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RUNNING A TIGHT SHIP

UHP WATERJETTING AND SURFACE-TOLERANT COATINGS IN NEWBUILDING APPLICATIONS

By Nuno Cipriano, Ultrablast Lassarat Ltd., Brazil

Almost 20 years ago, ultra-high-pressure (UHP) waterjetting started to gain popularity as a surface preparation method for maintenance in shipyards and for offshore projects due to the development and availability of surface- and moisture-tolerant coating technology. Recognized by the U.S. Navy and global energy company Petrobras, the push started with maintenance projects in the 1990s and conversion projects in the early 2000s, and by 2008, a good deal of thought, study and testing was dedicated to the next step: the adoption of UHP for newbuilding projects. Used for both offshore and marine assets, the method was initially focused on ballast tanks, according to the International Maritime Organization (IMO) standard adopted in 2008, "Performance Standard for Protective Coatings (PSPC), IMO PSPC for Water Ballast Tanks."

Now, about two decades after early use of UHP in Brazil, 13 years after the booming adoption of UHP at Singaporean shipyards for floating production storage and offloading (FPSO) conversion, and five years after the idea of its use being extended into newbuilding yards in the context of IMO PSPC regulations, this progression has led to the building of a series of 10 Suezmax vessels (a naval architecture term for the largest ship measurements capable of transiting the Suez Canal in loaded condition, almost exclusively used in reference to tankers) in northeastern Brazil. This article is a contractor's view of the practical challenges, the difficulties, and ultimately the success of UHP adoption by shipyards for newbuilding projects.

UHP WATERJETTING AND SURFACE-TOLERANT COATINGS

As sandblasting has not been used in Brazil for more than 20 years by environmentally responsible companies and driven by proponents like Joaquim Quintela, Fernando Fragata, Carlos Augusto and others, waterjetting has become the favored method of surface preparation there.

The Centro de Pesquisas Leopoldo Américo Miguez de Mello (CENPES, the research center of Petrobras responsible for research, development and engineering), has been working with paint manufacturers to develop paints for application over wet and lesser-prepared or flash-rusted surfaces and for more than 20 years, Petrobras has successfully been using UHP waterjetting with surface-tolerant paints in maintenance, conversion and newbuilding projects.

Onshore and offshore maintenance projects also employ these combined technologies but when considering conversion or newbuilding situations, a combination of UHP waterjetting and abrasive blasting, together with surface-tolerant paints, can be employed.

Machinery area behind the blasting chambers. Photos courtesy of author.

FPSO P66 being assembled (top), block being UHP waterjetted inside blasting chamber (above) and surface-tolerant coating being applied (right).

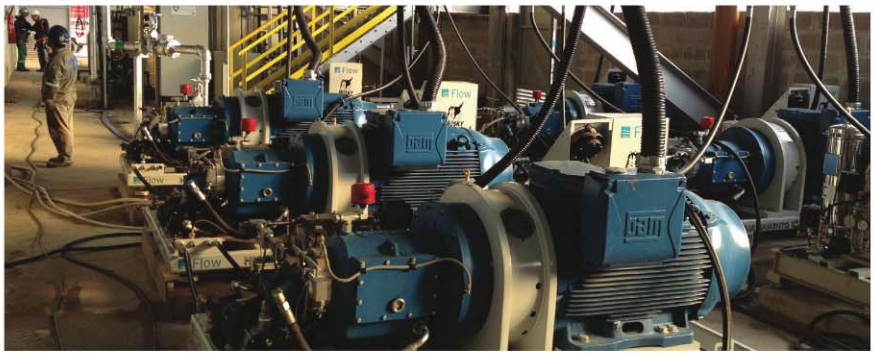
Even when using abrasive blasting, both shipyards and owners can see advantages with wet surface-tolerant paints, independent of the surface preparation method used, because they are more flexible in terms of the surface preparation condition before painting, the weather conditions during application, ease of application and achieving thickness build. Also, it is commonly recognized that having surfaces washed before painting assures that they are free from salt and coating performance increases drastically.

Moving into the 21st century, the health, safety and environmental (HSE) regulations have become stricter forcing Brazilian companies to adapt to new techniques of surface preparation and to direct their coating departments to work mainly with waterjet-prepared surfaces when working in shipyards. Additionally, the new prequalification constraints impacted the selection of paints for ship building in 2006, with the resolution of IMO MSC 215.82, "Performance Standard for Protective Coatings for Dedicated

UHP machines at Ecovix shipyard (left) and FPSO block being installed inside blasting chamber for UHP waterjetting (right).

Seawater Ballast Tanks in all Types of Ships and Double-Side Skin Spaces of Bulk Carriers." Therefore, when the push for environmentally cleaner UHP waterjetting as a surface preparation method was felt most acutely in Brazil, the paints to match it were also required to pass more strict testing criteria.

Between 2008 and 2010 one paint manufacturer began testing products to meet the IMO PSPC requirements in unusual conditions (applying the coating system over wet, flash-rusted,



Second system coat being applied (top left), electrically operated UHP waterjetting machines working at 40,000 psi (top right) and worker waterjet cleaning to SSPC-SP WJ-2/ NACE WJ-2 standard (above).

UHP-waterjetted panels, instead of panels that had been abrasive blasted and shop-primed with zinc silicate). This not only delivered a good result, passing PSPC criteria, but also launched a heated debate between paint manufacturers, classification societies and shipyards in Brazil which lasted a few years. In the end, the least probable of outcomes surfaced: one coating system received recognition (by means of Type Approval) as an IMO PSPC-approved system that could be applied at block stage in shipbuilding over UHP waterjetted bare metal. This outcome was critically important, enabling the adoption of this new concept in emergent shipyards in Brazil.

THE SYSTEM IN ACTION

One of the most important and game-changing projects was started in the Estaleiro Atlântico Sul Shipyard (EAS) in northeast Brazil, when company management chose to use UHP waterjetting on a newbuilding project. The objective was to build 20 Suezmax and Aframax (a medium-sized crude tanker with a deadweight tonnage ranging between 80,000 and 120,000) vessels employing an IMO PSPC-compliant universal coating system that could be used at the block stage over UHP waterjetting, including over weld seams. The blast cabins were therefore designed to use only UHP waterjetting which made the shipyard construction project much simpler and economically more appealing.

Third and final system coat being applied.

After EAS had been using this system for four years, another new shipyard, Ecovix (Engevix Construções Oceânicas), in the south of Brazil, followed in its footsteps and made UHP waterjetting their main surface preparation method, used together with wet surface-tolerant paints. Ecovix, however, took the EAS example and improved the blast cabins by fixing all the equipment in one area, thus increasing the efficiency of the operation. Also, in order to comply with their environmental license, the shipyard had to ensure that the subcontractor operating the blast cabins had a complete water-treatment system with 100 percent water effluent recycling. This allowed the shipyard to set new standards by using an environmentally responsible process and at the same time cutting costs of water consumption and external water treatment and dumping.

Together with the resident contractor for UHP waterjetting and

Workers being trained in UHP waterjetting operation.

production rates for preparing epoxy shop primer to SSPC-SP WJ-2/NACE WJ-2, "Waterjet Cleaning of Metals – Very Thorough Cleaning," ranged from 8 to 16 square meters (172 square feet)/per hour/per operator. The blasting chambers have also been structured to

painting, Ecovix developed modified UHP waterjetting cabins which today can be considered worldwide references. Up to 42 nozzles/guns can work simultaneously in any three of the eight available cabins where the water is recovered instantly during operation, sent to underground tanks that store the effluents to be treated in the water treatment stations. The chemical process in use is quite simple but due to the specific components of the effluent, there was a learning and improvement process that lasted over two years. Each unit is capable of treating 20 to 25 cubic meters (700 to 900 cubic feet) of effluent per hour and 100 percent of the effluent is recycled and reused in the UHP waterjetting machines within the manufacturer's parameters [Hardness ($CaCO_3$) < 17 mg/L; ferrous (Fe) < 0.1 mg/L; chloride = 0; manganese (Mn) < 0,1 mg/L; silica < 14 mg/L; pH = 6.5 – 7.5; Conductivity < 150 µS/cm; Solids < 10 µm].

Since the inception of this project at Ecovix, the contractor has blasted more than 850,000 square meters (9,150,000 square feet), which is nearly 470 blocks and two platforms, using only UHP waterjetting as the surface preparation method and applying only wet surface-tolerant paints inside the cabins and onboard. The contractor had installed 21 electrically driven 40,000 psi, two-gun pumps, plus six diesel-powered 40,000 psi two-gun pumps at the shipyard. There was no need to remove and treat weld-burn areas and construction damage, and

Application of first system coat after UHP waterjet-cleaned surface.

work independently from all other construction in the shipyard, having all the utilities needed for their operation.

CONCLUSION

During normal operation of this shipyard, the major advantages of using these combined technologies amount to a cleaner shipyard, no abrasive material to dispose of, less cost, and the ability to carry out simultaneous projects of various natures 24 hours a day without being dependent on ambient conditions. Despite working with dangerously high water pressure, UHP waterjetting offers fewer overall health risks due to the absence of abrasive media.

ABOUT THE AUTHOR

Nuno Cipriano has been the director of operations at Ultrablast Lassarat Ltd. since 2012 and works on new-building projects for replicant platforms for Petrobras being constructed in Brazil. He has over 10 years of experience in newbuilding and ship repair as a paint inspector of several Petrobras projects in Singapore, China, Brazil, Bahrain, Dubai, Vietnam, Portugal and Italy. Cipriano holds a bachelor's degree in chemical engineering from the Instituto Politécnico de Lisboa and a post-graduate qualification in project management from the Instituto Superior de Gestão. ***JPCL***

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