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Case History

Soft Media Make Joints Rough Enough

Photos courtesy of the author

Must a shipowner accept substandard preparations of the ballast tank erection joints of his newbuilding? Definitely not, says this author.

By Per E. Gabrielsson, Corrosion Consultant & Inspector, Virmo, Finland

During 2002–2003, the Finnish energy company, Fortum, had two, 106,000 dwt highly sophisticated, crude oil tankers under construction in Japan. As is normal in construction, the ballast tanks were prepared by abrasive blasting to Near-White, SSPC-SP 10 (Sa 2½) and coated at the newbuilding block stage. The erection joints and areas of weld damage (from burning) were to be power tool-cleaned before coating.

The original specification for these areas was for SSPC-SP 11 (power tool cleaning to bare metal and retaining or producing a surface profile), with an anchor pattern of not less than 25 microns.

However, it was soon realised that the specification was not realistically achievable with hand tools, considering the complexity of the surfaces to be treated. Disc sanders could not produce the required anchor profile; they only scratched the steel substrate, and unevenly at that. Conical steel grinders created a surface roughness of only 10–35 micron Rz. (Rz is a measure of average peak-to-trough roughness.) Also, the steel substrate near the manual erection welds remained blackish due to high current welding. (High current welding produces high heat, which changes the composition of the steel, creating a black, very hard substrate.) This hard substrtate was difficult to remove fully with power tools, and grinding did not adequately clean the uneven manual welds. Eventually, both owner and shipyard realised that to achieve the required 20+ years of the coating life (with minimal maintenance), power tool cleaning of erection joints and burn damages would not be sufficient.

After attempts with hard disc sanders, steel conical grinders, and

other mechanical power tools, the yard eventually chose to evaluate Sponge-Jet abrasive blasting technology, as recommended by the Fortum Shipping site team. The technology evaluated consists of #30 grit aluminium oxide abrasive wrapped in polyurethane. The media and process created an Rz value of 40–75 microns (profile)—ideal for the coating system. In fact, the sponge system easily achieved an SSPC-SP 10 (Near-White Metal) finish on all surfaces, which is superior to (and phases out) the initially specified SP 11-grade.

When the media impacts a surface, it softly bounces rather than making a hard ricochet, unlike traditional abrasives. The sponge blast system thus does not destroy the coating in surrounding areas. This "low energy rebound" also makes it easy to contain and collect the media for reuse after screening/classifying. Finally, the boundary areas between blasting and the existing coating system are very nicely feathered and require only hand sanding with a coarse abrasive paper, followed by vacuum cleaning, before coating.

As an outcome of this trial, the yard decided to order 12 Sponge Jet model 240XL HP (High Production) blasting units, together with 12 pneumatic media screeners/classifiers. After testing variations of the media, the yard chose Silver #30 based on both cleaning rate and anchor pattern obtained. These were the key concerns for both Fortum Shipping, the owner, and the yard because this process directly affected the speed of new ship construction and the long-term performance of the coating system.

The initial production was rather slow until the blasters became used to the equipment and found the ideal way of performing the blasting without creating damage in the surrounding areas. When the method was established, the work proceeded quickly, reducing construction delays. At the same time as the erection joints were blasted, burned

areas and larger damaged areas received the same treatment. In one case, complete removal of 2,000 square metres of a poorly adhering third coat was carried out on a double bottom ballast block. (This poor adhesion had previously been caused by applying the third coat [modified epoxy] on a surface where the steel was at its dew point.) This delicate removal of the third coat only was successfully carried out without damaging the second coat of modified epoxy.

Fortum Shipping has concluded that the use of the sponge blasting system for erection joints in ballast tanks is technically feasible and that it should be the primary method of surface preparation for any quality-oriented ship owner. According to Sami Niemelä, who, as the technical superintendent of Fortum Shipping is in charge of these two newbuildings, "The higher quality of surface preparation that is cost effectively achieved by this method will provide significant long term savings by way of extended coating performance on the most vulnerable spots in the ballast tanks of newbuildings."

The extension of the coating life has a critical impact on the long-term operating costs of any vessel. Not only does it affect maintenance costs, but also it directly relates to ship availability and thus revenue. When owners consider the cost of future lost days of operation due to coating repair and stricter inspection legislation, it is apparent that increased attention to new construction is prudent.

Long lasting protection can be achieved, in part, by considering the root cause of failure and proactively addressing those concerns. From my experience, I have found the following tips to be quite valuable. They should be considered on any newbuilding.

- The steel preparation should be in accordance with ISO/DIS 8501-3-2 – grade P3.
- Residual chloride content of the blasted steel should be no more than 2 $\mu g/cm^2$.

• The blasting degree, including weld seam preparation, should be a minimum of SSPC-SP 10 with an anchor pattern of at least 50 microns.
• Stripe coating should be performed. Boundary areas should be stripe coated.
• Paint rollers should not be used for any type of application. Perform stripe coating and touch-up with round brushes.
• The minimum dry film thickness should be 350 microns for any single reading.
• Coating layers should be applied no thicker than specification, thus minimising or eliminating the risk for internal stress and cracking of the coating.
• The area to be coated should be clean, and surrounding areas should be vacuumed.
• Coatings with a reliable track record should be specified.
• Be aware that aluminium-pigmented coatings block ionic transmissions to a considerably higher degree than normally pigmented coatings.
• Ensure that the specified coating is the original formulation and not a "modified newbuilding" coating.
• Use highly-motivated coating specialists for the newbuilding project—such investments will always pay back.

All this will no doubt cost some additional dollars, but considering the importance of optimising the coating of water ballast tanks, the additional money is a good investment.

Since 1984, Per Gabrielsson has been a coatings inspector and consultant specializing in preparing cost-effective and maintenance-free coating specifications. He began working for Hempel Coatings in 1960 and was technical manager from 1969 to 1984.

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