NAVY / MARINE CORPS / COAST GUARD / MERCHANT MARINE

SEAPOWER

COMBAT ROBOTS

MORE UNMANNED SYSTEMS BEING DEVELOPED TO JOIN BOOTS ON THE GROUND

July 2012 $5.00
NAVY LEAGUE OF THE UNITED STATES
www.navyleague.org

MEDICAL LESSONS FROM KANDAHAR / **INTERVIEW:** MCPOCG MICHAEL P. LEAVITT

Eye on Cost, Performance

Navy Metalworking Center aims to save production time and money

By NICK ADDE, Special Correspondent

Problem Solvers

Established in 1988, the Navy Metalworking Center supports the goal of reducing acquisition and total ownership costs through innovative metalworking and manufacturing solutions.

- The center submits a single bid for the Navy's metalworking projects every five years.
- When reviewing potential projects, the management team considers, among other things, the maturity of the technology necessary to solve a problem, the center's core capabilities to resolve it and the potential for cost savings.
- Projects can be turned out as quickly as within six months, or continue for years.

For years, the mission of the Navy Metalworking Center (NMC) remained more or less constant: improve the performance of weapon systems. In today's climate of tight budgets, however, the Johnstown, Pa.-based facility is doing the job with eyes trained on higher quality and the bottom line.

In doing so, the center's managers say, its teams of engineers have been able to streamline production times, deliver better products and save money. Thanks to collaborative work among the center and partners in industry, for example, an improved design of the leading edges of the waterjet inlet tunnels on the new Freedom-class Littoral Combat Ship (LCS) has reduced labor hours and weight.

"We're heavily focused on cost savings and [cost] avoidance today," said Daniel L. Winterscheidt, the center's program director.

The tangible benefits of their research are borne out at the shipyards that build state-of-the-art systems such as the DDG 1000 Zumwalt-class multipurpose destroyer, DDG 51 Arleigh Burke Aegis-class destroyer, Virginia-class fast-attack submarine, CVN 78 Gerald R. Ford-class aircraft carriers, the LCS and the F-35 Lightning II joint strike fighter.

Established in 1988, NMC operates under the umbrella of the Office of Naval Research's Manufacturing Technology (Man Tech) program, to develop and improve metalworking technologies and processes. Concurrent Technologies Corp., an independent and nonprofit organization, operates the facility under a government contract. The center employs between 1,400 and 1,500 workers, most of whom are engineers, technicians or welders, and works extensively with shipyards, large corporations and smaller companies to complete projects.

"We tend to bring our skills as inventive technology developers to [a] project, but by no means do we do all the work," said Rob Akans, the center's technical director. "We find the best team from very large, well-known companies to small, innovative companies that we think have the right capabilities to augment the needs of the project. It's very much a team effort."

As is the case throughout the Navy and the other armed services, NMC gets its work through the competitive-bidding process. The center submits a single bid for the Navy's metalworking projects every five years.

"Project issues come in from a number of areas, primarily shipyards and program offices," Akans said.

The center's management team reviews potential projects. Chief considerations include the maturity of the technology necessary to solve a problem, the center's core capabilities to resolve it and the potential for cost savings.

"For example, we looked at 45 potential projects for the current planning cycle, which is fiscal year 2013 [Oct. 1 through Sept. 30, 2013]," Akans said. "We'll boil it down to the top eight to 10 projects."

U.S. NAVY

An MH-60R Seahawk helicopter assigned to Helicopter Maritime Strike Squadron 77 flies alongside the Littoral Combat Ship (LCS) USS *Freedom* in the Pacific Ocean June 7, 2011. The Navy Metalworking Center, in collaboration with partners in industry, devised an improved design of the leading edges of the waterjet inlet tunnels on the Freedom-class LCSs to reduce labor hours and weight and is investigating using new lightweight materials that can withstand the high temperatures on the gas turbine uptakes and exteriors on the LCS.

The new vessels — DDG 1000, DDG 51, CVN 78 and LCS — are garnering most of the center's attention, with the F-35 drawing slightly less focus, Akans said.

Scheduling the work depends upon how quickly the Navy needs a finished project. Generally speaking, projects can be turned out as quickly as within six months, or continue for two years or longer.

The second Ford-class carrier, *John F. Kennedy* (CVN 79), is five years away, Akans said. As such, the timetable is relatively open.

"On the other hand, with the LCS, the Navy is building two ships per year, [with] two builders," Akans said.

"We identify up front when they need it, looking at what we think we can deliver. Then we track how we're doing with the insertion [date] we're targeting. The sooner it's inserted, the more cost savings there are over the life of the program," he said.

Lockheed Martin is building the Freedom class of LCS, a monohull design, in collaboration with Marinette Marine Corp., of Marinette, Wis. Northrop Grumman is building the Independence class, a trimiran design, in collaboration with Austal USA in Mobile, Ala.

With the LCS, the shipyards were faced with production challenges associated with ensuring that the 13 formed steel plates for the waterjet inlet tunnel were positioned correctly inside the ships' hulls. Welding distortion had to be accounted for. Unless a solution was found, costs and production times would soar.

The center's team came up with a method that entailed casting the component in three separate segments, using molds that were designed to minimize or eliminate problems with porosity, distortion or cracking. The molds were produced in two days, shipped to the foundry and were ready for use within two weeks of the day the team finalized a design for the molds' casting. The innovation will be applicable to other future production projects, the center's leadership believes.

While working on present projects, the center's brain trust keeps an eye trained on future needs.

"We look at what are the next generation of manufacturing techniques, which the Navy should be aware of … where we see technology going in the next several years," Winterscheidt said.

Additive manufacturing, which entails building metal parts layer upon layer, is one such area of focus, he said.

"It's not ready for prime time," Winterscheidt said, noting that when additive manufacturing is perfected, the development team working on the F-35 will be particularly interested.

The issue of corrosion also garners considerable attention.

"Corrosion is not a new problem. The Navy has been trying to come to grips with it for years," Winterscheidt said.

Anti-corrosion efforts involve development of, and experimentation with, new coatings and materials, with the intent of striking a balance between cost and performance. Designers could offer the Navy a stainless-steel ship, Winterscheidt said, but the price tag would be too high.

Other efforts center upon improving the welding process.

"A big cost-driver is the guy with the stick in his hand, trying to weld," Akans said.

Hybrid laser-arc welding, which combines traditional welding with the use of lasers, could hold the answer, said Denise Piastrelli, the center's business and operations director.

"It gives you better productivity and weld quality," she said.

Teams also are working to perfect white-light scanning technology, which would further ensure quality.

"It's a very sophisticated way of determining the exact shape of a part or surface, and making sure [such parts or surfaces] are within geometric tolerance," Winterscheidt said.

U.S. NAVY

The Los Angeles-class attack submarine USS *Pittsburgh* and the Arleigh Burke-class guided-missile destroyer USS *Sterett* transit the Arabian Sea April 12. The Navy Metalworking Center is working on a project aimed at improving the corrosion resistance of torpedo tube muzzle doors of the Los Angeles-class boats, as well as another to reduce manufacturing costs of weapons cradles on Virginia-class submarines.

The center's key innovation projects also include:

- Investigating the possibilities of using new lightweight materials that can withstand the high temperatures on the gas turbine uptakes and exteriors on the LCS.
- Developing new corrosion-resistance parameters for the ferrous alloys used on the torpedo tube muzzle doors in Los Angeles-class submarines. The change could save $9.4 million over the course of the vessels' remaining 70 years of life expectancy.
- Combining different materials for Virginia-class submarines' propeller shafts, prolonging the periods between replacements.
- Reducing manufacturing costs of weapons cradles on Virginia-class submarines, with the potential of realizing savings that range from $612,000 to $1.2 million per vessel. The plan is to reduce rejection rates and necessity to rework projects by roughly 10 percent.
- Reducing weight and manufacturing costs for the Advanced Gun Systems on DDG 1000 by employing better arc welding, machining and casting techniques.
- Developing a prototype flame-brazing system that would improve the quality of joined fittings and streamline the labor process now in use at shipyards. The plan could shave $2.3 million from the total cost of building three new CVN carriers, overhauling the hulls of six others and building nine new Virginia-class submarines.
- Exploring the potential of alternative welding techniques, which would expand the eight- to 16-hour time window during which contaminants must be removed from joints and aluminum surfaces before they are welded.
- Mechanizing the weld-shaving process used on DDG 1000 and other vessels. Now done manually, the task is slow, repetitive and a primary source of injury claims among shipyard workers. The project could trim the cost of DDG 1000 production by $1 million.
- Improving the processes of applying and removing coatings of weapons systems' coatings. Streamlining the present protocols for coatings removals could save $350,000 for each Virginia-class submarine hull, with the potential for further savings when applied to other ship classes. ■