

Optimized SMAW Electrodes Consistently Meet Ballistic Requirements for Navy Ships, Ensure Availability

Status: Transitioned and Implemented

PROBLEM / OBJECTIVE

MIL-10718-M electrodes are used for shielded metal arc welding (SMAW) of HSLA-100 and HY-100 steels on Navy ships. However, the electrode was only available in a 1/8-inch diameter, which tended to yield an unacceptable rejection rate during testing. This Navy Metalworking Center (NMC) project ensured consistent availability of two diameter sizes of MIL-10718-M electrodes needed for the cost-effective production of naval vessels.

ACCOMPLISHMENTS / PAYOFF

Process Improvement:

The project enabled optimization of 1/8-inch MIL-10718-M electrode chemistry and validated acceptance testing procedures and criteria. Further, 3/32-inch electrodes were validated to meet NAVSEA requirements, thereby increasing welding flexibility through the introduction of a second electrode size. Ultimately, the NMC project resulted in the qualification of two suppliers for each diameter of electrode. ESAB and Lincoln Electric each produced lots of electrodes and provided them to General Dynamics Electric Boat (GDEB) and Northrop Grumman Newport News (NGNN), who verified the operating characteristics, weld metal mechanical properties, electrode usability and welder appeal. The electrode manufacturers successfully demonstrated conformance of these lots to the requirements of Technical Publication T9074-BC-GIB-010/0200.

Implementation and Technology Transfer:

Both the improved 1/8-inch and new 3/32-inch MIL-10718-M electrodes have been approved for use in naval weapon systems. The 1/8-inch electrode was implemented on CVN 78 hull starting in January 2007 as well as on the Virginia Class Submarine (VCS). The 3/32-inch electrode has been approved for use on CVN 21 and VCS.



Shielded metal arc welding (SMAW) process
Photo courtesy of Lincoln Electric

Benefits:

- Achieved consistent performance with three lots each of 1/8-inch and 3/32-inch MIL-10718-M electrodes from ESAB and Lincoln
- These electrodes will provide welds capable of consistently meeting required performance in welded HSLA-100 and HY-100 steels.
- The ability to procure these electrodes from two manufacturers allows for greater flexibility, provides competition in pricing and ensures consistent availability to the U.S. military and military contractors.

TIME LINE / MILESTONE

Start Date: February 2004

End Date: June 2007

FUNDING

Total ManTech Investment: \$1M

Cost Share: PEO Carriers provided 25% cost leveraging for testing at NSWCCD

PARTICIPANTS

Future Carrier Program Office (PMS 378)
Naval Sea Systems Command (NAVSEA 05P24)
Naval Surface Warfare Center, Carderock Division
Northrop Grumman Newport News
General Dynamics Electric Boat
ESAB North America
Lincoln Electric
CTC/Navy Metalworking Center