

ECOSOLUT® 24

A New Standard in Vegetable Oil Tank Cleaning

Case Study

Advantages of ECOSOLUT 24 Compared to Traditional High pH Cleaning Procedures

- ▶ Lower cleaning temperature, saving energy costs and time
- ▶ No secondary acid cleaning procedure necessary to get rid of white residues
- ▶ Compatibility with all cargo tank coating types
- ▶ Safer handling of pH neutral chemicals
- ▶ Enhanced 'ECOSOLUT' environmental profile

Introduction

Tank cleaning from vegetable oils in a chemical tanker is normally performed under highly alkaline conditions (e.g. pH ≥ 12) and high temperatures (e.g. $\geq 80^{\circ}\text{C}$). These conditions are required in order for the vegetable oil to be chemically degraded in a saponification reaction (see below). A significant disadvantage of the saponification reaction is that metal soaps are generated which have limited water solubility and can leave problematic white residues on the surface of the cargo tanks similar to the soap scum in a domestic bath. An additional and time-consuming acid-based cleaning procedure is then required to remove the residues and complete the cleaning operation.

By contrast ECOSOLUT 24, which is pH neutral, cleans vegetable oils by a surfactant mechanism at 60°C , thus removing the need for such stringent and aggressive operating conditions, thereby providing a real opportunity to make considerable time and cost savings for the owners and / or operators of chemical tankers trading in this sector. Moreover metal soaps are not generated in surfactant cleaning, removing the need to consider the use of acid based cleaners.

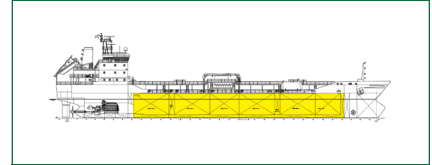
Due to the efficiency of ECOSOLUT 24, it has been found that efficient cleaning is achieved with a chemical dosage that is typically 10 times lower than many alkali based cleaners

Previous surfactant-based cleaners for vegetable oil have generally been used in combination with an alkali in order to reach the required degree of cleaning. ECOSOLUT 24, by use of optimized surfactant technology, has now been shown to match this performance without the need for alkali, thereby avoiding the problems described above.

Lower Cleaning Temperature Advantages

The advantages of efficient cleaning at 60°C rather than 80°C are obvious, giving not only considerable energy savings but also time benefits for the reduced delay to get the cleaning solution up to working temperature.

USAGE AREAS



Tank Cleaning and Maintenance

PACKAGING



APPROVALS

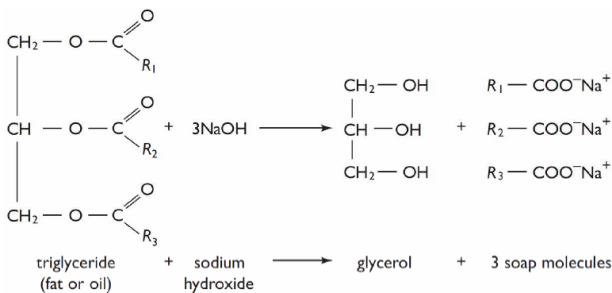


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Metal Soap Residue Elimination

Vegetable oils are tri-glycerides of the structure shown below.



The alkali (sodium hydroxide is shown but potassium hydroxide behaves similarly) breaks the vegetable oil into glycerol and metal soaps. Glycerol is very water soluble but the metal soaps have limited water solubility. The metal soaps can thus be left as white residues on the tank surface after the water-based cleaning solution treatment. They then have to be removed, normally by a strong acid (e.g. phosphoric acid) based cleaner.

The solubility of the metal soaps depends on several factors:

- ▶ The alkali used (potassium hydroxide gives more liquid residues than sodium hydroxide)
- ▶ The composition of the vegetable oil
- ▶ The temperature of the cleaning water
- ▶ The hardness of the cleaning water – calcium and magnesium ions will give highly insoluble metal soaps ('soap scum')
- ▶ The salinity of the cleaning water

Because of this complexity, predicting when the metal soap residue problem will appear is difficult. This can lead to unscheduled delays in completing the cleaning process.

Compatibility with All Cargo Tank Coating Types

Because ECOSOLUT 24 cleans under neutral conditions it is compatible with all cargo tank coatings types including zinc silicate coatings that degrade under high pH conditions. Ecosolut 24 has been independently tested and approved by leading coatings companies under the most stringent cleaning conditions.

Safety, Health and Environment

There are obvious safety advantages of a neutral cleaning formulation such as ECOSOLUT 24 compared to working with high pH/corrosive materials. Furthermore the required treatment rate of ECOSOLUT 24 is an order of magnitude less than that for a typical alkali-based cleaner, thus reducing the environmental impact of the cleaning operation.

Test Comparison of Vegetable Oil Cleaning Performance of ECOSOLUT 24 and Alkali-Based Cleaning

In an independent test laboratory the vegetable oil cleaning performance of ECOSOLUT 24 was compared with:

- i) a potassium hydroxide-based tank cleaning additive
- ii) a well-established surfactant cleaning additive ('A') which is often used in combination with a KOH cleaning additive ('B')

The usage rates and cleaning temperatures were as per the data sheet recommendations i.e.

- ▶ Ecosolut 24 – 0.5% aqueous solution at 60°C
- ▶ KOH-cleaner – 5% aqueous solution at 80°C
- ▶ 0.5% A + 5% B at 60°C

In brief, the test protocol involved:

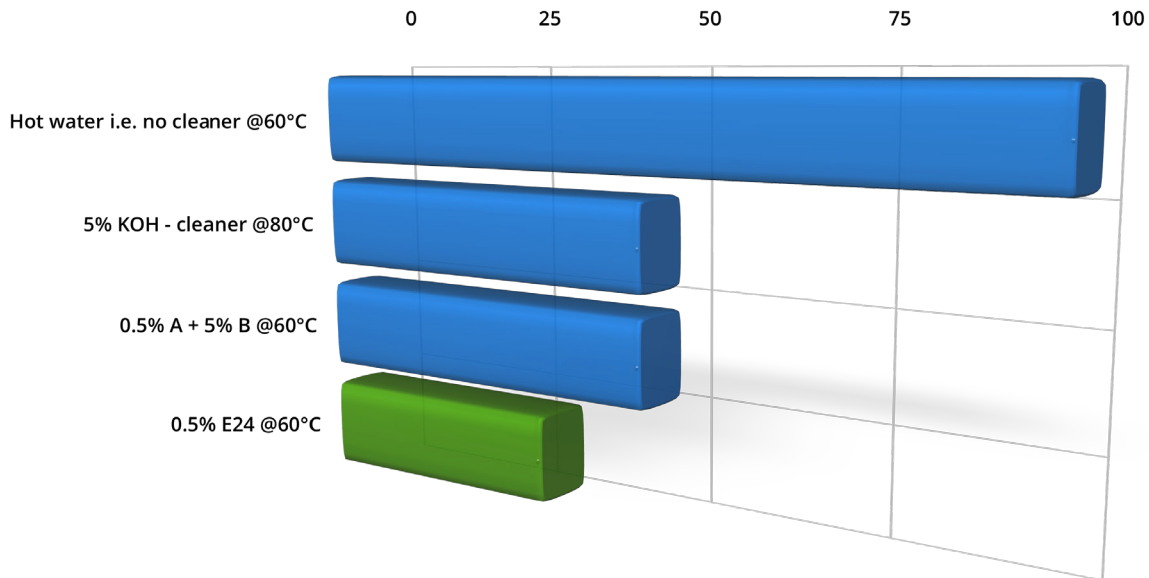
- ▶ Immersing mild steel coated test panels in palm kernel oil (PKO) at 45°C for 48 hours;
- ▶ Allowing them to drain as they cooled to ambient, leaving an even film of solidified oil on the surface;
- ▶ Washing for 2 hours in recirculating cleaning solution under manufacturers recommended conditions (see above);
- ▶ Rinsing the washed plates with ambient freshwater then allowed to dry;
- ▶ Prolonged immersion of the dried plates in strong organic solvent to extract any residual PKO;
- ▶ Analysing the organic solvent solution to quantify the extracted PKO content.

The results are summarized compared to a hot water-only washing, see chart below.

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PKO Residue (Hot Water Scaled to 100)



Important Notice

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Approvals

ECOSOLUT 24 has been independently tested and approved by leading coatings companies under the most stringent cleaning conditions. ECOSOLUT 24 is an IMO registered Cargo Tank cleaning additive in MEPC.2

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