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L&I Maritime Ltd

- **UK company formed 1999**
- **UAE company formed in 2006**
- **Providing chemical expertise to the industry**
- **Tank Cleaning / Cargo Tank Inspection**
- **Cargo Handling**
- **Training**
- **Projects – laboratory to field (MarinSpec Associates, formed 2007)**

L&I Maritime Ltd

- **Principals are ship owners, charterers, oil majors, chemical suppliers, industry organisations and coating manufacturers**
- **APC have employed the services of LIM to investigate the positive impact of MarineLine on cargo handling and tank cleaning between different cargo grades**

Absorption / Transmission

- **We identified two immediate areas for investigation:**
 - i.) **The absorption of penetrating chemical cargoes and transmission into subsequent cargoes**

This project is well underway (via MarinSpec Associates) and APC have been encouraged to publish the interim results in the near future

Cleanability

ii.) The “cleanability” of MarineLine compared to other cargo tank linings

This project is still in its early stages, but the initial results are interesting and I am pleased to discuss them with you today

Cleanability

- Our first intention was to explore how MarineLine responded to basic tank cleaning methods, compared to other commonly used cargo tank linings
- Different linings possess different characteristics / advantages and we needed to see where MarineLine fitted in
- These characteristics always need to be considered when planning any tank cleaning operation)

Cleanability

- **Organic coatings** tend not to absorb viscous (oil based) cargoes, but do absorb (and retain) solvent type cargoes
- **Inorganic coatings (zinc silicate based)** are porous and whilst they do absorb solvent type cargoes, do not retain them. Viscous cargoes can and do “stick” to the profile
- **Stainless steel** extremely versatile but with some limitations

Cleanability

- **With this in mind, the following project was developed**
- **Five cargo tank linings would be directly compared against each other:**
 - Stainless steel**
 - Industry standard zinc silicate (aged)**
 - Industry standard phenolic epoxy**
 - Industry standard high solids ph. epoxy**
 - MarineLine 784**

Cleanability

- **Test panels * of each lining would be immersed in the following cargoes for 48 hours:**
 - i.) Palm Stearin at 65°C**
 - ii.) Hydro-cracker Bottoms (HCB) at 50°C**
 - iii.) FAME (SBO based) at 30°C**
 - iv.) Ethylene Dichloride (EDC) at 30°C**
 - v.) Styrene Monomer at 30°C**

* Where appropriate the panels were post cured according to the manufacturers specifications

Cleanability

- **After immersion, the panels were cleaned according to the Dr. Verwey tank cleaning guide.**

**PS and HCB: Hot (70°C) S/W for 6 cycles
Hot F/W 0.05% Teepol for 4 cycles
Cold F/W for 1 cycle
Steaming**

Cleanability

FAME: Warm (50°C) S/W for 6 cycles
Hot (70°C) F/W for 3 cycles
Steaming

EDC: Cold S/W for 3 cycles
Warm (50°C) S/W for 3 cycles
Steaming

Styrene: Cold S/W for 9 cycles
F/W flush, then steaming

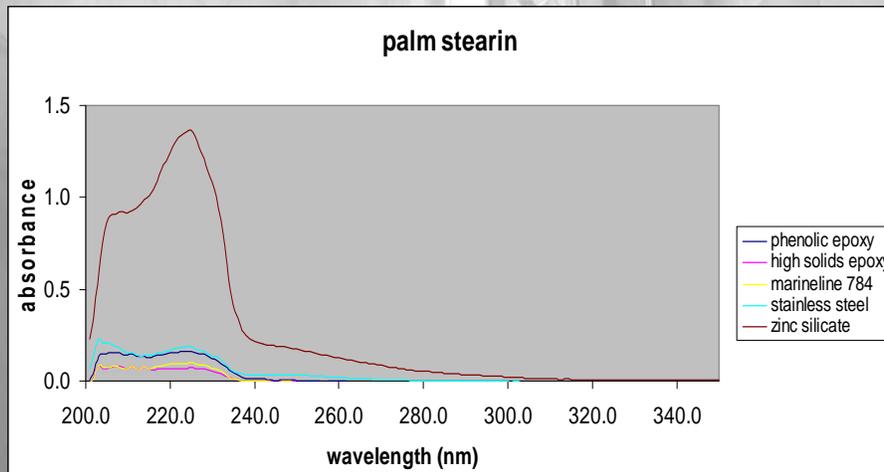
Cleanability

- After cleaning, all test panels were “wall washed” with 20ml of methanol
- Any contamination on the surface of the test panels or absorbed into the coating, would be washed into the methanol. (Contact time is minimal, so accurate analysis was required.)
- This methanol was scanned in the UV region of the light spectrum using the L&I WAVE II Spectrometer

Cleanability

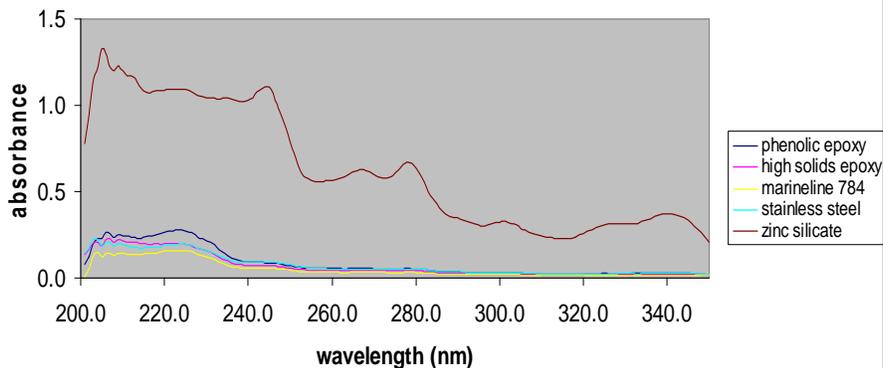
- Theoretically, the test panels with the cleanest wall wash samples could be considered as the easiest to clean ...

Results



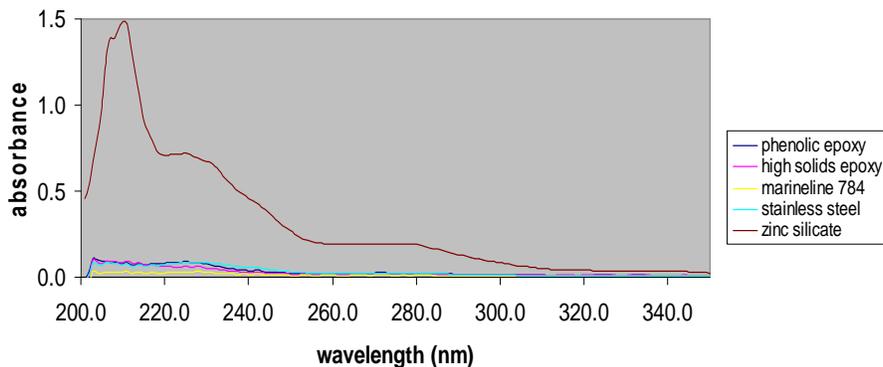
Results

hydro-cracker bottoms



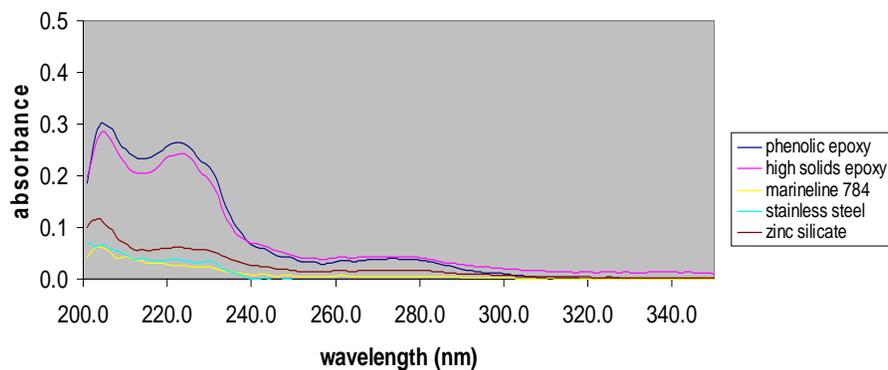
Results

fatty acid methyl ester (soya)



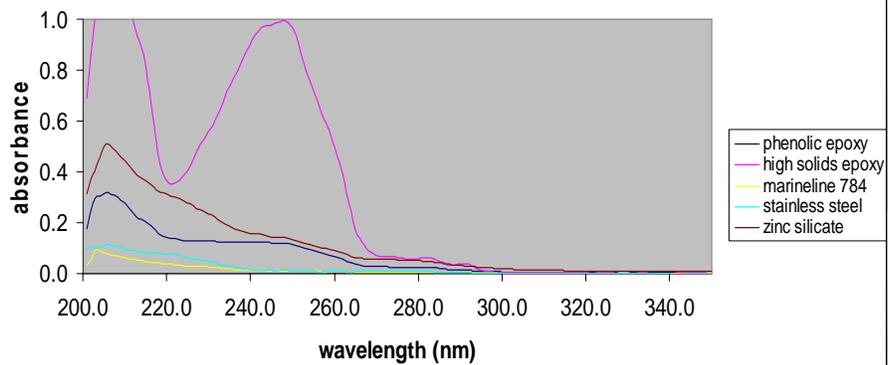
Results

ethylene dichloride (edc)



Results

styrene monomer



Discussion

- Clearly, the choice of cargo tank lining does impact on tank cleaning
- Viscous cargoes are retained in the zinc silicate coating
- Solvent cargoes are retained in the organic coatings
- Stainless steel and MarineLine behave almost the same

Discussion

- Over-cleaning is perhaps apparent?
- More efficient tank cleaning procedures can be investigated using this model
- Removing absorbed solvent residues from organic coatings and viscous cargoes from zinc silicate

Economic Advantages

- Extremely difficult to quantify the economic advantage of M/L because it depends on too many factors:
 - i.) how the vessel is equipped
 - ii.) how many tanks can be cleaned simultaneously
 - iii.) ability of the officers / crew
 - iv.) the duration of the ballast leg / permitted time
- What is apparent is that M/L does not seem to absorb penetrative chemical cargoes, nor does it allow viscous oil based cargoes to stick to its surface. In other words, it possesses the advantages of both inorganic and organic coatings.
 - i.) significantly quicker cleaning from oil based cargoes compared to zinc silicate
 - ii.) no challenge of removing absorbed cargoes from organic coatings
 - iii.) reduced need for tank cleaning chemicals. lower tank cleaning costs and less environmental impact
 - iv.) significantly less risk of contaminating subsequent cargoes from retained residues, because there are no retained residues

Thank You

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