environmental risk.
- Less energy or capital intensive than alternative market solutions.
Compared to alternative technologies, the Elgin SAS Sludge Treatment System has a number of operational advantages:

<table>
<thead>
<tr>
<th>Process Characteristics</th>
<th>Elgin / SAS Sludge Treatment System</th>
<th>Sole Chemical / Polymer Treatment System</th>
<th>Thermal Treatment System</th>
<th>Sole Mechanical Treatment System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produces Stackable Solids</td>
<td>🍃</td>
<td>🍃</td>
<td>🍃</td>
<td>🍃</td>
</tr>
<tr>
<td>Maximizes Oil Recovery</td>
<td>🍃</td>
<td>🍃</td>
<td>🍃</td>
<td>🍃</td>
</tr>
<tr>
<td>Continuous Treatment Process</td>
<td>🍃</td>
<td>🍃</td>
<td>🍃</td>
<td>🍃</td>
</tr>
<tr>
<td>Immediate Results</td>
<td>🍃</td>
<td>🍃</td>
<td>🍃</td>
<td>🍃</td>
</tr>
<tr>
<td>No Need of pH Adjustment</td>
<td>🍃</td>
<td>🍃</td>
<td>🍃</td>
<td>🍃</td>
</tr>
<tr>
<td>No Thermal Input Required</td>
<td>🍃</td>
<td>🍃</td>
<td>🍃</td>
<td>🍃</td>
</tr>
<tr>
<td>Creates Three-Way Split of Oil, Water and Solids</td>
<td>🍃</td>
<td>🍃</td>
<td>🍃</td>
<td>🍃</td>
</tr>
</tbody>
</table>

For more details about how the Elgin SAS Sludge Treatment System may be able to provide you and your team immediate value, please contact your Business Development Representative or contact us through [www.ElginSeparationSolutions.com](http://www.ElginSeparationSolutions.com) or [www.SurfaceActive.com](http://www.SurfaceActive.com). We can work with your team in evaluating samples and providing a detailed assessment of the expected system efficacy and the financial payback that you can expect.