

Effective tank cleaning while in operation

The success of any tank cleaning operation is generally measured on the ability of a vessel to switch from one cargo grade to another in the shortest possible time, using the minimum volume of tank cleaning chemicals or materials*.

Hidden inside this statement are a considerable number of variables, all of which directly impact on the end result. Many of these variables can be changed during a tank cleaning operation, for example the choice of cleaning chemical, temperature of washing water, number and/or operating mode of the tank cleaning machines and the skill of manipulating these variables is potentially what makes one vessel better than another at tank cleaning.

But perhaps the most important variable which cannot be altered during tank cleaning operations, arguably has the most impact on the success of all tank cleaning operations, and that is the vessel itself. For example, the size and construction of the cargo tanks, the ability of the vessel to maintain the optimum washing water temperature, the ability of the vessel to supply and remove washing water to and from the cargo tanks, to name three of the most significant.

Very simply, the construction and overall maintenance of these 'fixed assets' of the vessel are controlled and certified by the classification societies who inspect the vessels from newbuild and throughout operational service. The class societies will also provide the vessels with a class notation, which

directly relates to the construction of the vessel and permissible operations.

Put another way, class notation defines the minimum standard that a vessel must achieve in order to operate in a specific field. But vessels that are equipped above and beyond this minimum standard may also qualify for additional class notations. Specifically this would indicate to an interested commercial partner, that a vessel with an additional notation may be more suited to perform a particular service compared to a vessel without the additional notation, even if the class notation of both vessels was the same.

It is noted that within the DNV classification of vessels, one such additional notation is termed ETC, or Effective Tank Cleaning (on board oil products and chemical tankers). The basis of this notation can be read on the DNV website thus:

'An improved tank cleaning standard relating to the arrangement of and equipment on board oil product and chemical tankers that may reduce the turnaround time in ports. This notation is an attempt to make it less likely that the cargo will be affected by insufficient cleaning'.

It is interesting that by applying this notation, DNV appears to be actively working towards enhancing both the operational and

commercial performance of the vessels. The comments relating to the quality of the next loaded cargo are extremely important for owners and operators of tankers because in all cases where there is a cargo contamination claim, it is the owners and/or operators of the vessel that will take ultimate responsibility.

Fewer safeguards

In the case of loading oil products, there are fewer safeguards to protect the quality of loaded cargoes compared to loading chemical products, for the main reason that oil products tend to be loaded under fully inerted conditions, which essentially prevents the cargo tanks from being visually inspected prior to loading.

Significant emphasis is then put onto the documented tank cleaning procedure, but as noted, the responsibility for the quality of the loaded cargo ultimately lies with the owners of the vessel, so it is clearly within the best interests of the vessel to ensure that the cargo tanks are suitably cleaned from the previous cargo, irrespective of whether the vessel is inspected prior to loading or not.

On the contrary, in the case of loading chemical products, all cargo tanks (as a minimum) are inspected visually prior to loading and very often, when sensitive chemical products are being loaded, the tanks are further inspected by chemical analysis (wall wash inspection).

The different levels of inspection reflect the difference in quality specifications between oil products and chemical products. The overall quality of oil products tends to be much lower than the quality of chemical products and it is common to see the quality of many oil products measured in ranges which allows a certain degree of cross contamination from one oil product to another, based on the fact

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that all oil products are fundamentally derived from the same source.

Conversely, the quality of chemical products tends to be based on a high level of purity (typically greater than 90%) with strict limitations on key contaminants, reflecting the fact that the vast majority of chemicals are in fact pure, single component products.

Clearly the purer the product being loaded, the more thorough the pre-loading inspection should be and the fact that the ETC notation specifically addresses this point is clearly an advantage to those vessels that qualify for the notation.

One particular area where the benefits of enhanced tank cleaning are very apparent is cleaning from dirty to clean oil products, which historically has always caused some level of concern among commercial parties wishing to charter vessels in the clean oil trade.

It is obvious that black oil residues could discolour white oils, but there is no accurate understanding of how much black oil would actually be required to contaminate a white oil product. Furthermore, even if the cargo tanks of a vessel cleaning from black oil are visually inspected prior to loading, there is no guarantee that the white oil cargo will be in specification after loading.

So many charterers have a blanket agreement stating they will not take a vessel with black oil as last cargo to load a white oil cargo, which is not only restricting to them, it also reduces the flexibility of those vessels that have the potential to clean directly from black to white or dirty to clean.

This cautious approach is perhaps not unrealistic when one considers the costs associated with off specification oil/chemical products. But it should also be considered that most of this caution is historical and based on the fact that older tonnage was relatively unequipped to clean directly from dirty to clean compared to modern tonnage.

The cargo tanks were full of internal strengthening/stiffeners, which significantly increased the surface area inside the cargo tanks, where previous cargo residues could reside. Equally, the internal steel work created a huge number of shadow areas that seriously reduced the coverage of the tank cleaning machines that were already relatively inefficient compared to the modern tank cleaning machines found on vessels today. There were no individual deep well pumps, simultaneously recirculating with cleaning chemicals and maintaining the washing water temperature was extremely difficult ... the list could go on.



Coated cargo tanks have corrugated bulkheads and no internal structures.

Clearly the design improvements in modern tankers has had a significant impact on the ability to clean these vessels and one could suggest that this is exactly the reason why the DNV ETC notation came about, to reward those owners who invested in vessels that could provide more commercial options for charterers?

So surely, if a vessel is capable and able of cleaning directly from dirty to clean, and the owners are willing to take the responsibility, there must be an opportunity to develop this without having to consider an historical precedence that is actually no longer relevant?

One such owner is Marinvest Shipping** of Gothenburg, who is a part owners and manager of a fleet of product tankers, totalling about 700,000 dwt. One of the company's primary objectives is to undertake projects that will enhance the future operational and commercial development of the fleet so that the partners will always receive the optimum level of service, whatever the trade pattern the vessels are involved in.

Marinvest made a conscious decision to equip the entire fleet to a standard that made them all eligible for the DNV ETC notation, which essentially means that all the vessels are equipped with the following key features recognised by DNV as being instrumental in enhancing tank cleaning and reducing the risk of contaminating loaded cargoes:

- 1) Coated cargo tanks that are characterised by having corrugated bulkheads and no internal structures.
- 2) Stainless steel cargo piping and where appropriate stainless steel heating coils.

- 3) Individual cargo tank deep well pumps, for optimised stripping.
- 4) The ability to wash at least the largest cargo tank with hot water at a minimum temperature of 85 deg C.
- 5) Tank cleaning machines that conform to the DNV Type approval program 785.70 and portable washing equipment/ appropriate access openings to wash the shadow areas created by the pump stack.

Marinvest operates tankers in the dirty, clean and chemical market and fully understands the limitations of not being able to load clean products directly after dirty when the opportunity arises, even though the vessels are seemingly well equipped to do so.

Similar owners who have modern vessels with the DNV ETC notation would also stand to benefit from demonstrating that they are able to switch directly from dirty to clean in a reasonable time frame and without creating excessive cleaning slops, which would not only benefit the owners, but would also create more commercial opportunities for the charterers.

Marinvest recently put this theory to the test, cleaning one of the vessels from carbon black feedstock (CBFS) to gas oil. The vessel, a 74,999 dwt oil tanker with ice class 1A, was delivered in 2007, with six pairs of wing tanks and two slop tanks all coated with phenolic epoxy and had been in the dirty trade for almost three years

The entire tank cleaning operation - overseen by L&I Maritime (UK) - took just seven days to complete and created only 60 cu m of oily slop and did not utilise petroleum based solvents, which are commonly used for

this type of cleaning operation. The following is a summary of the tank cleaning operation that took place in all tanks:

- 1) All lines well drained back to the residual oil tank (ROT) in order to minimise the volume of residual CBFS on board (ROB) at the start of the Annex I pre-wash.
- 2) Cleaning two tanks simultaneously, starting with warm seawater machine washing with four portable tank cleaning machines per tank, with a gradual increase in washing water temperature to 70 deg C. The duration of cleaning per tank was eight hours and both slop tanks were employed during the pre-wash in order to facilitate the supply and receipt of cleaning water.
- 3) Forced ventilation until tanks gas freed. Visual inspection to check for ROB.
- 4) Cleaning two tanks simultaneously via the slop tank FRAMO pump, four hours hot seawater machine washing at 70 deg C. During the first hour of cleaning, 200 l of an IMO approved solvent based emulsifying tank cleaning chemical was injected directly into the tank cleaning line using a positive pressure pump.
- 5) Forced ventilation until tanks gas freed. Visual inspection to check for signs

of discolouration.

- 6) All manifolds, crossovers, drops and heaters flushed with hot seawater back to the cargo tanks and then additional hot seawater machine washing in all cargo tanks for two hours per tank.
- 7) All lines and tanks flushed with freshwater.
- 8) Manual spot cleaning using an IMO approved emulsifying agent containing anionic and non ionic surface active agents.

After the cleaning was completed, all cargo tanks were independently inspected by a major international inspection company and approved for the carriage of clean petroleum products. The vessel then went on to load a cargo of gas oil and is continuing to trade in the clean market.

What made this operation potentially more challenging than a regular black oil to white oil cleaning operation was the fact that CBFS is heavier than water, which means the residues removed during the cleaning, tend to sink to the lower areas of the cargo tanks, leaving patches of discolouration on the lower sloping hopper sides. This was actually the reason why the manual cleaning at the end of the operation was required.

As stated at the start of this article - the success of any tank cleaning operation is generally measured on the ability of a vessel to switch from one cargo grade to another in the shortest possible time using the minimum volume of tank cleaning chemicals or materials.

In this case, a 74,999 dwt oil tanker switched from almost three years of trading in the dirty market to load a clean cargo in just seven days using 2,400 l of cleaning chemicals through the tank cleaning machines and only 600 l of cleaning chemicals for manual cleaning. The author* believes this is clearly a "success".

****This article was written exclusively for TANKEROperator by Guy Johnson, a director of L&I Maritime (UK) Ltd. He can be contacted at operations@limaritime.com Tel. +44 1909 532 003.***

*****With considerable acknowledgement to the operations manager at Marinvest Shipping - Magnus Cardfelt (direct telephone +46 31 81 72 54 Email magnus@marinvest.se) and Captain Vasko Milosevic, master mariner within the Marinvest Shipping fleet.***

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