The 1st PSPC Experience

Y. W. Kim
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DAEWOO SHIPBUILDING & MARINE ENGINEERING CO., LTD.
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The objectives of this presentation are to share the experience and lessons learned collected from actual application of PSPC and to raise issues for future improvement and amendment of PSPC.
**Effective Date of PSPC**

**PSPC Application according to SOLAS amendment - IMO Resolution MSC.216(82)**

Apply to ships of not less than 500 gross tonnage:
* For which the building contract is placed on or after 1 July 2008 or
* the delivery of which is on or after 1 July 2012

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**All type of ships**

- **Adoption of SOLAS amendment and PSPC**
  - 8 December 2006

- **Contract Date**
  - 1 July 2008

- **Delivery Date**
  - 1 July 2012

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**IACS CSR Requirement – Tanker, B/C**

- PSPC shall be applied to ships contracted on or after the adoption date (8 December 2006)
From early 2007, oil tankers and bulk carriers were contracted with PSPC due to CSR requirement and other type of vessel were contracted with PSPC by owner’s request.

Up to now, more than 70 vessels have been contracted with PSPC.

The first PSPC application started from January 2008 on a CSR applied bulk carrier. Block stage coating works have been completed however, tank final inspections are not finished yet. The vessel will be delivered at the end of this year.
**Specification**

- Painting works for WB tanks shall be carried out in accordance with the IMO performance standard for protective coatings (PSPC) under IACS CSR.

- Water soluble salt test for WB tanks and peak tanks shall be carried out in presence of the paint manufacturer’s inspector with the following procedures:
  
  At block stage: To be carried out at least one point per block.
  
  At hull stage: To be carried out at least one point per each ballast tank.

  Salt limit: The salt limit shall be set at max. 50 mg/m² of sodium chloride in accordance with the ISO 8502-9.

- All hull structural members with rust grade A or B in accordance with the ISO 8501-1.

- Surface Preparation
  
  Primary: Sa 2.5
  
  Secondary: Sa 2.5 (Block stage) + St 3 (Hull Stage)

- Tar free epoxy, 2 coats, 320microns.
Application of PSPC

- Previous Conditions
- Improved Practice
- Selection of Coating System
- Pre-Job Meeting
- CTF
Previous Conditions

Primary Surface Preparation

- Steel grade: A or B
- Salt: 10 ~ 30mg/m²
- Other contaminations: Acceptable
- Profile: 50~70 microns
- Blasting grade: Sa 2.5
- Weather control: Indoor shop
- Shopprimer type: Inorganic zinc silicate

Condition in a subcontractor’s shop
Steel: Occasionally C or D plates
Salt: 30~270mg/m² (Before blasting)
20~80mg/m² (After blasting)
Other contaminations: Oil, mill scale and rust are found.
Blasting grade: Partly less than Sa 2.5
Owner’s Concern on Primary S/P
Secondary Surface Preparation

- Steel works and Edge condition: Generally acceptable. Small holes and corners were weak points. Differences between yard standard and ISO 8501-3 P2.
- Salt: 40 ~ 80mg/m² (Before blasting) up to 2000mg/m² (Before blasting, sea transported) 10 ~ 50 mg/m² (After blasting)
- Other contaminations (Oil, mill scale etc.): Acceptable
- Profile: 80~95 microns
- Weather control: Indoor blasting cell
- Dust: Various Conditions according to blocks and compartments

Condition in a subcontractor’s shop
Salt: 130 ~ 300mg/m² (Before blasting) 40 ~ 140 mg/m² (After blasting)
Other contaminations: Oil, mill scale and rust are found.
Profile: 20 ~ 130 microns
Blasting grade: Partly less than Sa 2.5
Previous Conditions

Painting Works and Others

- General Painting Conditions: Acceptable

- DFT Control:
  Different criteria for each contract e.g., 85/15, 90/10, 95/5 etc.
  Generally acceptable on plates.
  Corners and hole were weak points (Low/Excessive DFT).
  Sprayers are not familiar with 320 microns spec. (300 or 350 was generally applied)
  Max. DFT: According to paint maker’s recommendation.

- Ventilation & Environmental conditions: RH < 85%, less than 3°C above the dew point

- Stripe coating: Two coats by brush or roller
Previous Conditions

Inspection Practice

- Dust: Visual inspection
- Salt: Random test by paint maker’s inspector (by maker’s standard)
- DFT Check: As per Contract specification. (5 spot measurement in 10m2 or 20m2 etc.)
- Certificate: Some inspectors are certified by FROSIO. However, there are many non-certified inspectors
Improved Practice

Primary Surface Preparation

- Quality Control in regular basis
  - DFT: Daily Check, Profile: Weekly Check, Dust/Salt:
    - Monthly Check
  - Conductivity check for abrasive

- QA in Sub-contractor's shop:
  - Use of A or B grade steel plate
  - Optimum setting of facility
  - Monitoring of salt and proper washing
  - Abrasive size and conductivity control

Secondary Surface Preparation

- Special attention on small holes and corners. (edge, cleanliness etc)
- ISO 8501-3 P2 grade for steel works
- Monitoring of salt and proper washing (especially for sea transported blocks)
- Abrasive size maintenance for proper profile
- Thorough vacuum cleaning
Improved Practice

Painting Works and Others

- More strict DFT control: 90/10 rule, Max. DFT control
- Check of WFT during spray
- Skilled sprayers
- Limited use of Brush/Roller for stripe coating

Inspection Practice

- FROSIO Level III Certified Coating Inspector
- Dust, Soluble Salt checks to be done in regular basis
- DFT Checks to be done in accordance with Annex 3
- Inspection result to be recorded in the agreed inspection forms
Coating system comprising epoxy-based main coating and shopprimer shall be passed a prequalification test.

The retained shop primer shall be cleaned by sweep blasting, high-pressure water washing or equivalent method.

Table 1. 3.2. - Sa 2 removing at least 70% of intact shop primer, which has not passed a prequalification certified by test procedures in 1.3.

<table>
<thead>
<tr>
<th>Maker</th>
<th>Schedule</th>
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Schedule for Type Approval: WBT Coatings with the yard shopprimer
3.2 Inspection of surface preparation and coating processes shall be agreed upon between the shipowner, the shipyard and the coating manufacturer and presented to the Administration for review.

- PSPC does not cover all issues related with painting works and inspection for water ballast tank coating.
- There are many issues to be agreed before actual application of PSPC such as painting work procedure, Inspection scope & attendance, Test Procedure, Form of report, HSE procedure, Repair procedure etc.

Pre-Job Meeting among the Owner, Yard, Paint Maker and Classification Society has been held before starting the Painting Works.
Meeting Agenda

- Various Test Procedure (Soluble salt, Dust, Profile, DFT)
- Inspection Report (Shoppriming, Secondary Surface Preparation, Block painting, Final painting)
- Inspection Flow Chart
- Paint Working Procedure for Block, P.E & Hull stage
- Safety & Health
- Maintenance Manual
- Data Sheet & Type Approval Report
- Etc.
3.4.1 Specification of the coating system applied to the dedicated seawater ballast tanks and double-side skin spaces, record of the shipyard’s and shipowner’s coating work, detailed criteria for coating selection, job specifications, inspection, maintenance and repair shall be documented in the Coating Technical File (CTF), and the Coating Technical File shall be reviewed by the Administration.

- CTF (Coating Technical File) will be delivered by the shipyard after review of Classification Society.
- CTF shall be compiled by Coating Inspector.
- Work records of coating application shall be fully included in CTF.
- Technical data, specification etc. will be prepared by paint manufacturer and yard’s painting engineering department.
Lessons Learned

- Coating practice of shipyard and subcontractor shall be checked and improved before application of PSPC.
- Special care shall be taken regarding surface preparation requirements such as grade of cleanliness, profile, salt and dust contamination etc.
- Intensive pre-job meeting among the involved parties is a concrete base of successful application of PSPC.
- Number of certified coating inspector is one of the important factors due to increased work volume.
- Coating inspector shall have good knowledge on PSPC itself and the yard practice, facility and process also.
- PSPC itself has some issues to be improved and amended in the future.
Limitation of Tools (e.g., Brush/Roller)

The target of the PSPC is on the performance of coating, not on the tools.

‘Stripe coats must be applied as a coherent film showing good film formation and no visible defects such as pores or un-wet areas.’ - Industry Guideline

IACS UI SC233

Stripe coats should be applied as a coherent film showing good film formation and no visible defects. The application method employed should insure that all areas that require stripe coating are properly coated by brush or roller. A roller may be used for scallops, ratholes etc., but not for edges and welds.
Issues for Future Amendment

Profile Range and its reference standard
Profile between 30-75 mic. vs Reference standard ISO 8503-1/2 :1998

- There is no reason that profile over 75mic. is not as good as 75mic.
- 30~75 mic. of profile can not be measured by ISO 8503-1/2.

- Upper limit of profile shall be amended to a generally acceptable value e.g., 100mic.
- Profile range shall be amended to meet the referenced ISO standard e.g., Fine (G) ~ Medium (G) or Segment 1~3
ANNEX 3

- Even compared with general inspection practice of an advanced shipyard, Annex 3 is far more labor intensive.
- This increase of labor does not add up any remarkable quality improvement but considerable cost.

Check point requirement shall be simplified to a practical level and more extensive inspection requirement shall be left on specific shipbuilding contract.
Soluble Salt

- Each paint manufacturer has their own criteria based on their experience and knowledge.
- 50mg/\text{ℓ} \text{NaCl} is not the minimum requirement
- Even fresh water is contaminated by chloride or other ions in some regions.

**Typical recommendation on Salt Level by Paint Manufacturers**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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<tbody>
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<td>Immersion Service</td>
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<td>111</td>
<td>100</td>
<td>80</td>
<td>50</td>
<td>130</td>
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<tr>
<td>PC, FWT Coating</td>
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<tr>
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<td>315</td>
<td>100</td>
<td>80</td>
<td>100</td>
<td>164</td>
</tr>
</tbody>
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*Converted to ISO8502-6/9, Unit: mg/\text{ℓ} \text{NaCl}*

Soluble Salt limit shall be in accordance with the paint manufacturer’s recommendation.
Thank You!

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