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Slop Oil Treatment & Valorisation Plants

A TecnoVeritas Technology

White Paper

August 2017

Innovative IMO Slop Tank Recycling and Valorisation Based on Ultrasound Assisted Oxidation

New regulations regarding protection of environment adopted by most countries all over the world, invite ship owners to adopt an environmental friendly behaviour.

Ship operations produce hydrocarbon residues from ballast water, tank washing residues and other hydrocarbon mixtures from the engine room and bilge waters. In many cases these oily waste are illegally drain off into the sea. To avoid such practice, IMO, through MARPOL 1978 International Convention for the Prevention of Pollution from ships, imposed the presentation to the port authorities of certificates reporting waste unloading in the last port through an authorised MARPOL collector is now compulsory.

TecnoVeritas has been investing actively in research and development applied to sustainable ship operation and environment since 1994, being awarded the first prize of **SEATRADE Awards on Clean Shipping 2012** and a **Green Projects Award 2013**.

The called “Slop Tank” product once collected by the authorised company, must be treated and recycled, which is an environment benefit. In this process it must be dried, cleaned from solid particles and finally conditioned to become a product with a certain market value, for example as heavy residual fuel for cement industry, or ships.

However stricter environmental Regulations followed by the most recent requirements of MARPOL VI, dictates that sulphur contents of fuel oils for ship operation must be inferior to 1%. As most “slop tank stocks” have non-compliant properties like higher sulphur contents, or a lower flash point temperature, an adequate product manipulation is needed to bring such properties to acceptable standards therefore valorising such products.

TecnoVeritas has been working on Ultrasounds Water in Fuel emulsions since 2009, developing its ENERMULSION in-line Water Fuel Emulsion system for marine and shore applications, based on Ultrasounds technology. Figure 1 represents the heart of the system, Ultrasounds unit.



Figure 1 – General View of an Ultrasonic unit Enermulsion with a processing capacity of 4Ton/h.

It happens that, it was discovered that during the high intensity cavitation process generated by Ultrasounds, there is place for a partial thermionic decomposition of the water molecules, generating a considerable amount of H₂O₂ (hydrogen Peroxide) that is a strong oxidiser, and therefore a combustion improver and a sulphur oxidiser. It was also possible to realise that asphaltenes are largely reduced, therefore originating a much cleaner combustion in terms of Particulate matter, NO_x, SO_x and minimised combustion equipment troubles. All this to say that fuels with improved quality and therefore a better market value may be obtained.

As a result of such research, TecnoVeritas developed a comprehensive Ultrasound based system, to recycle “slop Tank residues” to obtain a premium oil product out of waste oils residues.

The system process may consist of a Vacuum vessel, an Ultrasound cavitation system, Desulphurisation unit with oxidiser and catalyst sub-units and a sulphones Separation unit. This system is of particular interest for most recycling companies dealing with slop tank oil as it is optimised for fairly low quantities and very high energy efficiency, allowing them to valorise their

products as premium fuels complying with actual fuel regulation international standards.

The TecnoVeritas Slop Tank Valorisation system differentiates from common desulphurisation processes of the large refineries based on hydrogen processes undergoing high temperatures and pressures, therefore being applicable to small refineries that process small volumes of product. As mentioned the present technology does not involve high temperatures and high pressures, as well as it has a small energy consumption, making possible very high energy efficiencies. Using the TecnoVeritas technology for “Slop Tank” the recycled products become homogeneous, with an adjusted Flash Point, less pollutant in terms of Particulate matter, Asphaltenes, NO_x, SO_x and other metal oxides.

In reality, the obtained **recycled** product, becomes an Environmental “friendly” Premium fuel for the marine and shore industry, through the use of the **Ultrasonic Assisted Oxidation** alongside with the optional Vacuum Flash Technology.

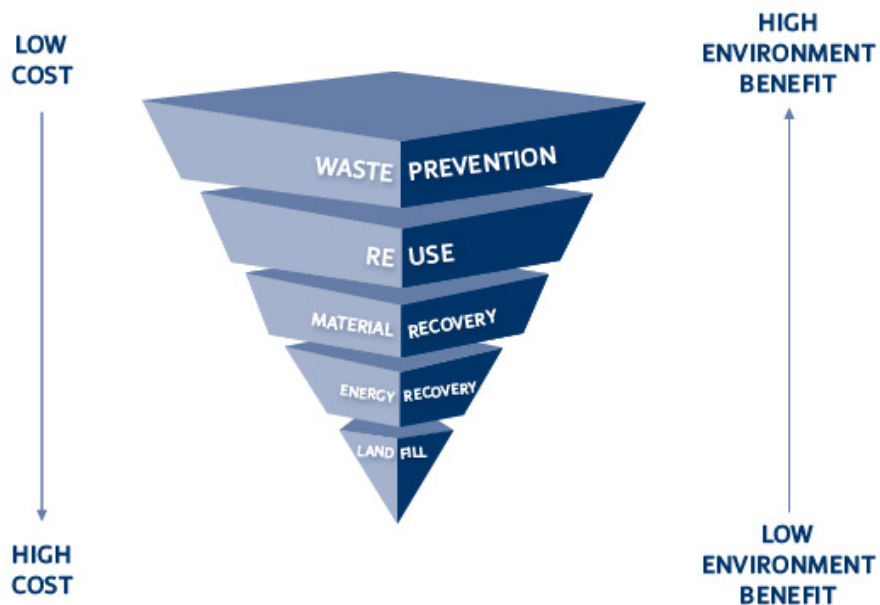


Figure 2 - The “waste triangle” illustrating the economic and environmental benefits of recycling.

Waste prevention as per figure 2, is supported in this case by the recycling of waste oily stock collected from the ships and other plants, limiting the waste. Waste prevention is not primarily a question of waste, but an environmental good practice. It has to do with resources, and how better to utilize resources. Slop tank residues may be understood as leftovers of oil resources, that otherwise need to be compensated by extra “fresh oil” increasing its exploration and related processing carbon footprint. The waste triangle (Figure 2) illustrates that by preventing waste from arising, a positive impact on environment and costs are usually reduced. It is also illustrated how low cost and increased environmental benefits are linked.

Considering the relationship between environment and economic benefits, **TecnoVeritas, Ultrasound Assisted Sulphur Oxidation** applied to heavy products such as “Slop tank” products is a novelty, allowing the oil recycling companies to valorise their products by adjusting their properties, and seas pollution.

The process is illustrated on Figure 3. Process consists of one flash vacuum tank (optional), an Ultrasonic processing unit and also on an Oxidation and Separation unit.

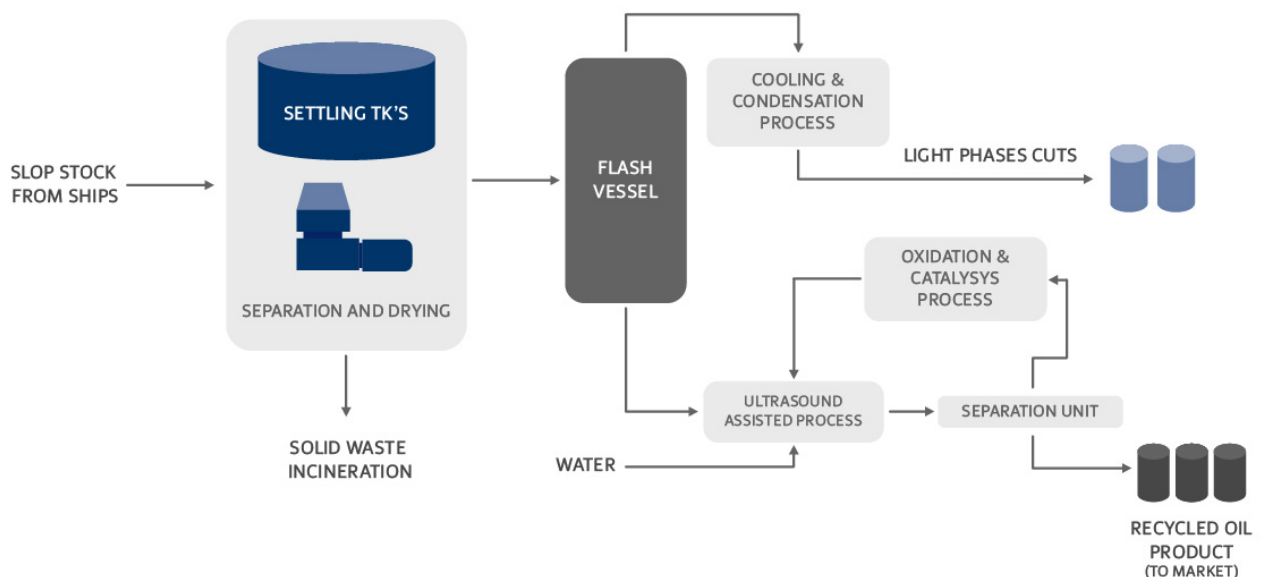


Figure 3 – Slop Tank Valorisation Plant

TecnoVeritas has designed and built Ultrasonic Assisted Processes with processing capacities ranging from 1Ton/h up to 5 Ton/h, therefore ideal for medium size slop recycling plants, although higher capacities are possible if required.

One complete industrial unit is currently in operation in the Port of Setúbal, Mitrena (Portugal).

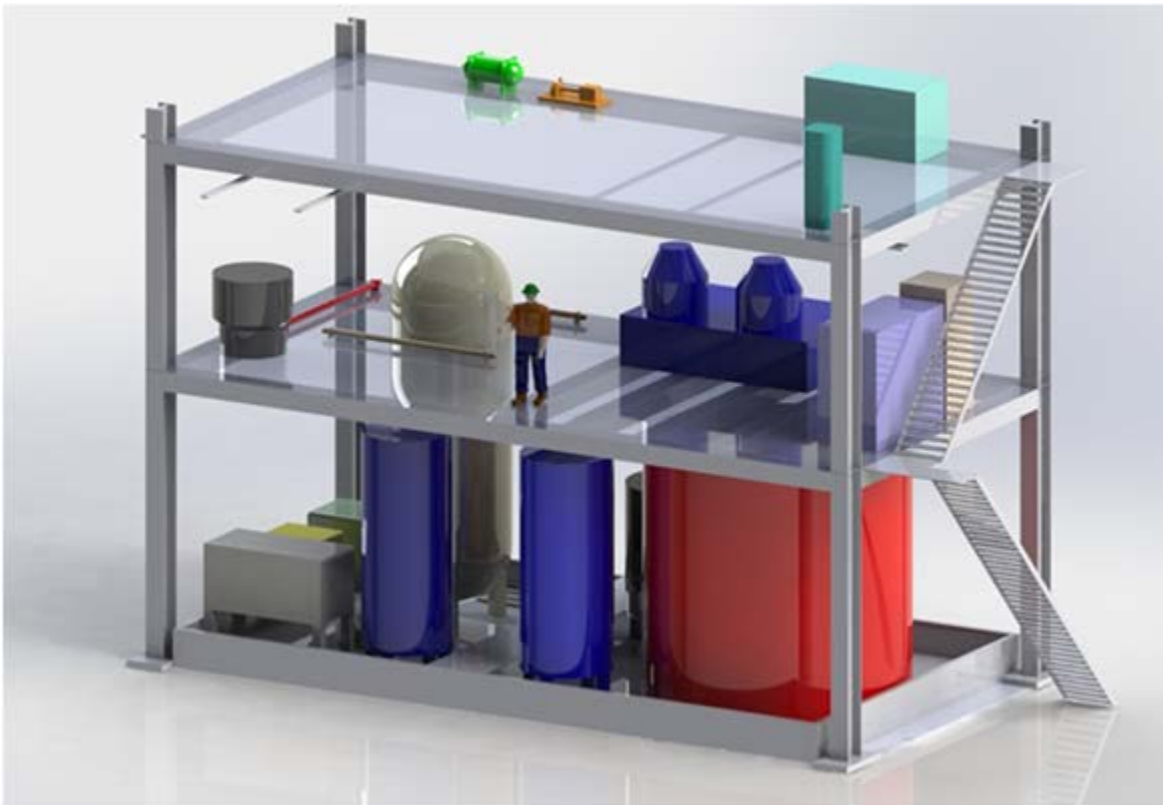


Figura 4 - General arrangement of a 5Ton/h Slop processing plant, as installed in Setúbal Portugal.
The plant foot print is only 12m x 6m, and it is fully automated and monitored.

The Slop Tank valorisation plant is an Environment friendly technology as it is an alternative to incineration, recycling a residue into a premium fuel with high specific energy, improved combustion properties and resulting emissions is the goal. The valorisation of the recycled product through its improved properties, allows a quick pay back of the investment. The plant area required is limited, and may be supplied in skid modules as well as on board of 40ft marine containers for fast plant deployment. The system is CE marked, with complete traceability of waste reprocessing in

accordance with the Basle's agreements. No atmospheric emissions or discharges in accordance with the stricter international standards, and it is a valuable answer to avoid sea pollution by hydrocarbons.

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