

IMM Coating Fingerprint Certification Scheme

Frequently asked questions

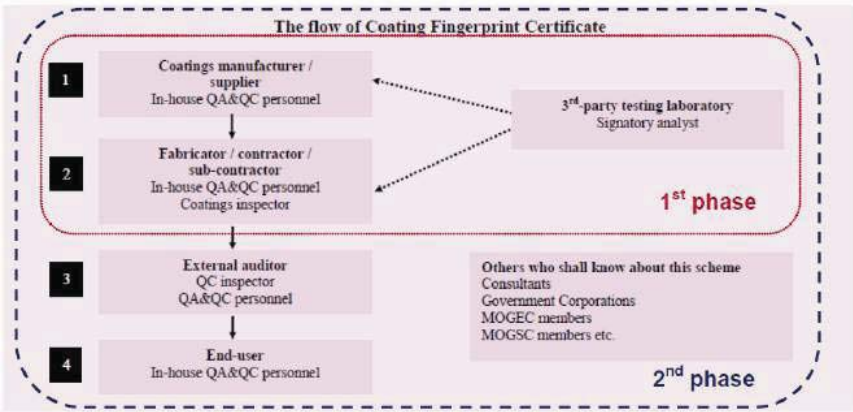
Note: updated until 31st December 2015.

No	Q&A
Q1	<p>Whether FTIR spectra can tell the difference between a low quality and a high quality epoxy paint.</p> <p>No, FTIR results may not be able to correlate to quality or performance of paint due to insufficient experimental results at this moment. Instead, currently FTIR analysis is mainly referred to differentiate the different types of epoxies, hardeners or paint systems, in term of chemical functional groups, instead of the cost or quality.</p> <p>Nevertheless, to correlate the quality or performance of the paints to the FTIR structural analysis will be attempted soon.</p>
Q2	<p>How beneficial a Coating Fingerprint Certificate is for the quality control and monitoring of paints supplied to oil and gas users?</p> <p>From the users’ perspective in Malaysia on premature coatings failure, coatings approval testing, coatings specification, blaster & painter certification, coating inspector certification <i>etc</i> were and are part of the routine QA/QC practice.</p> <p>For current practice, sampling/audit can be done anytime according to the clause listed in PTS for checking on the quality of a paint product, should there be failures on a project during application. The supplier will be blacklisted if they failed the audit. However, physical tests are conducted on the product supplied and the current testing methods cannot fingerprint the product to its original formulation.</p> <p>In other words, up-to-date, the in-coming quality of the paint products has yet to be addressed. The FTIR structural analysis enables paint manufacturers and users to be assured that the paint products supplied from reputable paint manufacturers were not tampered. Users can now be assured that the overall quality of paint they had purchased will not be affected, regardless of the raw materials sourcing.</p>
Q3	<p>The product formula for the paint manufacturer is a trade secret. <u>Will FTIR analysis be able to reveal the product formula easily?</u></p> <p>Extensive FTIR library search of the FTIR spectra collected by Nicolet using OMNIC Software, Spectrum Two Software, OPUS Software <i>etc</i> was carried out. We notice, different multi-component search features of different FTIR Spectrum softwares show “different possible components” for same sample, either for epoxies or hardeners. It seems to be challenging to reveal the product formula by using FTIR analysis even though we have the access to the extensive FTIR libraries from different FTIR manufacturers.</p>

No	Q&A
	<p>Most importantly, it is not the intention of coatings fingerprinting to intrude into the paint formulation. The paint manufacturers’ product formulation will remain a secret as FTIR analysis will not be able to expose the product formulation easily. Fingerprinting test methods will offer users with quality assurance that what they bought is what they will get, even though they cannot know what are inside the product formulation.</p>
<p>Q4</p>	<p>How about the price factor in securing a project and how does the implementation of fingerprinting assist paint manufacturer?</p> <p>The FTIR testing costs may vary from one paint manufacturer to another due to the volume of products manufactured in a year. Nevertheless, the major reputable paint manufacturers of high quality products with larger volume of production will have a very insignificant increase to their production costs. The impact will be higher on the smaller paint manufacturers who do not produce the higher quality products. The indicative costing for FTIR fingerprinting costing (estimated in 2014) is as below:-</p> <p><u>Option 1 (Paint manufacturer’s in-house laboratory)</u> Testing cost per liter = 2 sen</p> <p><u>Option 2: Testing by 3rd-party laboratory</u> Testing cost per liter = 10 sen</p> <p>Reference: IMM Taskforce on Coatings Fingerprinting (Phase I), <i>Indicative costing for FTIR fingerprinting on costings fingerprinting</i>, in <i>Materials Mind</i>. 2014, Institute of Materials, Malaysia: Selangor, Malaysia. p. 27</p>
<p>Q5</p>	<p>Will the execution of Coating Fingerprint Certificate force paint manufacturers to buy raw materials from a single supplier/source? Attempt to achieve the standard may lead to the price increment along the supply chain.</p> <p>This standard is to maintain the consistency of the paint supplied; although the failure may not due only to the quality of the paint supplied. Besides, there are many factors affecting the failure of coatings. This is an issue of inconsistency. Hence, this Coating Fingerprint Certificate is one way of reducing inconsistency.</p> <p>All the reputed paint manufactures have assured paint users that the “performance and consistency” of the batch-to-batch paint supplied are guaranteed from different manufacturing plants (different locations within a region or even from different continents). All of them show very stringent control on the in-coming raw materials (from different raw material suppliers, countries <i>etc</i>).</p> <p>Consequently, the issue of implementation of Coating Fingerprint Certificate may force paint manufacturers to buy raw materials from a single supplier/source is not relevant in this case since there is existing quality control process for all the in-coming raw materials.</p>

No	Q&A
Q6	<p>How will coatings fingerprinting be implemented? Will this be mandatory or optional? This may be an issue with first line maintenance coating, where quick-and-easy method is always sought after.</p> <p>Coatings fingerprinting will be implemented in phases as mandatory starting 2016. Grace time shall be made available to all related parties and feedback is sought after for improvement. After the pilot test, we shall gather information and responses on implementation for fine tuning of the overall implementation.</p> <p><u>Users’ technical specification on FTIR fingerprinting on coatings</u></p> <p>Some technical specifications on protective coatings of selected oil and gas users in Malaysia have included coatings fingerprinting as requirement. It is timely now to execute the Coating Fingerprint Certificate for QA & QC of the paint supplied.</p> <p>(1) PETRONAS Technical Standards</p> <p>Due to serious premature coatings failures at various PETRONAS facilities, PETRONAS Technical Standards (2016) (Technical Specification) (PTS 15.20.03) (Protective Coatings and Linings) (which is waiting official approval issuance) has included coatings fingerprinting as a requirement for qualification testing as well as for routine batch-to-batch paint production.</p> <p>3.6.1 Coating Manufacturers shall furnish their Coating Quality Control Batch certificates to ensure that the properties of the products supplied are consistent with the laboratory tested products. The Coatings Fingerprint Certificate shall be produced per batch of coating manufactured and data stored in digital format. This data shall be submitted to the Owner Materials, Corrosion & Inspection (MCI) representative from the project team during delivery of coating products. Example of the Coatings Fingerprint Certificate can be found under Appendix B.</p> <p>Note that coating fingerprinting will only be enforced for coating projects involving $\geq 5000 \text{ m}^2$ of total surface to be coated.</p> <p>3.6.2 Owner retains the right to conduct random coatings fingerprinting test at any given point during the course of the project as it deems fit. This shall be referenced against fingerprinting results submitted by the manufacturers.</p> <p>(2) Technical specification of Shell</p> <p>Referring to Technical specification of Shell Global Solutions International B. V. (Shell GSI) (2009) for Design and Engineering Practice (DEP 30.48.0031-Gen) on Protective Coatings for Onshore Facilities, all paints and coating materials shall be fully qualified in accordance to this specification.</p>

No	Q&A
	<p>2.2 Coating qualification</p> <p>2.2.1 General Qualification of coating shall be achieved through performance-based testing, in compliance with this DEP. To achieve uniformity and reproducibility in testing, all relevant data during the preparation and testing of the test panels shall be recorded. Any deviation shall be highlighted in the test report.</p> <p>2.2.4 Fingerprint Each coating system to be qualified shall be subjected to an identification test. <u>A fingerprint test shall be carried out as required in ISO 203040:2009(E) (2009) (Paint and varnishes - Performance requirements for protective paint systems for offshore and related structures) (Clause 5.5 and Annex B – both main and optional parameters)</u></p>
Q7	<p>When the fingerprinting exercise is going to be deployed and can this FTIR method define the minimum-maximum range or envelope that can be adhered to for acceptance and rejection of paint sample?</p> <p>Coatings fingerprinting execution is not limited to FTIR structural analysis. Instead, the complete Coating Fingerprint Certificate for polymeric coatings consists of two parts, <i>i.e.</i></p> <ol style="list-style-type: none"> (1) physical analyses (<i>e.g.</i> viscosity, density, color code, non-volatile matter (by mass), mass of Zn metal/Total Zn <i>etc</i> are performed in the in-house laboratory during the paint manufacturing process) and (2) structural analysis by FTIR (which shall be carried out immediately after each batch of the production in the paint factory). <p>The acceptance criteria for the paint sample are to pass both (1) physical analyses and (2) structural analysis. For FTIR structural analysis, degree of similarity (r) ≥ 0.900 shall be set as acceptance criterion (tentative tolerance = ± 0.002 or range of $r = 1.000 - 0.898$).</p>
Q8	<p>What are number of sample and frequency of the paint products in normal production to be analyzed (in-house) for the fingerprinting purposes?</p> <p>For <u>execution</u> of Coating Fingerprint Certificate, the followings shall be followed:-</p> <ol style="list-style-type: none"> (1) For each batch of paint production in the paint factory, 1 sample from the Bottom of the mixing tank is needed. If the correlation (r) of the sample spectrum < 0.900 as compared to Reference spectrum, then 1 sample from Top and 1 sample from Middle of the mixing tank are required to be analyzed. (2) Reference spectrum shall be generated from the average of 1 sample from Top + 1 sample from Middle + 1 sample from Bottom of the mixing tank
Q9	<p>Is there any certification/document(s) to ensure paint products supplied are as per contract specification for current industry practice?</p>

No	Q&A
	<p>Currently the paint manufacturers provide a Certificate of Quality without fingerprinting information when they supply the paint to the job site. As such, the customer has no means to identify if the product supplied is the product ordered in terms of product formulation and quality.</p> <p>Hence, tentative Coating Fingerprint Certificate is proposed by IMM as the “birth certificate/fingerprinting certificate” of the paint products supplied for quality control from the paint manufacturers.</p>
<p>Q10</p>	<p>Who should be the body to prepare the Coating Fingerprint Certificate and whether there will be monitoring by a 3rd-party?</p> <p>The coatings fingerprinting process shall follow the practice of the metals industry for the Mill Certificate where the manufacturer takes the responsibility to prepare the Mill Certificate for the product manufactured in their factory. The customer has the right to conduct a 3rd-party quality control inspection in the manufacturer’s factory to ensure compliances.</p> <p><u>For 1st phase:</u> Coating Fingerprint Certificate shall be submitted by paint manufacturer for</p> <ol style="list-style-type: none"> (1) qualification of coatings fingerprinting (2) a routine batch check on every subsequent batch of the paints for the qualified a paint system (3) verification test of the retained paint sample when there is/are “doubt(s)” on the reproducibility and consistency of the paint formulation delivered on-site. The doubt(s) may arise from the on-site FTIR structural analysis by handheld or mobile FTIR spectrometer, visual inspection on the paint <i>etc.</i> <p>IMM Coating Fingerprint Certification Scheme</p> <p>Who shall attend and be certified? For all those who <u>produce, inspect, review and validate</u> <i>Coating Fingerprint Certificate</i>.</p>  <p>The flowchart, titled "The flow of Coating Fingerprint Certificate", is enclosed in a dashed red border. It is divided into two phases. The 1st phase (top) includes: 1. Coatings manufacturer / supplier (In-house QA&QC personnel); 2. Fabricator / contractor / sub-contractor (In-house QA&QC personnel, Coatings inspector); and 3rd-party testing laboratory (Signatory analyst). Dotted arrows indicate interaction between the manufacturer and the 3rd-party, and between the fabricator and the 3rd-party. The 2nd phase (bottom) includes: 3. External auditor (QC inspector, QA&QC personnel); and 4. End-user (In-house QA&QC personnel). A box on the right lists "Others who shall know about this scheme": Consultants, Government Corporations, MOGEC members, and MOGSC members etc. Solid arrows show the flow from manufacturer to fabricator, and from fabricator to external auditor, and finally to the end-user.</p>
<p>Q11</p>	<p>What is the usefulness of FTIR fingerprinting of polymeric coating materials in the supplier selection process during pre-qualification period?</p>

No	Q&A
	<p>The selection of coatings systems is carried out from many aspects; among others are application methods and product specification & quality. Coatings fingerprinting specifications for the oil & gas industry is progressively under development by IMM Taskforce on Coatings Fingerprinting. The specification will be adopted for the paint products pre-qualification and selection process. Such a specification will assist the oil & gas industry to improve its quality assurance program in ensuring the effective corrosion protection of its facilities onshore and offshore in severe corrosive environments. It will also ensure that the quality of the anti-corrosion paint products supplied throughout the qualification period will not be compromised and changes to the product quality can be detected prior to application.</p>
<p>Q12</p>	<p>What is the purpose of checking the homogeneity of paint at different locations in the mixing tank using FTIR structural analysis?</p> <p>The purpose of checking the homogeneity of paint at different locations in the mixing tank using FTIR is to confirm the homogeneity of the paint in the mixing tank in the paint manufacturing process, in which paint samples are collected for various analyses and tests. In fact, the FTIR scan results obtained from paint samples provided by a paint company confirmed that the paint is indeed homogeneous at different locations in the mixing tank. Besides, the paint manufacturers would have focused very well in keeping the homogeneity of the paint mixing in the production. This implies, it is sufficient to have 1 sample from the Bottom of the mixing tank is needed for routine analyses.</p> <p>For <u>execution</u> of Coating Fingerprint Certificate, the followings shall be followed:-</p> <ol style="list-style-type: none"> (1) For each batch of paint production in the paint factory, 1 sample from the Bottom of the mixing tank is needed. If the correlation (r) of the sample spectrum < 0.900 as compared to Reference spectrum, then 1 sample from Top and 1 sample from Middle of the mixing tank are required to be analyzed. (2) Reference spectrum shall be generated from the average of 1 sample from Top + 1 sample from Middle + 1 sample from Bottom of the mixing tank
<p>Q13</p>	<p>Why despite all the vigorous checking and testings on the paints for pre-qualification by the oil and gas companies there continue to be many paint failures prematurely on the oil and gas structures and facilities?</p> <p>The reason of conducting various prequalification tests on the paints is to ensure that the correct paint systems will be specified for the designed applications. However, what is actually supplied to a project site has been assumed to be the correct type of paints specified.</p> <p>Over the years, when the protective coatings delivered to the job sites, the coatings come along with a “so-called” quality assurance document, which claims the products delivered in with “good quality” issued by the paint manufacturer, without 3rd-party verification. Occasionally, Material Safety Data Sheets (MSDSs) of the products are supplemented.</p>

No	Q&A
	<p>From the user’s perspective in Malaysia on premature coatings failure, coatings approval testing, coatings specification, blaster & painter certification, coating inspector certification <i>etc</i> were and are part of the routine QA/QC practice. Up-to-date, the incoming quality of the paint products has yet to be addressed.</p> <p>Now that the issue of possible incorrect paints being supplied to the project site has been highlighted, the initiative to fingerprint paints is most welcomed by the industry. Coatings fingerprinting will help the paint users monitor the quality of paint supplied. At the same time, it can also help in eliminating problem and ensure good quality of paints and application.</p>
<p>Q14</p>	<p>What is the basis for setting the acceptance criterion for degree of similarity (r) \geq 0.900 for FTIR structural analysis?</p> <p>The degree of similarity, which is termed as <i>correlation</i> (r), of a spectrum is generated by comparing the spectra of the samples to that of the Reference using the <i>high sensitivity compare function</i> of the FTIR software. For examples:-</p> <p>The acceptance criterion for epoxy resin is</p> <ul style="list-style-type: none"> ○ $r_{\text{Epoxy}} \geq 0.900$ for whole FTIR region and fingerprint regions <p>and analogously for hardener is</p> <ul style="list-style-type: none"> ○ $r_{\text{Hardener}} \geq 0.900$ for whole FTIR region and fingerprint regions. <p>$r \geq 0.900$ correlation target setting in the Coating Fingerprint Certificate was an agreed compromise between Taskforce members comprised of various paint manufacturer’s representatives, paint users, FTIR specialists, and academia. Random errors, such as sampling and handling of samples are taken into account. Four <i>high sensitivity compare</i> algorithms from four different FTIR manufacturers have been tested and the correlation was found to be acceptable but no detail studies were conducted on the algorithms. This acceptance criterion is not available in any standard and IMM is the first party to initiate this acceptance threshold.</p> <p>$r \geq 0.900$ is reasonable value at this point in time. It is subjected to further revision in the future for further improvement by considering feedback from the paint manufacturers and users.</p>
<p>Q15</p>	<p>Whether the paint will work as expected if $r \geq 0.900$?</p> <p>$r \geq 0.900$ is only an indication that the batch of the paint supplied to the job site has high degree of similarity (in term of chemical structures) as compared to the Reference paint that passed the qualification test. This degree of similarity will not able to tell the performance of the coatings.</p> <p>Coating fingerprint Certificate is a QC tool like the Mill Certificate for metal products. It will not guarantee the performance of the product. The Coating fingerprint Certificate certifies that the product has been manufactured to the correct specifications.</p>

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No	Q&A
	Performance of the product will depend on many other factors such as the correct application, environment, design <i>etc.</i>

IMM Certified Coating Fingerprint Quality Controller Course 1st Edition

under IMM Coating Fingerprint Certification Scheme

Coatings Fingerprint Basics: Putting Coating Fingerprint Certificate to Work



Training and certification by :



Chan Chin Han

Course organizer by :



**IMM CERTIFIED COATING FINGERPRINT
QUALITY CONTROLLER
1st Edition**

Coatings Fingerprinting Basics: Putting Coating Fingerprint Certificate to Work

Chan Chin Han



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