MARCO POLO FITTED WITH THORDON AT MALTA SHIPYARDS

Marco Polo is a 180m (591ft.) cruise liner propelled by two 563.5mm (22.185") diameter tailshafts running on a water lubricated stern tube bearing system. She entered Malta Shipyards on the 19th March, 2007 for a 21-day refit which included the replacement of the two tailshafts with reconditioned ones, installation of two new propellers, conversion of stern tube bearings system to Thordon COMPAC from *lignum vitae*, installation of a Thordon Water Quality Package for each shaft and last but not least, renewal of the tailshaft coating system from conventional fibreglass to Thordon's Thor-Coat shaft coating. The Classification Society was DNV.

Each tailshaft hosted a forward and a two-piece aft bronze liner positioned to correspond with the existing stern tube bearing configuration. One of the spare tailshafts that were to replace the working shaft was sent to the shipyard before the vessel entered drydock. The job consisted of removing the old shaft coating, repairing any defects and coating the shaft with Thor-Coat. As soon as the tailshaft arrived at the shipyard it was mounted on one of the heavy lathes at the Malta Shipyards main machine shop and the old coating was removed by machining. It was noted that due to the coating failure, local pitting corrosion was detected. These were smoothed out by local grinding until sound material was exposed. The cavity was then filled with Belzona to restore the original profile.

The bronze liners transition area had to be machined in order to create a profile for a resultant strong bond between the Thor-Coat material, shaft steel and bronze liner. This was carried out according to Thordon's recommendations from the Thor-Coat Application Manual. Once the machining was complete, the shaft was sent to be grit blasted, returned immediately and put on the lathe where it was cleaned with isopropanol alcohol. Since the tailshaft had quite a large area to cover, only one Thor-Coat kit was mixed at a time, which allowed the shipyard enough time for proper application. The application was done in sections by means of brushes and consequently finished by a doctor blade mounted onto the lathe tool post, which ensured a uniform thickness and a smooth finish throughout. The liner transition areas were given particular attention since from our previous experience with applying Thor-Coat, we noted that this area is more liable for defects than the parallel areas. The application was carried out with the lathe turning at 3.4 rpm for brushing of adhesive and 5.8 rpm for towelling. **The application time of Thor-Coat was approximately 2.5 hours from start to finish.** After application, the first 24 hrs of the curing occurred while the shaft was turning on the lathe in order to avoid any possible sagging of the material. Several 500W lamps were rigged up on both sides of the shaft to accelerate curing time. After 24 hours, the Thor-Coat material, although not fully cured, was tough enough to touch and handle. A holiday detector was used to test the coating and occasional pinholes were detected and repaired locally.

Finally, any Thor-Coat on the liner surface in the transition areas was finished properly by means of a fine iron file and the tailshaft was ready for installation. The whole process was witnessed by the attending DNV surveyor.

Soon after, the whole process was repeated for the second tailshaft. The only difference during the coating application was that for some reason that was not readily apparent, the pot life of one particular Thor-Coat kit did not give us enough time to apply it as it hardened during the application. This resulted in a lot of concentrated defects in one particular area and it was decided to re-machine the particular area and apply another coating of Thor-Coat. This gave us the first experience of machining Thor-Coat, which was done quite easily. The final product was very satisfactory both for us as well as for the attending DNV surveyor.

Eventually, the tailshafts where transported to the vessel, where the Thordon COMPAC propeller shaft bearings were installed ready to host the tailshafts in place.

The re-fitted *Marco Polo* is equipped with a renovated propulsion stern tube system, which definitely reflects its character of durability!

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Thor-Coat propeller shaft coating for 563.5 mm (22.185") shafts of Marco Polo cruise ship