

# PROGNOSIS FOR APPLYING HYDROSMART TECHNOLOGY To TANK WASHING

## Overview

Oil Tankers are divided into three main categories, Crude Oil Carriers, which transport the unrefined oil from the oil fields or production facilities to the refineries. Fuel Oil Carriers, which transport various grades of the refined oil to the ports servicing those markets and finally the Product Carriers which carry highly specialized liquid cargo's which may or may not be oil related. These cargoes include aviation spirit, vegetable oils, (such as palm oil), acids and a variety of specialized liquids where product purity and the need to avoid cross contamination is essential.

All of these vessels need to have their tanks cleaned after discharging their cargoes prior to loading their next cargo.

The most problematic of these are the large Crude Oil tankers (known in the industry as VLCC's Very Large Crude Carriers), These have very large tanks each capable of holding as much oil as the entire cargo carrying capacity of product carriers, thus their sheer size and volume, makes the cleaning of these tanks potentially problematic.

Crude oil is loaded pretty much as it comes out of the oil well complete with a multitude of impurities, (e.g. sand), some of which settles out during the voyage and gets left behind in the tanks after the cargo is discharged together with a substantial amount of the cargo which is inhibited by the structural members at the bottom of the tanks from flowing freely to the discharge pipes. It is not unusual for the discharge pipes and pumps from these cargo tanks to be over 1 metre in diameter, and they tend to lose suction before all the oil in the tank has been discharged. This can leave as much as 2000-4000 tons of oil remaining behind in the cargo tanks.

This adds greatly to the tank cleaning operation and smaller 'stripping' pumps and pipes are used to try and get out the remaining cargo but they are comparatively slow to complete the job in time before the vessels requirements to take on seawater ballast. This is done to resolve stability problems, shear stress issues, and for physical necessities such as immersing the propellers, reducing the sail area of the hull, and to trim the ship for the voyage back to the next loading port. The tank cleaning operation is then carried out during the voyage back to the next loading port.

A widely used tank cleaning system is the 'Butterworth system built into the cargo tanks which consists of a large number of rotating high-pressure jets, (similar to the Cloudburst and Fury systems used in cleaning winery tanks). The first phase of cleaning of the tanks that do not contain seawater ballast is to circulate the remaining crude oil through the nozzles at high pressure as a pre-cleaning measure to recover as much of the oil residue as possible without contaminating it with seawater and as much of this is stripped out as possible and pumped to a separate tank. The main phase of tank cleaning is then commenced in which sea-water heated to fairly high temperatures 35 - 45°C is pumped at high pressure through the tank cleaning nozzles. The resulting mixture of seawater, oil and all the other impurities are then pumped to the slops tanks to allow as much of the oil as possible to rise to the surface so that it can be separated out during the voyage, (albeit in a salt contaminated form). Some of the cleaned tanks are then ballasted so that the tanks that were initially filled with ballast water can now be emptied for cleaning.

Because of the volatile nature of hydrocarbons, (oil) and all its associated gasses, tank cleaning operations are inherently dangerous and are carried out under strictly controlled conditions. Cargo tanks are usually pressurized with inert gases, (non-explosive gases extracted from the exhaust pipes of the main engines). These are present both on the loaded voyage to inhibit gases

from the cargo igniting, and are essential just after discharge and during tank cleaning, where the highest air to gas ratio is present and the mixture is at its most volatile state. The high-pressure jets produce substantial amounts of static electricity and have to be earthed to avoid ignition.

Most of these gases are highly toxic which makes inspections of the tanks potentially problematic and a major health and safety issue. Although the emphasis thus far has been on the cleaning of crude oil tanks where the contamination and the scale of the operation is greatest, the issues apply equally to the cleaning of tanks carrying more refined oil products such as fuel and bunker oils. Of particular note is the problem of Hydrogen Sulphide gas H<sub>2</sub>S which builds up in the layer separating the oil from water in the slops tanks and can easily reach concentrations that can kill instantly if the layers are disturbed.

So how can Hydrosmart technology assist in the resolution of these issues?

Hydrosmart was originally developed as an anti-corrosion system, based on some advanced particle physics research that enables a specific range of resonance frequencies to influence electron polarity of a targeted group of minerals and chemicals, that were instrumental in the corrosion process. When these frequencies are applied to water and many other fluids, the electrons associated with the minerals and chemicals in that fluid, have greatly reduced bonding abilities and a substantial proportion of the chemical interactions that would normally take place, no longer occur.

This is the basic principle on which a solution to the corrosion issue was found, however, Hydrosmart technology has subsequently proved to have abilities that go far beyond corrosion control, (which in itself is a significant issue in tank cleaning) and has demonstrated, in a variety of commercial applications, to inhibit the chemical interactions that allow the odor producing gasses to form.

H<sub>2</sub>S odors have already been eliminated from large anaerobic ponds of wastewater in a very large textile factory, this implies that H<sub>2</sub>S is no longer being produced. In this effluent water there has been heavy dosing of concentrated Sulphuric Acid and the large volumes of salt used in the textile dyeing process have created ideal conditions for H<sub>2</sub>S production. H<sub>2</sub>S is also a by-product of the anaerobic process. The resulting concentrations of H<sub>2</sub>S and its offensive odor were reduced to imperceptible levels within a week of applying Hydrosmart treatment.

In the tank-washing process, the prognosis is even better as the Hydrosmart treatment should take much of the salt out of its chloride form, reduce particle size, lower surface tension, and release most of the contaminants from the oil itself.

The treatment should also break the bonds between the oil and the tank surfaces making for a much more efficient tank cleaning operation with the prospect that cleaning process will be possible at much lower water temperatures.

Added to this are the scale prevention and removal abilities of the technology which will improve or restore the internal surfaces of the tanks and the tank cleaning system, increase efficiency, lower maintenance costs, reduce corrosion and speed up cleaning times.

It is likely that most of the gas producing chemical reactions will be inhibited with the further prospect of treated ballast water taking silt, sludge and marine deposits back into solution.

There is also promising potential for product carriers where efficient tank cleaning can prevent cross contamination in tanks, discharge and transfer lines.