MARITEC - TECHNICAL UPDATE

The Marine Fuel and Lubricants Specialist

Wednesday 7th June 2017

Technical Update: Chemical Waste In Fuels Bunkered in Singapore

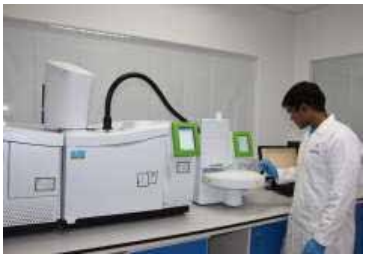
In the month of April 2017 several vessels received marine fuels in Singapore which completely sludged up. The fuel grade ordered was 500 cSt and the KV50 was tested to be in the 400+ cSt range. These fuel had high densities of (1,005.5 - 1,007.6) kg/m3 which is typical for this grade. All test parameters met the ISO 8217:2005 Specifications but the sludge overwhelmed centrifuges, clogged filters and drain lines making it impossible to be used and therefore not fit for its intended purpose. Naturally, the immediate suspicion was fuel instability and/or incompatibility issues and these were checked out extensively and found to be not the problem at all.
In fact some fuels were found to have: -

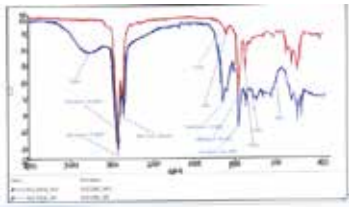
- High Stability Reserves with P-Value in the 2.5 range (ASTM D7112-12)
- Asphaltenes levels were in the 7.2% m/m range which is a typical level.
- Toluene/Xylene Equivalent of 28% (<30%) indicating fuels should be stable.

Maritec Research Department carried out extensive research for several weeks with advanced testing techiques and state of the art instrumentation.

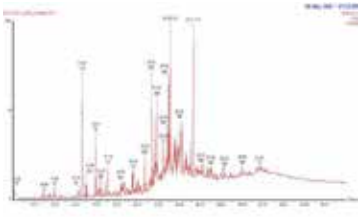
GCMS/FTIR investigations found the presence of alkyl phenols, 1-phenyl-1, 2-ethanediol, 4-cumylphenol, components from **Bisphenols and monoglycerides**. Alkyl phenols, 1-phenyl-1,2-ethanediol, 4-cumylphenol, components from Bisphenols and monolycerides **are non-hydrocarbon compounds and are not derived from petroleum refining and which should not be present in marine fuels.**

The vast majority of alkylphenols are used to synthesize derivatives, which have applications ranging from surfactants to pharmaceuticals. The four principle markets are nonionic surfactants, phenolic resins, polymer additives, and agrochemicals. 4-Cumylphenol is primarily a site-limited intermediate, manufactured and used as an end cap for polycarbonate photopolymers and co-polymers . 4-Cumylphenol is used in the manufacture of surfactants, phenolic resins. It is used as polycarbonate chain terminator.
Bisphenol F monomer is polymerized to prepare **epoxy resins and polycarbonates for use in the manufacture of lacquer, varnishes, coatings, adhesive plastics and other products.** It is used in the production of tank and pipe linings, industrial floors, road and bridge deck toppings, structural adhesives, grouts, coatings and electrical varnishes. Bisphenol A are used by manufacturers yearly. It is a key monomer in production of **epoxy resins and in the most common form of polycarbonate plastic.** Some vessels recieving fuels with such contaminants have indicated fuel injection equipment problems besides the fuel handling issues.





Maritec is presenting this information from a technical perspective so that other shipowners or ship operators who have encountered similar problems may be better aware what to look for and will be able to shorten the investigation process. Some months back we also encountered similar incidences in Singapore but since the owners did not opt to carry out further investigations the matter was not pursued. We anticipate a lot more of similar poor quality fuels around the world which may also include the presence of Estonian shale oil which is mined in ore form, crushed and retorted under high temperatures resulting in similar sludging problems. Oil sands and shale oil were already included as a fuel as far back as in the ISO8217:2005.



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