Coating conditions in water ballast tank, void space and cargo oil tank of aged ships and required performance standard of protective coatings for new ships

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2. Introduction

With regard to the expansion of the standard to void spaces and cargo oil tanks, NMRI (National Maritime Research Institute) and SAJ (the Shipbuilders' Association of JAPAN) carried out the inspection of ships to clarify the actual coating conditions of aged ships in order to know the necessary specification and application of coating for 15 years target life.

by NMRI and SAJ

2. New regulations for painting

2-1. For Water Ballast Tanks

Application	Dedicated seawater ballast tank for all kind of ships of not less than 500 gross tonnage and double skin spaces in BC of 150m in length and upward
	・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
Coating technical files	The coating technical files should be kept on the ship which was established in a rule
Inspector	FROSIO levelⅢ or NACE level2 or equivalent
Coating system	Epoxy type multi-coat system with two stripe coats
	Coating system shall pass pre-qualification test
NDFT	320μm with 90/10 rule
Free edge	Rounded 2mm or by three pass grinding or equivalent
Damaged SP	Blasted to Sa2$^{1}/_{2}$
Butts	Treated to St3 or better. Small damages up to 2% of total area shall be treated St3, and continuous damades over 25m^{2} or over 2% of total area of the tank shall be treated to Sa2$^{1}/_{2}$ respectively.
Others	Requirements of ciucumstance, surface cleanliness such as oil contamination, dust, water soluble salts are precribed
Guideline	Guideline for implementation of MSC.215(82) is being discussed in IACS/JWG for practical and consistent application

2. New regulations for painting

2-2. For Void Spaces (DE50)

Application	Bulk Carrier and Oil Tanker only
	The standard (PSPC for VS) are not mandatory
Coating technical files	The coating technical files should be kept on the ship
Inspector	FROSIO levelⅢ or NACE level2 or equivalent
Coating system	Epoxy type (one spary or two spray) system with one stripe coat (stripe coat should be applied on thermally cut free edges and small holes only
	Coating system shall pass pre-qualification test
NDFT	200μm with 90/10 rule
Free edge	one pass grinding or equivalent
Damaged SP	Blasted to Sa2 or St3
Butts	Treated to St3 or better or Sa2 where practicable
Others	Requirements of ciucumstance, surface cleanliness such as oil contamination, water soluble salts are precribed

NMRI, SAJ and other Japanese representatives proposed the practical standard based on the inspection results for VS of aged ships while the meeting in DE50 on this March.

2. New regulations for painting

2-3. For Cargo tanks (on JWG)

DE50 instructed the correspondence group to develop the draft new SOLAS regulation regarding cargo oil tank protection for the discussion at DE51.
The development of PSPC for cargo oil tanks will be further considered at DE51.
MRI, SAJ and other Japanese representatives submitted the proposal of using corrosion resistance steel in the cargo oil tanks as an alternative.
And we participate in the meeting of correspondence group and discussion for practical and consistence application.

3. Report on the coating condition of actual ships

3-1. Inspected ships

	Ship A	Ship B	Ship C
Type of ship	Tanker (VLCC)	Tanker (VLCC)	Bulk Carrier (Panamax)
Age of ship	15 years old	12 yaers old	11 years old
Shipyard	Japanese	Japanese	Japanese
Operator	Japanese company	Japanese company	Japanese company
Major sea route	East Asia – Middle East	East Asia – Middle East	East Asia – Oceania

3. Report on the coating condition of actual ships

3-2. Water ballast tanks

3-2-1. Coating specifications in water ballast tanks

		Ship A	Ship B	Ship C
Type of paint		Tar Epoxy paint	Tar Epoxy paint	Tar Epoxy paint
DFT		200μm (1 spray)	200μm (1 spray)	220μm (1 spray)
Stripe coat		Not applied	Holes and narrow spaces	Not applied
Primary surface preparation		Sa2.5 (shot blast) IZP	Sa2.5 (shot blast) IZP	Sa2.5 (shot blast) IZP
Steel condition	Free edge	Removed burrs	1 pass grinding	1 pass grinding
	Weld bead	No treatment	No treatment	No treatment
Surface treatment		St3	St3	Sa2.5 (Partally St3)

3. Report on the coating condition of actual ships

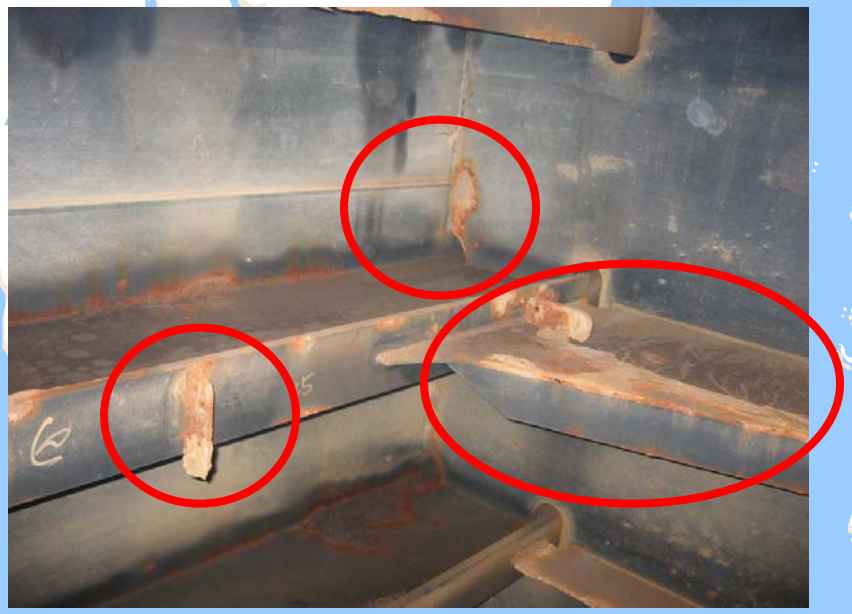
3-2. Water ballast tanks

3-2-2. Overview in the water ballast tanks (Ship A)

3. Report on the coating condition of actual ships

3-2. Water ballast tanks

3-2-3. Overview in the water ballast tanks (Ship B)



3. Report on the coating condition of actual ships

3-2. Water ballast tanks

3-2-4. Overview in the water ballast tanks (Ship C)

3. Report on the coating condition of actual ships

3-3. Void spaces

3-3-1. Coating specifications in void spaces

		Ship A	Ship B	Ship C
Coating type		Alkyd based	Tar epoxy	Surface-tolerant epoxy
DFT		70μm (2 spray)	125μm (1 spray)	100μm (1 spray)
Stripe coat		Not applied	Not applied	Not applied
Primary surface preparation		Sa2.5 (shot blast) IZP	Sa2.5 (shot blast) IZP	Sa2.5 (shot blast) IZP
Steel condition	Free edge	No treatment	No treatment	No treatment
	Weld bead	No treatment	No treatment	No treatment
	Weld spatter	Loose spatter to be removed by scraper	Loose spatter to be removed by scraper	Loose spatter to be removed by scraper
Surface treatment	Grade	St2 (By disk sander and/or power brush)	Between St2 and St3 (By disk sander and/or power brush)	Loose rust to be brushed off
	Treated area	Damaged shop primer, welds and rusted areas	Damaged shop primer, welds and rusted areas	Damaged shop primer, welds and rusted areas
Water soluble salt		Removed to the extent invisible to the naked eye		
Oil contamination		Removed, the traces may be visible		

3. Report on the coating condition of actual ships

3-3. Void spaces

3-3-2. Overview in the void spaces (Ship A)

3. Report on the coating condition of actual ships

3-3. Void spaces

3-3-3. Overview in the void spaces (Ship B)

3. Report on the coating condition of actual ships

3-3. Void spaces

3-3-4. Overview in the void spaces (Ship C)

3. Report on the coating condition of actual ships

3-4. Cargo oil tanks

3-4-1. Coating specifications in slop tanks

		Ship A	Ship B	Ship C
Coating type		Tar epoxy	Tar epoxy	–
DFT		200μm (1 spray)	200μm (1 spray)	–
Stripe coat		Not applied	Holes and narrow spaces	–
Primary surface preparation		Sa2.5 (shot blast) IZP	Sa2.5 (shot blast) IZP	–
Steel condition	Free edge	Removed burrs	1 pass grinding	–
	Weld bead	No treatment	No treatment	–
Surface treatment		St3	St3	–

3. Report on the coating condition of actual ships

3-4. Cargo oil tanks

3-4-2. Overview in the slop tanks (Ship A)

3. Report on the coating condition of actual ships

3-4. Cargo tanks

3-4-3. Overview in the slop tanks (Ship B)

4. Conclusion

4-1. Water ballast tanks

Deck head area under upper deck seems to be in quite severe environment condition.

Rust is initiated from edges and welds, and good treatment on edges and welds will prevent rust initiated.

Apparently, coating specifications of the ships for water ballast tanks at new building don't satisfy 15 years coating life.

New regulation will become very effective for protection in water ballast tanks by the painting specifications.

4. Conclusion

4-2. Void spaces

Although all inspected ships had been in use for 10 to 15 years, coating in void spaces were still almost perfect condition.

Very small local corrosions were observed in the areas prone to be damaged mechanically. These areas estimated smaller than 0.1% of the total area.

Coating specifications of the ships in the void spaces at new building are sufficient for 15 years coating life.

4. Conclusion

4-3. Cargo oil tanks

Coatings in the cargo tanks were comparatively in better condition than those in water ballast tanks.

Though some corrosions were observed in deck head areas, plate loss was quite small, while re-coating or plate renewal was necessary for some of deck head areas in water ballast tanks of the same ship.

Therefore, PSPC for cargo tanks could be relaxed compared with those require by PSPC for water ballast tanks.


Thank you very much
for your attention!!