

## **Investigation into cleaning from Ultra Low Sulphur Diesel (ULSD) to methanol in a zinc silicate coating using E-14 and the current market leading water based neutral detergent**

### **Introduction**

Tank cleaning from Annex I (oil) cargoes in zinc silicate coatings typically requires the use of a detergent (to remove residual hydrocarbons) very often in combination with bleach or sodium hypochlorite (to remove surface discolouration).

Experience from within the industry shows that currently, a product called Accell Clean is the most efficient detergent and this product appears to be widely used on board the zinc silicate coated vessels of the ship owners / operators, who frequently trade in the bulk methanol market. At the request of OTI Greentech (OTI), L&I Maritime (UK) Ltd (LIM) were asked to arrange and oversee the evaluation of a new detergent based tank cleaning chemical called E-14 in order to compare its efficacy against the market leader.

The most significant challenge facing these vessels when cleaning from non-volatile or persistent oils like ULSD, gas oil and kerosene is the removal of residual hydrocarbon which becomes trapped inside the surface profile of the zinc silicate coating. Essentially, the coating appears to be clean on outside, but really it is saturated with a previous cargo that is not going to evaporate and can only be removed by specialist cleaning chemicals. If the previous cargo residues are not successfully removed, there is a significant risk of contaminating the methanol cargo because of course, methanol is a very aggressive and penetrating solvent that is able to actively get inside the zinc silicate matrix and remove any retained cargo residues.

With this in mind, all vessels loading methanol will first be inspected and analytically tested in order to confirm that the coating is indeed clean and ready to load the methanol cargo. This inspection takes the form of a “wall wash” test, whereby random areas of the tank are washed with methanol and subsequently tested for the presence of hydrocarbons. A hydrocarbon reading of less than 10 would be considered as acceptable to load a cargo of methanol.

The following investigation was carried out on board a 45,000 MT DWT zinc silicate coated chemical tanker with 20 cargo tanks, that had previously discharged a cargo of ULSD and was scheduled to load methanol next cargo. Cargo tanks 1 – 6W were cleaned with Accell Clean and cargo tanks 7 – 10W were cleaned with E-14.

### **Procedure**

All cargo tanks (1 – 10W) were cleaned as follows:

- i.) 1 hour ambient seawater machine wash to slop
- ii.) 4 hours hot seawater machine wash overboard

And then

COT 1W – 6W

- iii.) 4 hours recirculation with 1% Accell Clean
- iv.) 4 hours hot (75 – 80°C) seawater machine wash
- v.) Ventilation and methanol wall wash

COT 7W – 10W

- iii.) 4 hours recirculation with 1% E-14
- iv.) 4 hours hot (75 – 80°C) seawater machine wash
- v.) Ventilation and methanol wall wash

**Results.** The following wall wash results were noted:

Cargo Tank	Hydrocarbon (FTU)	Cleaning Operation
1P	83	1% Accell Clean
1S	79	1% Accell Clean
2P	135	1% Accell Clean
2S	122	1% Accell Clean
3P	114	1% Accell Clean
3S	138	1% Accell Clean
4P	157	1% Accell Clean
4S	146	1% Accell Clean
5P	119	1% Accell Clean
5S	148	1% Accell Clean
6P	146	1% Accell Clean
6S	128	1% Accell Clean
7P	7.6	1% E-14
7S	71	1% E-14
8P	3.2	1% E-14
8S	44	1% E-14
9P	54	1% E-14
9S	5.5	1% E-14
10P	6.5	1% E-14
10S	2	1% E-14

The following additional cleaning was then carried out:

COT 1W – 6W, 7S, 8S and 9P:

- i.) 4 hours recirculation with 1% E-14
- ii.) 4 hours hot (75 – 80°C) seawater machine wash
- iii.) Ventilation and methanol wall wash

<b>Cargo Tank</b>	<b>Hydrocarbon (FTU)</b>	<b>Cleaning Operation</b>
1P	7.7	1% E-14
1S	3.5	1% E-14
2P	2.7	1% E-14
2S	8.4	1% E-14
3P	4.2	1% E-14
3S	7.6	1% E-14
4P	9.4	1% E-14
4S	8.6	1% E-14
5P	1.7	1% E-14
5S	1.0	1% E-14
6P	9.8	1% E-14
6S	3.1	1% E-14
7S	9.0	1% E-14
8S	3.5	1% E-14
9P	2.5	1% E-14

**Conclusions / Discussions**

There are several very clear conclusions that become immediately apparent:

- i.) The wall wash results from the cargo tanks cleaned with Accell Clean were consistent with what has been seen in the past
- ii.) The wall wash results from the cargo tanks cleaned with E-14 significantly out-performed the cargo tanks cleaned with Accell Clean
- iii.) The wall wash results from the cargo tanks cleaned with E-14 for the second time reduced the hydrocarbons to a level that was considered to be acceptable for loading a cargo of methanol

One of the main issues facing owners / operators of zinc silicate coated tankers trading in this area is the ability to remove residual hydrocarbons that remain trapped in the coating **after** washing with detergent. These residues are typically very well entrained in the coating and sometimes require upwards of 5 or 6 rounds of chemical washing in very hot water to remove them. In this case, it was clear that the initial cleaning effect of the E-14 not only out-performed the current market leading product, it also very effectively removed the residues that were left behind inside the cargo tanks after they had been cleaned with Accell Clean, resulting in an acceptable level of cleanliness after only 2 rounds of cleaning. This not only saves time for the vessel, it also significantly reduces the amount of washing residues produced and the consumption of bunker oil which is required to run the boiler and heat the washing water.

For and on behalf of L&I Maritime (UK) Ltd  
Guy Johnson  
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