Evaluation report test patches Deck 3
MV Slingeborg

By Wink Inspections

Vessel	: MV Slingeborg
Owners	: Wagenborg Delfzijl
Location	: Göteverken Cityvarvet shipyard
Place & Country	: Götenburg Sweden
Date	: 28 Oktober 2004
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INTRODUCTION

During the new building of above mentioned vessel and it sister vessels, MV Schieborg and MV Spaarnborg, at Flenderwerft Lubeck deck nr. 3 was pre-treated and coated with a system of Leigh paints.

From the early beginning the paint system on all vessels gave problems, which was shown in detachment of the entire deck system and appearing corrosion.

The owner decided that the system has to be removed because the manager Cobelfret needs a strong coating and even more important non-skid and low friction for the cargo. The system on the MV Slingeborg showed that much detachment and corrosion that action has to been undertaken.

To evaluate the strength against mechanical impact and slip coefficient the test patches were exposed to the cargo, trailers and on and offloading.

SUMMARY

After approx. three months of field-testing and exposure the test undersigned inspector and the superintendent, Mr. M ten Wolde, inspected patches. During the inspection the performance, adhesion, slip coefficient etc. were checked and evaluated.

The results of the executed inspection were as follows:

Ceram-kote: First the dry film thickness was tested with an Elcometer 456 Top gauge. The dry film thickness was difficult to measure because the probe of gauge goes up to 2200 microns dry film thickness. Most of the measurements were above the mentioned 2200 microns dry film thickness. The coating appeared to be quite smooth because the added quarts sand was ground off and the remaining non-skid product was round off. Because of the addition of ceramic parts the coating is strong cohesive but also very smooth and slippery when the non-skid product is warn off. The surface showed some very deep scratches as result of on and offloading of the trailers and skids. The coating appeared to be tough and quite strong but to have a better idea about the strength the adhesion must be tested. The adhesion was simply tested by the superintendent by using an approx. 7 Kilogram weighing flat steel bar and hit the coating with force and with a 60 to 70 % angle. The coating immediately broke in large pieces and detached 100% from the blasted steel surface.

Most likely the ceramic particles makes the coating beside tough also quit brittle. The detached areas will be quit difficult to repair especially on a deck on a Ro-Ro vessel like this vessel.

Hesselberg: The dry film thickness of the Hesselberg test patch was measured. The dry film thickness appeared to be from 1780 until > 2200 microns dry film thickness. The product showed also as the Ceram-kote test patch some deep and many shallow scratches. It appeared that the added aluminium oxide, which was use as non-skid was ground off, the non-skid properties or slip coefficient was nil. The surface was very smooth and quite slippery. The adhesion was unofficially tested by hitting the coating with the steel flat bar in the same 60 to 70% angle, the adhesion seemed to be good and appeared to be better than the adhesion of Ceram-kote.

Sigma Coatings The measurements of test patch of Sigma Coatings showed a dry film thickness of approx. 700 to 1000 microns. The non-skid product which is a carborundum i.e. aluminium oxide was spread out in the wet layer in two grain sizes namely size 14 and 16. It appeared that the fine grain sized non-skid material still had good non-skid properties but had too low slip coefficient for the owner's purpose. The coarse grain performed the best in ways of non-skid properties. Some heavy scratches were found in the coating but the steel surface was protected against corrosion by the primer. The adhesion was also tested by means of hitting the surface with the steel flat bar with result that the topcoat (Sigma Novaguard) chipped off but the primer coat stayed untouched in place. The underside of the paint flake showed the primer coat, which means that there is splitting in the primer coat.

MCU Coatings: The measurements of the test patch of MCU Coatings High Tech Coatings showed an average dry film thickness of 140 microns. Low spots like 80 microns were found too but still preformed very well. Despite half of the area was covered with a topcoat the non-skid product (aluminium oxide) was still in place for about 80/ 90 % without any breaking or round off edges. Severe scratching was present but corrosion could not be found. Under creep was not present.
The same adhesion test with the flat steel bar was carried out. After hitting the coated surface several times it appeared that only small areas were scratched, the topcoat was minimal removed and the anticorrosive primer was still in place.

CONCLUSION

After thorough inspection and evaluation undersigned inspector must say that the performance of the Ceram-kote and Hesselberg test patches were quite disappointing. For systems like fore mentioned pre-treatment and application is very important. A system thickness of approx 2000 microns dry film thickness is required by the manufacturer which will result in a practical use of approx. 2.8 to 3 litres per square meter which makes both systems very expensive. The Sigma Coatings system performed well but also this solvent free coating with a solvent base epoxy primer has some difficulties in ways of pre-treatment, application and especially repairs i.e. maintenance.

The epoxy primer will block corrosion and under creep but give less adhesion of the top layer to the surface than without the primer. If the Sigma Novaguard gets scraped off by a skid or trailer the primer will block the corrosion. Another negative aspect of the system can be found when the system needs repairs or maintenance; Scratches, cuts etc. must be grinded out and smoothened before applying the primer coat. After proper cure this can be over coated with the solvent free coat.

Time has always been the biggest problem to maintain a deck especially on a Ro-Ro vessel. The solvent free products cure slow and even slower when it is colder, at a certain temperature it will even stop curing. With a short time frame with on and offloading of a vessel like this the product may be good but is not suitable for maintenance. If we look at the polyurea product of MCU Coatings we can say that the system, if we look at the thickness of 100 to 140 microns we applied by hand, performs very well. The total system thickness of this manufacturer is about 5 % of total thickness, which Ceram-kote pre-scribes in there specification. The adhesion and corrosion protective properties are excellent if we compare them to the high build solvent free systems. The non-skid properties were still good and acceptable; the coarse grain sized aluminium oxide was mostly still embedded by the product. The system is very well to maintain because the products are single pack and fast curing. Furthermore there are hardly no restrictions in terms of pre-treatment or and application. Application of the products still can be done at a humidity of 99 % and without any dew point restriction and have no maximum over coating time which makes the products of MCU Coatings High Tech Coatings perfect suitable for this purpose.

Considering all facts like cost per square meter, strength against mechanical impact, corrosion protection, required pre-treatment, curing and onboard maintenance I have to conclude that the first best choice would be the MCU Coatings system and the second best the Sigma Coatings system.

MCU Coatings because of the incredible protection against corrosion, low system film thickness so lower costs per square meter, easy maintenance and especially the large window of hardly any restrictions to pre-treatment, conditions for application and the fast curing.

Sigma has a good solvent free system with a solvent-based epoxy primer basecoat. It is a good and tough coating with strong advantages like impact resistance. The disadvantage is maintenance, thorough pre-treatment is necessary and there is no repair kit, which cures fast. The repaired area cannot be used and is very weak in the first few days.

In ways of pre-treatment undersigned inspector’s preference goes out to vacuum hydro blasting. The hydro blasting robots will remove easily the poor adhering paint and present corrosion, the advantage of cleaning with ultra high pressure water is that the water will be injected through the coating and hit the steel surface underneath so all kinetic energy will be released which means that the water will explodes.

The release of kinetic energy will result in fast and clean removal of coating, corrosion and other material. Furthermore due to the high force of the water the water the present chlorides (salt) and magnetite (black corrosion parts in the steel surface) will be fully removed.
This will eliminate any osmotic reaction of chlorides and environment outside the coating, which can cause blisters, detachment etc. Another advantage of using hydro jetting with a robot is that due to the kinetic energy of the water, which is released onto the surface with 3000/3200 bar, that the surface is immediately dry. The paint can be applied while hydro blasting is in progress and only a few away.

The other choice is blasting with a vacuum blasting which is carried out with machine, which " throws " the blasting medium with high speed onto the surface. The disadvantage of this way of pre-treatment is that the machine is using so called shot, which is round and gives a smooth and not an angular profile, which is necessary for adhesion for the new coating system, (with the exception of MCU Coatings). If chlorides are present the vacuum-blasting machine will not remove this. During blasting the surface must be tested to monitor the chloride level. It is possible that after blasting the surface must be high-pressure water cleaned and re blasting.

More details can be found in the photo list and spreadsheets, which guide this evaluation report.

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