Coatings Fingerprinting

Coral 2.0 TRT Tech #3

Method of identifying main coating composition from Fourier Transform Infrared (FTIR) Spectroscopy wavelength which is used as baseline fingerprint for comparison purpose

Overview

Technology Description

Method of identifying main coating composition from Fourier Transform Infrared (FTIR) Spectroscopy wavelength which is used as baseline fingerprint for comparison purposes.

Technology Usage

Quality Assurance on paint products.

Functionality/ Application Examples

A group of taskforce was formed - Institute of Materials, Malaysia (IMM) with the aims to;

1. To review the available standards and specifications requiring Fingerprinting of Polymeric Coatings in the Oil & Gas Industry. (mainly referencing ISO 20340)
2. To review quality control and quality assurance techniques practised by the paint manufacturers during manufacture and storage.
3. To review QA and QC techniques practised by the blasters & painters in regards to the paints prior to application and during application.
4. To review fingerprinting testing methods available in regards to the reliability, speed of testing and costs.
5. To establish a Fingerprinting Document Template acceptable to all parties involved in the manufacture, application and usage of Polymeric Coatings in the Oil & Gas Industry.

**IMM Taskforce on Coating Fingerprint Members*;

- Oil & Gas Companies: PETRONAS, Shell, ExxonMobil
- Advisors: Universiti Teknologi MARA, Universiti Kebangsaan Malaysia & IMM
- Testing Laboratory: SIRIM
- Equipment Suppliers: Research Instruments, Agilent Technologies & Perkin Elmer
- Coating Manufacturers: PLC Laboratory, Jotun, International Paints, Hempel, Kansai Coatings & KCC Paint

<u>Phase 1 Deliverables</u>

- Tentative Coating Fingerprint Certificate for 2-component intermediate materials of epoxy coatings was presented.
- Successfully demonstrated that Fourier-Transform Infrared (FTIR) is a simple and reliable tool for the study of reproducibility (i.e. to fingerprint) of the epoxies and hardeners as well as to differentiate different types of epoxies and hardeners without any intrusion of paint formulations.
- Fingerprinting regions of FTIR for epoxy resin and hardener are proposed and the confidence level of acceptance for QA & QC control is proposed at ≥ 90.0%.

Phase 2 Deliverables

1. To proceed with Phase 2 which involves investigating FTIR spectrum change for various raw materials source as well as the effects of aged coatings.
2. Oil and Gas member companies to conduct pilot implementation with collaboration from relevant Task Force members and update the Task Force on results.
3. FP Task Force to look into the possibility of developing an IMM Best Practice document on Coating Fingerprinting to include sampling and analysis guideline.
4. To evaluate Inorganic zinc, Epoxy-Zinc, Polyurethane, Acrylic & Polyester coating, etc

Phase 2 Tasks (2 year Program)

Project 1

- To investigate any structural differences for the similar raw materials from different suppliers or places of manufacturers for the 2-component intermediate materials of epoxy coatings.
- *Project leader*: Assoc. Prof. Dr. Melissa Chan Chin Han, UiTM

Project 2

- To investigate the ageing effects during in-house storage at paint factory as well as at the job site under extreme weather conditions for different types of 2-component intermediate materials of polymeric coatings (e.g. inorganic zinc coating, epoxy-zinc coating, polyurethane coating, acrylic coating, polyester coating etc)
- *Project leader: Dr. Tan Winie, UiTM*

Limitations & Benefits

Limitations

Phase 1 evaluation test was conducted to 2-component Epoxy Coating only. Phase 2 evaluation will included evaluation on Inorganic Zinc, Epoxy-Zinc, Polyurethane, Acrylic & Polyester based coatings, etc.

Benefit (qualitative)

Enhanced quality Assurance by ensuring paint products supplied are not compromised regardless of the raw materials sourcing.

Benefit (quantitative)

Estimated cost saving from premature coating failures of about RM37 Million per year for offshore maintenance coatings repair work.

Cost Savings Estimation

- JOTUN shared sales to PETRONAS in 2013 ~ RM 24 Million.
- Assume total coatings sales to PETRONAS in 2013 ~ RM 50 Million.
- Application cost is about 4 times the coatings cost. Therefore, assume overall cost ~ (RM 50 M x 4) + RM 50 M = RM 250 Million per yr
- Generally, about 80% of paint failures are attributed to surface preparation. It can be assumed that 20% is due to paint quality etc.
- Cost of coating failures due to production: 20% of RM 250 Million = RM 50 Million per yr
- Conservatively, assume that the implementation of Fingerprinting initiative can reduce this amount by 50%. Potential cost due to premature coating failure : RM25 Million per yr (or RM 50 Million for 2 years)
- Project cost ~ < RM 2 Million per year (~ 8% of failure cost)
- Note that the values calculated are somewhat underestimated based on the feedback received on Asset Life Study performed due to ageing assets particularly for offshore facilities.
- The project cost in actual fact will be a lot lower than the 8% failure cost.

Certifications

Phase 1 – Adopted to PTS 15.20.03 Protective Coatings and Linings. This detail guideline is the first in the world.

International recognition especially by major paint manufacturers. One participating company embarked on worldwide Round Robin Test and identified a regional manufacturing location with sub-standard raw material supplied.

Certification Program

- ✓ Joint development of Quality Controller Certification with IMM
- ✓ Identification of Certified Training Bodies.

Contacts

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