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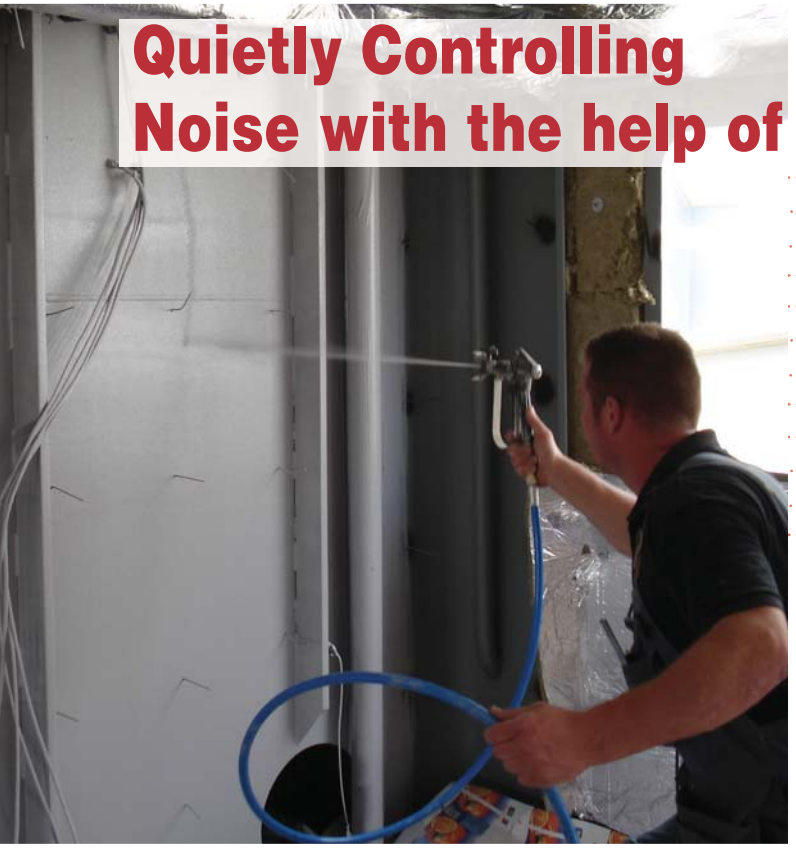

U.S. Navy's AGOR Research Vessels are built to be as operationally quiet as possible. That's where Mascoat's Sound Control-dB coatings come in.

By Joseph Keefe

When the U.S. Navy began its design and build program for its newest generation of research vessels, it specified that the vessels had to be as quiet as possible. That's because a large part of ocean research involves listening and excessive ship noise tends to negate that effort. Achieving the goal of an exceptionally quiet vessel, the vessel's design team employed a variety of methods to meet the Navy's exacting standards, choosing systems, defined equipment locations and designed special installation methods with acoustics as a priority. One of those methods involved Mascoat's Sound Control-dB coatings.

A quiet vessel allows for ocean research, but there are many compelling reasons for any workboat operator to achieve the same standard. These include the new Maritime Labor Convention (MLC2006), the ABS Habitability notations and, when applicable, the Special Purpose Ships (SPS) Code also can also into play. And, for U.S. vessels operating in international waters where MLC2006 is in force, a U.S. Coast Guard issued Statement of Voluntary Compliance (SOVC) can be an important benchmark in determining whether a vessel can operate there (or not). Those guidelines involve many variables, among them; sound damping to ensure the comfort of the crew.

Sound Damping Coatings such as Mascoat Sound Control-dB have become a trusted solution to help keep vibrations and noise to minimum. The coating has advantages over conventional methods of sound damping, such as application rate, cost savings, weight to damping ratio, corrosion protection, and product lifespan. That said; the ultimate solution for all vessels will involve a combination of many methods, starting first in the design of the vessel itself.

The Design Shop Weighs In

For this project, Guido Perla & Associates, Inc. (GPA) was hired by Dakota Creek Industries (DCI) to provide a Basic Design during the Phase I NAVSEA design competition. When the team's design was awarded the

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build contract in October 2011, GPA's engineers and Naval Architects went to work on the detail design and production engineering. GPA and DCI have partnered on many projects in the past ranging from a Navy Sea Jet, an Advanced Electric Ship Demonstrator, to fire boats, ferries, tugs and trawlers. Puget Sound-based DCI is a shipbuilding and repair facility specializing in steel and aluminum vessels up to 450 feet and 275 tons located in Anacortes, WA. The shipyard began construction on AGOR 27 in mid-2012.

Stefan T. Wolczko, naval architect and GPA's Business Development Manager also weighed in on the merits of Mascoat in the design process. He told ***MarineNews*** in March, "GPA has many options available in the toolbox for vibration and noise abatement, and GPA would not recommend a coatings-based solution as a 'one-or-the-other' alternative to other, more effective solutions. Coatings to reduce structure-borne vibration can act as a supplement to other methods of noise and vibration reduction, but are not considered a standalone solution. Significant reduction in noise and vibration are achieved primarily by use of proper structural design in foundations and surrounding elements to prohibit natural frequencies potentially tuned to excitation generated by supported equipment (and other factors such as pressure pulses from propellers)." He went on to describe mechanical solutions that a coating could not reasonably abate in a standalone application.

According to Wolczko, during the ship design process at GPA, noise and vibration are addressed in many elements of the design process from specification development and concept design through to production engineering. In the specification, requirements for allowable decibel levels and noise are determined based on the level of comfort desired for crew in various spaces. He explains, "Typically these include accommodation public and sleeping spaces, the pilothouse, the engine control room, and other mission-critical spaces, such as laboratories." Cognizant of these requirements, GPA arranges the vessel spaces to provide separation between the largest noise and vibration sources and the quietest spaces where practical. Along the way, measures to isolate equipment from each other, such as the exhaust ducting and silencers from the engines, will be utilized to prevent vibration from traversing through a system where possible. It is at this point that that sound insulation and/or coatings are considered.

Meeting Mascoat

Mascoat was founded in 1995 with the intention of bringing thermal barrier coatings to mainstream industrial environments. Shortly after inception, the company saw a need for similar products in the marine environment for not only condensation and radiant heat gain prevention, but also to mitigate sound issues. Headquartered in Houston, TX, the firm offers its coatings through distributors located in more than 70 countries around the world.

Mascoat is a water-based acrylic coating and damping treatment applied to the hull and bulkhead plating. The plating is typically excited (and therefore vibrating) due to vibration generated by machinery in the engine room. The damping then dissipates the hull plating vibrational energy. The heavy fillers are proprietary, but the VOC content is very low (0.29 lbs/gallon or 34.7 grams/liter). According to Will Conner, Mascoat's Marketing Director, the coating is heavier than standard paint because it is comprised of heavy fillers that dampen the vibration of metal. Nevertheless, the coating is lighter than conventional sound damping tiles. Conner adds, "The coating reduces sound by reducing vibration. Vibration is caused when a noise source interacts with a substrate, and then that noise is reverberated on the other side of the substrate. This propagates the noise into the next environment. By reducing the vibration, you reduce the noise that is transferred through the substrate."

Applied in thicker coats than standard paints, Mascoat's maximum thickness is usually 160 mils (4 mm). In comparison, most standard coatings on a ship are no more than 5-10 mils thick. The coatings don't require special skills to apply; typically, the shipyard, its paint contractors, and/or joinery companies can do the job. The actual thickness of the coating depends, says Conner, on a number of variables. "Application thickness can range from 0.5 to 4 mm (20-160 mils), depending on the severity of the noise and the proximity to the source, said Conner, adding, "For example, you might coat an engine room (closer to the stern) with 4 mm, but you may only use 1 mm in crew quarters closer

Mike Bahtiarian, Sound Engineer at Noise control Engineering (NCE)

Andrew Margarit, Senior Project Specialist at Mascoat

Stefan T. Wolczko GPA's Business Development Manager

to the bow of the ship.

"Shipyards like the coating method because it is typically much faster to install than other methods of damping that can involve tiles or vinyl systems," says Conner, adding, "Mascoat also produces total, 100 percent coverage. Other methods usually provide about 70 percent coverage. When all surface areas are treated, the result is enhanced measurably."

Defining & Controlling Sound

Andrew Margarit, Senior Project Specialist for Mascoat says that success in the world of on board noise abatement is measured by the reduction in Decibels (DB). Every 3db is a 50% reduction of the noise. Each cabin on the vessel has certain noise levels that it cannot exceed. And, these are firm regulations in both MSC and HAB vessels, but many owners try to lower sound levels regardless of the rules in order to enhance crew safety and comfort.

Mike Bahtiarian, Sound Engineer at Noise control Engineering (NCE), told MarineNews, "Airborne noise in compartments is measured using device called a sound level meter (or SLM). It has become a fairly common device which reads the sound pressure level in A-weighted decibels or dB(A). The underwater radiated noise is much more complicated measurement process which involves significant mobilization and staging along with underwater hydrophones and a proprietary systems used by NCE called BAMS (Buoy Acoustic Measurement System). All measurements are made to ANSI standards developed in 2009 (ANSI 12.64-2009)."

While the Navy specified the noise and vibration limits for the vessel, it did not specify how the designers and builders should get to the Promised Land. It was left completely up to the builder to devise a noise and vibration treatment system that meets the vessel specifications. And, that's where Noise Control Engineering, LLC (NCE) comes in. The use of the damping material was recommended by NCE during the preliminary design stage as a result of airborne noise and underwater radiated noise predictions performed by NCE under contract to Dakota Creek Industries and Guido Perla & Associates.

NCE's Mike Bahtiarian explains, "For the U.S. Navy Ocean AGOR, sound and vibration were part of the vessel requirements from the first day. Compartment airborne noise, underwater noise and also hull vibration were all evaluated during the initial design phase. NCE also performs all compliance testing during final sea

U.S. Navy photo by John F. Williams

The Auxiliary General Oceanographic Research vessel R/V Sally Ride (AGOR 28) is prepared for a christening ceremony at Dakota Creek Industries, Inc. shipyard in Anacortes, Wash. R/V Sally Ride is the second in the Neil Armstrong-class of research vessels and features a modern suite of oceanographic and acoustic ocean mapping equipment.

trials."

Noise reduction isn't just for sophisticated research vessels. And Bahtiarian has some tips for workboat operators contemplating or currently engaged in newbuild programs. "The new certifications from ABS, DNV (Silent Class Notation) and IMO noise regulations will demand that shipyards and ship designers consider the vessel noise and vibration as an additional design feature that will need to be integrated into the overall design of vessels," he says, adding, "The incremental cost of doing this is small and is ten to twenty times more expensive if the need for sound mitigation is considered after the ship is built." And, as GPA's Wolczko advises, there is more than one conventional method of sound damping. Damping can be provided in tile, spray-on, and/or trowel-on versions. The tile form, for example, is the original formulation which was developed by the Navy for use on Submarine bulkheads.

Ancillary Benefits, other considerations

Mascoat is applied thicker than conventional paints and also has additional ingredients that give the coating added weight. This, however, is important since it is the mass (weight) in the coating that stops the metal surface from vibrating and stops the structural borne noise. Nevertheless, says Mascoat's Margarit, "The coating is much lighter than other methods of damping – sound tiles, for example. Our product is actually extremely lightweight for the amount of db reduction you see."

Corrosion Resistance is also a byproduct, but perhaps not necessarily the focus of Mascoat. Margarit explains, "Due to the fact that once the coating is applied you get a protective membrane over the steel (or aluminum), we have seen vessels that have been in service with our coating for over 20 years come in with no corrosion on bulkheads that would typical be full of rust," adding with a note of caution, "Ours is a water based coating and if it is applied in areas that are going to come in consistent contact with water or fluids, a topcoat is recommended. This is not meant for complete submersion over an extended period of time."

Sound damping and noise abatement in the marine setting can't be achieved without planning, certainly not in isolation or as a function of just one particular solution. That said, Mascoat has proven that it belongs in the mix. And, there are other reasons to consider the versatile coating that have nothing to do with noise. Quietly, Mascoat successfully addresses myriad issues on board today's vessels. All the rest of the talk is just background noise.

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