The Performance Standard for Protective Coatings: Analysis and Review

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Note: The study was conducted in 2013 and reflects the regulations as they stood at that time

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ABSTRACT
The International Maritime Organization’s Performance Standards For Protective Coatings for Seawater Ballast Tanks, Resolution MSC.215(82), applies to all types of ships greater than 500gt for which the building contract was placed on or after 1st July 2008. This work aims to highlight aspects of the PSPC that the industry currently feels are unsatisfactory in the hope that this will be used to fuel further developments of the PSPC. This is achieved by briefly discussing the events leading up to the adoption of the Performance Standard before conducting an analysis of a questionnaire concerning its interpretation and application. The questionnaire was presented to relevant members of the maritime community involved in the production, application, inspection and verification of marine coatings.

The results of the survey suggest that although the PSPC is praised for promoting the importance of coating systems in ballast spaces and provides a mandatory minimum standard, there are a range of issues that members of the industry would like to see addressed to ensure that coating systems are awarded the level of consideration they deem appropriate.

Keywords
PSPC, Performance Standards, Coatings, Corrosion, Ballast Tanks, SOLAS, IMO.

1. Introduction
The “Performance Standard For Protective Coatings For Dedicated Seawater Ballast Tanks In All Types Of Ships And Double-Side Skin Spaces Of Bulk Carriers” (PSPC) was adopted on 8th December 2006 through amendment to SOLAS 1974 regulations II-1/3-2. The PSPC specifies the target useful life of protective coatings in dedicated seawater ballast tanks as well as prescribing the required procedures for the selection, application and inspection of protective coatings (Resolution MSC.215(82), 2006). The PSPC is mandatory for dedicated seawater ballast tanks in all vessels not less than 500 gross tonnage and double-side skin side spaces in bulk carriers greater than 150 m in length. Recognising that the industry would require some time to adapt to the new resolution three dates were chosen for implementation. Resolution MSC.216(82) sets out the dates for which the regulations will be implemented:

- Ships for which the building contract is placed on or after 1 July 2008; or
- in the absence of a building contract, the keels of which are laid or which are at a similar stage of construction on or after 1 January 2009; or
- the delivery of which is on or after 1 July 2012.

The International Association of Classification Societies (IACS) also introduced a reference to the PSPC into the Common Structural Rules (CSR) for Tankers and Bulk Carriers (IACS, 2006) noting “For ships contracted for construction on or after the date of IMO adoption of the amended SOLAS regulation II-1/3-2, by which an IMO “Performance standard for protective coatings for ballast tanks and void spaces” will be made mandatory, the coatings of internal spaces subject to the amended SOLAS regulation are to satisfy the requirements of the IMO performance standard.” In this connection IACS made the PSPC a condition of class as well as a mandatory IMO requirement. The latest revision of the CSR, the Harmonised Rules For Tankers and Bulk Carriers (IACS, 2014) omits this reference to the PSPC as it was considered that once the PSCP came into effect as a mandatory regulation there was no need for it to also remain a condition of Classification.

2. Development of the PSPC
The development of the PSPC can be traced back to 1991 when the IMO Assembly requested the Maritime Safety Committee (MSC) to begin considering design specifications that would improve the safety of shipping for bulk carriers in respect to ship design, construction and operation. Resolution A.713(17) Safety of Ships Carrying Solid Bulk cargoes, adopted on 6th November 1991, implemented interim measures to improve bulk carrier safety after recognising the growing concern over the continued loss of vessels carrying bulk cargoes. Despite these interim measures a total of 99 vessels were lost between 1990 and May 1997 with the loss of 654 lives (Bulk Carrier Casualty Report, 1998). A.713(17) makes reference to both the importance of protective coating condition and to the extent and effects of corrosion in way of ballast tanks and cargo holds.

The Enhanced Survey Program was adopted under SOLAS in May 1994 and enforced as of January 1996 through Resolution A744(18). The program increased the focus on periodic inspection work and paid particular attention to the extent of corrosion found on-board vessels. The result of these surveys lead to the assembly of large databases that for the first time allowed the corrosion rates of on-board spaces to be quantified in relation to vessel maintenance and operation (Gardiner and Melchers, 2003).

In November 1997, as a result of evidence gained through the Enhanced Survey Program, an additional Chapter to the SOLAS convention, Ch. XII – Additional Safety Measures for Bulk Carriers, along with further amendments concerning structural safety, Ch.II-1, were adopted and entered into force as of 1st July 1999. Further amendments were made to Chapter XII of SOLAS in 2004 including introducing a mandatory requirement that ‘double-side skin spaces and dedicated seawater ballast tanks arranged in bulk carriers of 150m in length and upwards constructed on or after 1 July 2006 shall be coated in accordance with the requirements of the regulation II-1/3.2 and also be based on the Performance Standards of Protective coatings to be adopted by the organization.’ (MSC.170(79), 2004).

Following work that had begun in 2003 at the request of IMO a group of industry organizations submitted draft
proposals for the PSCP to the 48th Ship Design and Equipment Sub-committee (DE.48/12, 2004).

Work continued on the contents of the PSCP over the following years. At the 49th session of the Ship Design and Equipment Sub-committee a draft of the PSCP, complete with square brackets indicating parts of the standard that had yet to be agreed upon, was made ready for submission to MSC 81.

Recognising that the 2004 amendments to SOLAS were due to enter into effect later that year MSC instructed a group of experts to finalise the content of the PSCP. This involved the consideration of 14 submissions regarding the content of the performance standard and ‘long hours of intensive discussion’ (Hoppe, 2013). As an interim measure MSC 81 approved the draft standard as a MSC circular, providing guidance on the application of the PSCP prior to its eventual adoption at MSC 82 in December 2006.

3. Problems with the PSCP

The PSCP has been met with critical response from some sectors of the industry with some discussions focused on the adoption of the PSCP indicating the operational difficulties associated with enhanced levels of inspection, verification and documentation procedures (Wei et al, 2011) while others remarked on both the benefits and challenges associated with adopting the standard and the prescriptive approach the IMO has taken (Malfanti and Malfanti, 2012).

Coinciding with the implementation of the PSCP (for date of shipbuilding contract) IACS issued a Unified Interpretation, UI SC223 (‘Unified Interpretation SC223 For Application of SOLAS Regulation II-1/3.2 Performance Standard for Protective Coatings (PSPC) for Dedicated Seawater Ballast Tanks and Double-side Skin Spaces of Bulk Carriers, adopted by Resolution MSC.215(82);’ 2008). Not only the document has been subject to multiple revisions and corrections but IACS have also published a detailed question and answer document to improve the uniform interpretation of the PSCP.

Concern from Shipyards expressed that the time period provided for the shipbuilding industry to prepare for implementation was not sufficient. For example, Japan noted at MSC 81(MSC.81/7/5) that ‘a considerable amount of time is needed for the world’s shipbuilding industry to prepare for the mandatory implementation of the performance standards (‘Agenda Item 7: Application of the Performance standards for protective coatings’ (2006)). At the time facilities provided for coating processes varied greatly between shipyards in different regions. While some shipyards were already applying coatings to PSPC standard or equivalent, many smaller yards lacked the infrastructure and the qualified personnel to achieve the required standard. This technological shortcoming gave a strong competitive edge to shipyards already well equipped to handle the PSPC requirements and soon proved too onerous for others (Lowe, 2012).

Also, by making the PSCP a condition of class coatings manufacturers were forced into a position where they had to purchase multiple pre-qualification certificates from different class societies in order for their product to be eligible with that society. This is an expense that would not have been incurred if the PSCP was implemented solely through SOLAS.

Ultimately it can be recognised that the implementation of the PSCP meant an increase in cost to Shipbuilders, Shipowners and Coating Manufacturers, while coatings inspectors and Classification Societies stood to gain from the increased focus on audit and inspection.

Now that the first PSCP compliant vessels are due to have their first special survey perhaps now is a good time to judge to mood of the industry and assess if there are any outstanding issues with the PSCPs implementation.

4. Methodology

4.1. Construction of Survey

The survey was constructed and distributed via a web-based software package (SurveyMonkey.com™ 2013). This software allows the user to develop personalised surveys and questionnaires before distributing them to a target population electronically. The data from completed questionnaires can then be collected and analyzed within the same software.

Questions were designed in response to the research stage of this investigation, involving discussions with industry representatives and reviewing current literature on the PSCP including submissions made to the IMO regarding the PSCP and IACS UI SC223.

An initial pilot survey consisting of a large number of questions was constructed and distributed to a small sample group initially for validation. The response from these individuals was crucial in refining the questions to focus on the topics most relevant to industry.

The final survey consisted of 14 quantitative questions, each with the opportunity for respondents to comment on their answers. At the end of the 14 questions respondents were then invited to answer 5 open-ended questions regarding their thoughts on the PSCP.

The survey first addressed the demographic of participants for later analysis between an individual’s views and their background. The length of time a participant had been employed in their current position was also included to give a cursory measure of their level of experience.

The multiple choice questions were structured to guide participants through the PSCP regulation itself, focusing first on the definitions, specification of the coating system, the assessment of alternative systems and the inspection/verification procedures.

Data was collected throughout the period December 2013 to February 2014.

4.2. Survey Database

Before distributing the survey it was first necessary to establish a database of relevant individuals. These individuals were identified as those being directly affected by the PSCP. The key sectors that were isolated as being relevant were marine coatings Inspectors, Manufacturers of corrosion prevention marine coatings, new-building...
Shipyards, Shipowners or operators, Classification Societies and the Test house facilities that will carry out testing of coatings for pre-qualification.

The directory of the marine coatings consultancy Safinah Ltd. was made available and offered the contact details of approximately 300 individuals across the range of sectors listed above. In order to ensure a higher response rate the survey was also made available via a link posted in several online groups specialising in marine technology and marine coatings on the professional social networking website LinkedIn.com. These groups allowed the sample size to be effectively increased while still targeting relevant individuals. The groups consisted of the Marine Coatings Group, Marine Coating Inspectors, FROSIO Certified inspectors, NACE international, Maritime Network and Paint and Coatings Industry Magazine. Over 50% of those who received direct contact responded and about 50% of those (25% of the total) completed the full questionnaire, which reflects the interest of the industry in this regulation.

The respondents comprised Coating Inspectors (32%), Coatings Manufacturers (25%), Shipyard Representatives (15%), Ship Owners or agents (12%), Classification societies (11%) and Test Houses (5%).

5. Results and Discussion

5.1. Definitions

85% of the respondents indicated that the definitions outlined in Section 2 of the PSPC are sufficient for their requirements. More than two-thirds of each of the subgroups agreed with this.

Many of the comments relating to this question expressed concerns with the definitions “lacking in clarity” with a response from one individual indicating that during their experience working on behalf of a Recognised Organization (RO), conflicting interpretation of terms has been used by shipowners to break their contractual obligations when purchasing a ship that no longer seems desirable.

Comments also reflected the need to define specific exemptions to the PSPC in the case of Dual or Combined use tanks. It is also unclear if spaces not common to Tankers or Bulk carriers, such as trim and healing tanks found aboard cruise ships, are subject to the resolution.

Another interesting point arose in regards with the use of the term ‘brittle’. Table 1.1, Section 4.4.4 of the PSPC states that: “Coatings… shall be able to withstand repeated heating/cooling without becoming brittle”. However, there is no clear definition of the term in the standard and currently there are no accepted criteria for assessment.

Other respondents commented that they would like to see a definition of Wet Film thickness and an emphasis on stripe coating to produce a ‘coherent’ film. It was also stated that it would be beneficial to reiterate coating condition terms, defined in A.744(18) as GOOD, FAIR and POOR, in the definitions of the PSPC.

5.1.1. Footnotes

Throughout the PSPC reference is made to various ISO and SSPC1 industry standards. Each of these references includes the dated standard (e.g. ISO 8503-1/2:1988). It has been noted that many of these standards have already been superseded and therefore recommended that dates be removed from these references to ensure the most up to date standards can be applied.

5.2. Documentation

5.2.1. Technical Data Sheet

More than three quarters (77%) of respondents indicated that the content of Technical Data Sheets (TDS) should be standardised. However, the comments corresponding to the same question suggest that this would be unnecessary, as coatings manufacturers already need to provide a minimum content for TDSs in order to market their product.

There seems to be uncertainty regarding the role of the TDS between the authors of the PSPC and Coatings Manufacturers. While the PSPC defines TDSs as containing ‘detailed technical instruction’ (PSPC 2.13 Technical Data Sheet) many Coatings manufacturers include statements such as ‘The given data must be considered as guidelines only’ and ‘information is given for guidance only’ (JOTUN Balloxy HB Light and IP Intershield 300 respectively). This would imply that the detailed technical instruction required by the PSPC must be obtained from another source.

Coatings manufacturers can provide a ‘system sheet’ for specific cases and may also provide on-site support but the opinion of the sample group would indicate that by standardising the contents of TDSs a ‘level playing field’ could be achieved where products are more readily assessed, particularly with respect to application and overcoating times and the effect of environmental conditions.

5.2.2. Tripartite Agreement

85% of respondents agreed that a standardised template should be provided for the agreement between Shipowner, Shipyard and Coating Manufacturer. All of the respondents representing shipowners indicated that they agreed with this statement.

There is feedback from respondents to the survey that notes that care must be taken when producing such a template given the differing attitudes toward documentation found throughout the world. Any template must allow the scope for parties to consider specifications that may exceed the requirements of the PSPC and to include the use of novel corrosion protection systems.

It has been pointed out that the PSPC is no longer a ‘new’ piece of legislation and that there are many shipyards that have since entered into satisfactory agreements.

Despite this, all of the Shipowners included in the sample indicated that a template would be of benefit.

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1 International Standards Organisation (ISO) and The Society for Protective Coatings (SSPC)
5.3. Procedure

5.3.1. Basic Coating Requirements

Table-1 illustrated in Section 4 of the PSPC concerns the technical aspects of selecting a coating system, surface preparation and coating application. The first section, subtitled ‘Design of the coating system’ lists considerations for a coating product to comply with the PSPC. Approximately two thirds of respondents (67%) agree that these criteria are sufficient to select a suitable coating system.

Ballast Water Management (BWM) is intended to prevent the transmission of invasive aquatic organisms and is already the subject of IMO guidelines (MEPC.127(53), 2005) and may soon become subject to a mandatory resolution. Many of the proposed BWM systems will employ ‘active substances’ which can potentially cause detrimental effects to coating integrity (Rietschoten 2010). Compatibility of BWM and corrosion prevention systems will have to be addressed, however at present there are no provisions for assessment or appointing responsibility for compatibility of the two systems.

PSPC section 4.4.4, Table 1 notes: “The selection of the coating system shall be considered by the parties involved with respect to the service conditions and planned maintenance”. It is not uncommon for ships under construction to change owner before completion or to be chartered to different operators. In such cases the service condition of a vessel is an unknown variable therefore it is not clear how the service conditions can be adequately addressed.

Currently many engineering “systems” aboard vessels, such as welding materials and scantling requirements, are considered based on the service requirements. Selecting a coating system that considers the in-service condition of a vessel is regarded by members of the Coatings industry as a progressive step in vessel design.

5.3.2. Dry Film Thickness

Two-thirds (67%) of respondents agreed that the Nominal Dry Film Thickness (NDFT) of a coating scheme should be dependent on the product being used. The majority of all sub-groups agreed this, with the exception of respondents from Classification Societies (57% of whom agreed that the NDFT should be prescribed by the PSPC).

The PSPC prescribes a nominal dry film thickness of 320μm with 90/102 rule for epoxy based coatings and maximum dry film thickness in accordance with ‘manufacturer’s detailed specifications’ (PSPC 4.4.4 Table 1.2).

Many consider 320μm to be a strange choice for the NDFT (Malfanti and Malfanti, 2012), however one respondent comments that the PSPC is already ‘too negotiable’ and prevents the wrong motives driving the choice of DFT, for instance material cost implications. It should be noted that while a Shipowner may save money during the building of a vessel by having the coatings under-specified, through-life maintenance costs may be much greater as a result.

Another issue raised with the NDFT prescription regards the reality of applying coatings in confined spaces to comply with the 90/10 rule, considering that in these spaces coatings are typically over applied the 90/10 rule encourages further over thickness (Kattan and Fletcher, 2014). This can lead to coatings becoming brittle and resulting in premature failure.

The PSPC states ‘Maximum total dry film thickness according to manufacturer’s detailed specifications.’ This is often far in excess of the specified scheme but prevents the expensive rework involved in reducing coating thickness. Suggestions have been received to limit the max DFT to that specified by ISO 12944-5: Corrosion Protection of steel structures by Protective paint systems- Part 5: Protective Paint systems. ISO 12944-5 recommends a maximum DFT of 3 times the NDFT of a system. This would give an upper limit of 960 microns for PSPC application. In contrast the upper limit specified by some TDSs can be as high as 2000 microns.

Reducing maximum permissible DFT could add considerably to rework costs for shipyards as it is much more time consuming to reduce coating thickness once applied, however over thickness of coating can lead to premature failure through cracking, leading to expensive maintenance.

5.4. Secondary surface preparation

5.4.1. Surface Cleanliness

The PSPC specifies that any steel coated in shop-primer, which had not passed pre-qualification, should be subject to ISO 8501-1 Sa2 removing at least 70% of the intact shop primer. Ultimately 70% will be to the subjective judgment of the coating inspector and furthermore the areas of retained shop primer are unlikely to be evenly distributed but instead grouped in hard to reach/shadowed areas. This is problematic since it is these areas that are prone to premature coating breakdown that will fail to be prepared to the prescribed standard (Broderick et al., 2010).

5.4.2. High Pressure Water jetting

Following the 92nd session of MSC amendments were made to IACS UI SC223 which involved removing a suggested interpretation that the use of high pressure water jetting may be considered as an alternative to grinding for a proper secondary surface preparation. 40% of the respondents agreed that high pressure water jetting could be used for surface preparation and surface cleaning and 6% agreed that it could be used solely for surface preparation.

It is important to make the distinction between surface preparation and surface cleaning. While surface preparation will remove contaminants from a substrate surface and produce a ‘profile’ (or anchor pattern) on that

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2 NDFT is the nominal dry film thickness. A 90/10 practice means that 90% of all thickness measurements shall be greater than, or equal to, NDFT and none of the remaining 10% measurements shall be below 0.9 x NDFT

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surface, surface cleaning will only remove material from the substrate surface but not alter the surface profile. That is to say that surface cleaning can only ever restore a surface to its original profile and hence any weld beads or areas with an unacceptable profile will need to have that profile restored.

A recent study into the effects of High pressure water treatment (Teimouriana et al., 2010) states that, during testing, steel substrate topography is not compromised as a result of high pressure water jetting and therefore water jetting could be permitted as a means of secondary surface preparation provided the substrate has an existing profile.

5.4.3. Edge grinding and Stripe Coating

The PSPC specifies ‘Edges shall be treated to a rounded radius of minimum 2 mm, or subjected to three pass grinding or at least equivalent process, before painting’ recognising that coating failures commonly occur as a result thin film thickness on sharp edges.

Of the respondents questioned 64% agreed that edge grinding could not be reduced in scope in the event that edge retentive coatings where used. This view was expressed by a majority of all sub-groups. However 73% of respondents from Shipyards agreed that the extent of edge grinding could be reduced.

Cargo vessels such as bulk carriers can have many kilometers of free edges and fillet welds that require treatment, edge grinding therefore represents a highly labor intensive process which is both costly and time consuming.

There is a range of ‘edge retentive’ coatings on the market, however, anecdotal evidence given as feedback to the survey would suggest that they are still an emerging technology.

In a presentation given by Samsung on the Effect of the PSPC (Lee, 2007) it has been suggested that the experience of shipyards has been disregarded in respect to this issue and that there is definite scope to reduce edge grinding when using standard epoxy based coating systems in combination with stripe coating.

5.5. Permanent Means of Access

75% of respondents would like to see a performance standard that covers permanent means of access (PMA) arrangements and other non-integral items found in spaces covered by the PSPC. Non-mandatory recommendations for many of these areas are provided for in MSC.1/Circ.1279 (Guidelines for Corrosion Protection of Permanent Means of Access Arrangements). However coating manufacturers often exempt themselves from guaranteeing areas of high structural complexity due to the difficulty in ensuring proper application to prevent coating breakdown.

Comments were raised suggesting that the coating of Water Ballast Tanks should be considered as ‘one entire system’ and include independent items and PMA. However, if coating manufacturers guarantees are exempt for some items, how can the total system be designed for a 15-year target life.

5.6. Pre-Qualification

5.6.1. Testing

The PSPC states that ‘it is not intended to exclude suitable alternative coating systems’ and that it ‘Invites Governments to encourage the development of novel technologies aimed at providing for alternative systems’.

In order for ‘standard’ epoxy systems to be considered suitable they must undergo a pre-qualification test described in Appendix 1 of the PSPC. The test panels used are prepared and coated in accordance with the PSPC before being subject to simulated ballast tank conditions. The Senior Principle Engineer of The American Bureau of Shipping points out that the test panels are not contaminated with salts/dust prior to testing and uses another engineering system by analogy: “Would you use a pressure hose at 100bar pressure if it had only been tested to 50bar?” (Jansen, 2012).

Table 1.1 shows proportion of the various sub-groups that would like to see testing include salt and dust contamination and ballast water treatment methods.

<table>
<thead>
<tr>
<th>Testing Items</th>
<th>Dust</th>
<th>Salt</th>
<th>BWTS</th>
</tr>
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<tr>
<td>Shipowners</td>
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<td>56</td>
<td>67</td>
</tr>
<tr>
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<td>Test House</td>
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<td>67</td>
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<td>Classification Soc.</td>
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<td>43</td>
<td>43</td>
</tr>
<tr>
<td>Inspectors</td>
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<td>79</td>
<td>71</td>
</tr>
<tr>
<td>Total</td>
<td>49%</td>
<td>62%</td>
<td>60%</td>
</tr>
</tbody>
</table>

Table 1: Testing Items

*Ballast water treatment system supplier

Many suggestions were made regarding specific testing methods to simulate ‘real-world’ conditions and it soon becomes clear that if every consideration were evaluated testing could soon become incredibly time consuming and expensive.

60% of respondents agree the need to test coating compatibility with Ballast Water Management systems if they use active chemicals that could cause detrimental effects to coating integrity, and 77% agree that the age related embrittlement should also be considered.

The PSPC make no provision for supplying documentation regarding the failure of a coating system following testing. This means that a given product can be tested an indefinite number of times before being accepted, this has been criticised by one respondent stating that it ‘undermines the validity of the test’.

5.6.2. Alternative Systems

The PSPC sets out acceptance criteria for pre-qualification testing for ‘Systems applied according to table 1 of this standard’ and for ‘alternative systems’ (PSPC Appendix 1 and 2).

Despite stating that ‘it is not intended to exclude suitable alternative coating systems’ and that it ‘Invites Governments to encourage the development of novel technologies aimed at providing for alternative systems’ the Acceptance criteria of ‘Alternative systems’ is more stringent than that for the ‘standard’ systems. This,
potentially, could lead to the disqualification of a novel coating system that performs to an equal or greater standard than the “standard epoxy” system described in the PSPC.

In total 63% of respondents find the current method for approving alternative systems to be satisfactory, although the majority of Shipyards and Classification societies (56% and 71% respectively) disagree with this. Many of the comments left by respondents express views such as ‘it is not fair to impose additional testing’ and ‘pass criteria should be the same as standard systems’.

5.7. Inspectors Qualifications

The PSPC emphasizes the importance of inspection and documentation procedures. Among the numerous tasks required of a coating inspector is the measurement and record of dry film thickness. PSPC requires inspectors qualified to NACE Coating inspector Level 2 or FROSIO Inspector Level III or equivalent.

Assistant coating inspectors who do not yet have the required qualifications can carry out part of the inspections provided they are trained to the coating inspectors’ satisfaction. Since amendment to IACS UI SC223 made during the 92nd session of MSC in 2013 (MSC 92/13/4), qualified coating inspectors have to be physically present while an assistant carries out any work. According to Lee (2007) the estimated time for three coating inspectors to carry out DFT measurements of a VLCC is more than one month. The possibility of using assistant coating inspectors (provided they do not have to be physically supervised) presents an opportunity to increase workflow at lower cost.

62% of the respondents agreed that the qualified coating inspector should be physically present when an assistant carries out inspection work; however the majority of Shipyards, Test houses and Classification societies disagree.

At the time the PSPC was implemented demand for vessels was high and experienced and qualified staff were in short supply. It was therefore a facilitating interpretation of the PSPC that assistant coating inspectors could carry out inspections on behalf of a qualified coating inspector. Now that the ‘boom’ years are over what was previously acceptable to some shipowners may no longer be the case (Kattan and Fletcher, 2014).

5.7.1. Independent Coating Inspectors

About half (53%) of those surveyed agreed that coating inspectors should be supplied by an independent third party to remove the potential for a conflict of interest where the coating inspector is employed by either the Shipowner or Shipyard. Neither Shipyards nor Coating Inspectors agreed that inspectors should be appointed individually (32% and 36% respectively).

While a Coating Inspector employed by shipyards may be under pressure not to hold up production, if they are employed by the Shipowner they may demand levels of ‘quality’ that could bottle-neck production.

Respondents to the survey showed mixed opinion on this matter. Comments have focused on the requirement for Classification societies to play a more active role in the inspection and verification procedures that would help to prevent bias.

5.8. Verification

73% of respondents agree that the inspection and verification procedures outlined in the PSPC fulfill the requirements of a good quality control system. Only 50% of the Classification societies that took part in the survey think that this is the case.

The PSPC has been criticised for not making available documentation expressing that a vessel has been constructed and coated to the standards of the PSPC. This is reflected by the different attitudes that many shipyards have when it comes to compiling the coating technical file. Some Shipyards are keeping incredibly detailed accounts while others ‘are demanding nothing’. This issue was addressed by MSC 92/13/4 noting that it is not currently a requirement for verification documents to be presented to the Shipowner. It was pointed out that this breaches the basic principles of a good quality control system and should be considered for future revisions of the standard.

Concern was also expressed about how Classification societies, acting on behalf of the Administration, should monitor implementation of the coating inspection requirements as the PSPC nor IACS UI SC223 state the frequency or level of detail required.

Conclusion

The PSPC was implemented in July 2008 and many vessels built to the new standard will soon be coming to their first special survey. This study investigated aspects of the PSPC that industry representatives may consider require further attention by conducting an industry survey based on issues raised in previous studies and submissions made to the IMO via the Maritime Safety Committee.

The quantifiable results gathered during the survey would indicate that the PSPC is providing the function for which it is intended, promoting due diligence with respect to the selection and application of coating systems and their role in corrosion prevention. The majority of comments left by respondents, however, remark that the standard is far from satisfactory and that there are many issues that still require addressing regarding its implementation and interpretation.

Malfanti and Malfanti (2012) state that four years after the PSPC had come into force there had been no evidence of arbitration or dispute as a result of premature failure of ballast tank coatings. By reviewing coating condition of compliant vessels over the next 5–10 years the industry will be able to quantify the benefit of implementing the PSPC.

As part of SOLAS the ultimate function of the PSPC is to improve the safety of merchant shipping. While it is clear that the PSPC has improved the focus on protective coatings during ship construction it remains to be seen if

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4 NACE, the National Association of Corrosion Engineers and FROSIO, Faglig Råd Opplæring og Sertifisering av Inspektører innen Overflatebehandling. Leading authorities in corrosion prevention technology and assessment. ©Safinah Ltd 2014
there has been a noticeable improvement in the condition of ballast tank coatings throughout a vessel's service life or if there will be any quantifiable impact on merchant vessel safety.

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