Shipbuilding CoBot Alliance

“Establishment and Operation of a Shipbuilding CoBot Training and Development Center”

(NSRP RA No. 24-02)

Production Processes, Planning and Facilities

July 23, 2025

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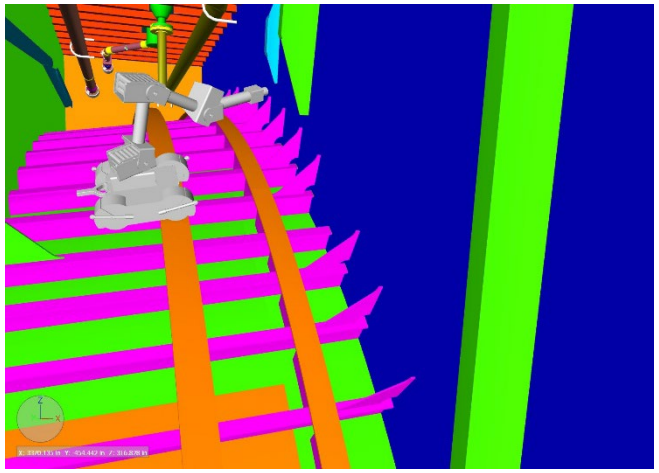
BLUF

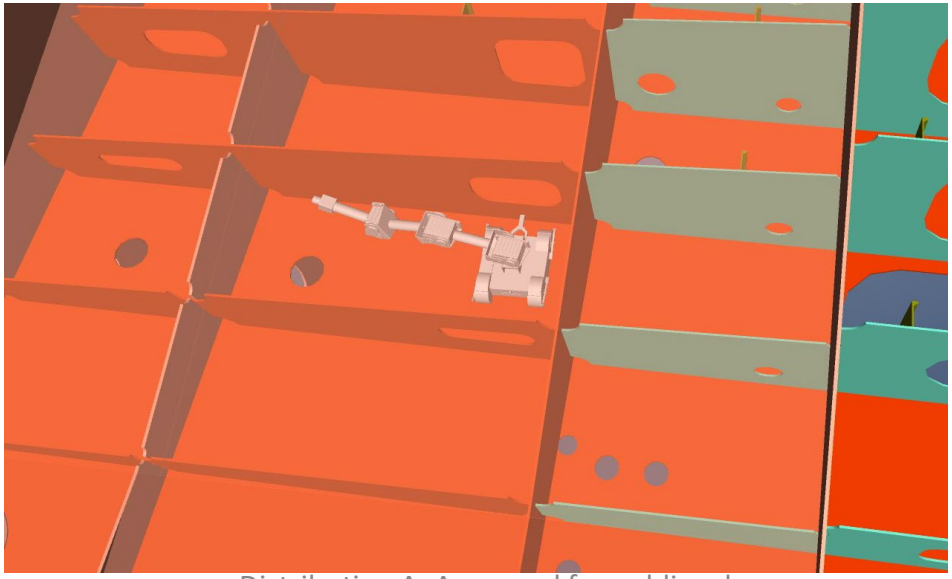
- U.S. shipbuilding faces a manpower crisis at a time when production needs to ramp up significantly.
- Bringing people into shipbuilding, especially for welding and other “dirty” jobs is a challenge for all shipbuilders and suppliers.
- Collaborative Robotics (CoBots) offer an automation solution that increases the productivity of skilled workers.
- Implementing CoBots for U.S. Navy work is time consuming and difficult due to training and qualification requirements.
- The Shipbuilding CoBot Alliance was established to create a streamlined path to implementation.
- The Maritime Industrial Base is already funding CoBot implementation projects at the major corporate shipyards. The SCA’s goal is to expand the effort across the entire Maritime Industrial Base in a standardized and repeatable fashion.

Alliance Mission

The Shipbuilding CoBot Alliance is established as a loosely structured consortium of shipbuilders, CoBot suppliers, shipyard supply chain suppliers, Navy technical authorities and industry experts. The purpose of the Alliance is to accelerate the implementation of CoBots in shipbuilding applications by providing a streamlined and efficient path to qualification of personnel and equipment to Navy and industry standards. A specific focus is the identification and resolution of issues and roadblocks currently impeding the use of CoBots in shipyard welding applications. The mission will be accomplished through training and qualification centers established in Norfolk, VA and Marinette, WI with potential for expansion as the need requires.

Portable CoBot Applications





Hurdles to Implementation

- Tech_Pub_248_S9074-AQ-GIB-010_248_rev1_11.12.19 specifies requirements for robotic welding for U.S. Navy applications
- Rev 0 required Level 1 Qualification (including failure tests on specimens) at the serial number level plus essential elements (amps, volts, gas type, material, grade, filler etc.) for a qualified Weld Procedure Specification (WPS)
- Rev 1 requires Level 1 Qualification at the make/model level plus essential elements for a qualified Weld Procedure Specification (WPS)
  - Additional machines in the same make/model with same essential elements only require level 2 Qualification (visual inspection) to a qualified WPS
- Other applications (cutting, weld prep, coating removal, gouging) do not have to be qualified for use with a CoBot beyond finished product inspection

Shipbuilding CoBot Alliance

- Objectives
  - Establish a pipeline for standardized personnel training and qualification, application development and CoBot qualification for Navy work
  - Research and Development to improve CoBot functionality and versatility in ship construction and repair applications.
- Method
  - Establish 2 regional Centers, one at NWTC in Marinette, WI run by Northern Wisconsin Technical College and a second at Tabet Manufacturing in Norfolk, VA run by GENEDGE, the VA MEP.
  - Equip each center with CoBot application cells with an emphasis on welding
    - » Other applications include cutting, grinding, paint removal, weld prep
  - Provide standardized, system agnostic training for shipbuilding applications with a primary focus on welding

Alliance Charter Members

- CoBot Suppliers
  - ESAB
  - Lincoln Electric
  - Miller
  - Switchweld
  - THG Automation
- Shipyards
  - FMM Marinette
  - Newport News Shipbuilding
  - Master Boatbuilders
  - Pacific Shipyards
- Equipment Suppliers
  - Atmospheric Plasma Solutions
  - NC-Seamless
- Management Team
  - CahillConsulting, LLC
  - Hepinstall Consulting Group, LLC
- Center Management
  - NWTC (host and manager)
  - GENEDGE (manager)
  - Tabet Manufacturing (host)
- Technology Team
  - Robotic Technologies of Tennessee
  - Edison Welding Institute
  - VA Digital Maritime Center
- Technical Support
  - NAVSEA

Operating Plan

- Each Facility has a qualified trainer(s)
- Each Activity (shipyard, shipyard supplier, etc.) needs to review the training curriculum and approve it for use by their personnel.
- Each Activity needs to either provide their own WPS or use an established baseline to develop a WPS as covered in the Qualification Test Plan.
  - Each activity is responsible for witnessing their employee's qualification welds – or an approved representative
- Test specimens will be created during training and sent to lab for analysis and creation of PQRs.
- Each Activity is responsible for sending qualified WPS and PQRs to their Approval Authority and/or Prime Contractor Activity

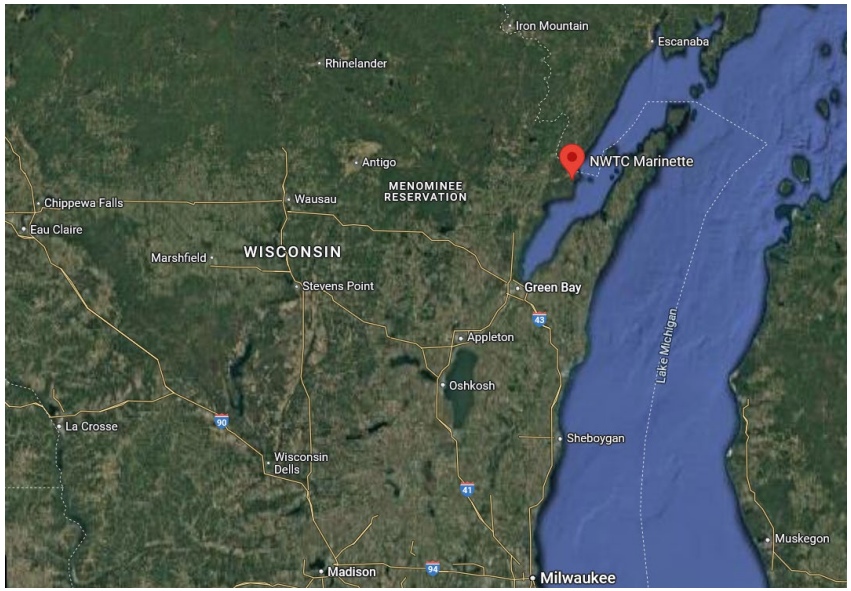
Business Case

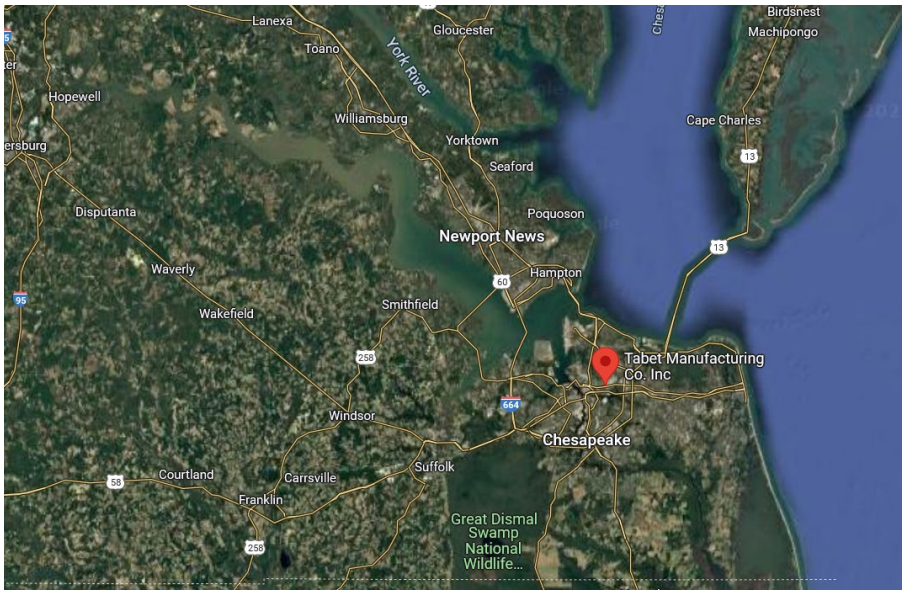
- CoBot suppliers provide equipment to centers as cost share
  - Labor support is funded
- Centers provide a pathway to qualifying multiple WPS on a specific make model
  - Independent trainer provides operator training to a standardized curriculum
- Shipyards and suppliers have access to training with an end result of Welder and CoBot qualified to an approved WPS
  - Training can be on multiple systems to support investment decisions or on a specific system if one has been chosen
  - Performing entity is required to sign off on their own WPS and then submit for approval
- NAVSEA is engaged to provide guidance on the qualification process
- Suppliers can sell the qualified system off the floor

Project Status

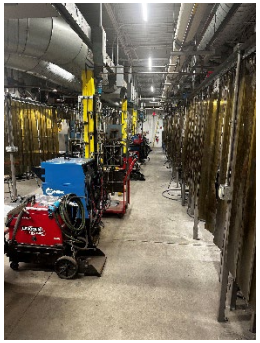
- Lab space at Tabet Manufacturing in Norfolk, VA completed with 5 systems installed
- First hands-on train the trainers feedback sessions week of 6/2
- Second training session 2 weeks later
- Stand up second center at NWTC in Marinette and begin training in August
- Phase 1 ends September
- Phase 2 to expand training and initial implementation with feedback

Initial Locations

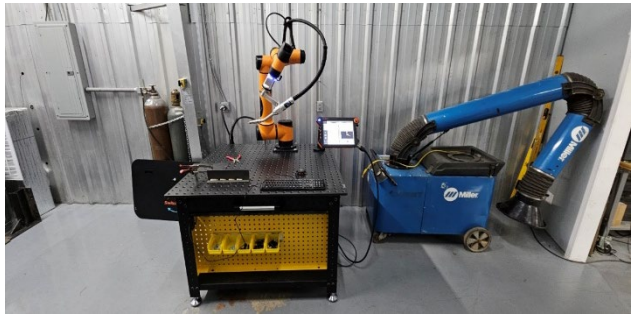




NWTC, Marinette, WI



Tabet Manufacturing, Norfolk, VA



Installed Systems in Norfolk

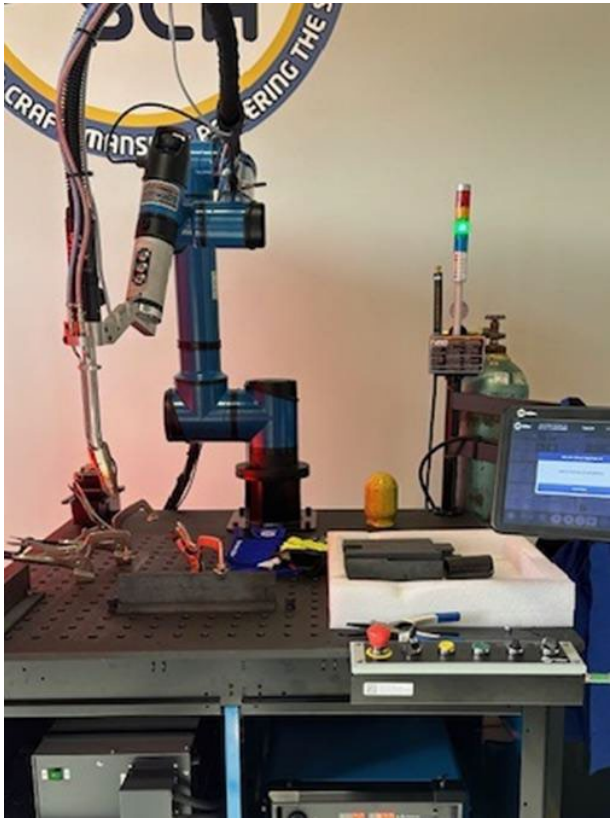
Lincoln Electric Company Cooper™ GoFa-10 A/C WB Welding CoBot Cart (GEN II)

THG Automation L.L.C., URW-2PA System

ESAB Smoot CoBot 500I x Power source, U8 Robust Feeder, URIO TT Arm

Installed Systems in Norfolk (cont)

Robotic Technologies of Tennessee i10 SwitchWeld system



Miller CoPilot Table System, includes Water-Cooled, Seam Tracking, Auto Deltaweld 500, and 400 VAC input

Conclusion

- Project on track to offer several training sessions at both locations this summer
- Phase I ends and Phase II begins in September
- Phase II will expand training and promote implementation
- Vision is to expand with regional centers in each shipbuilding heavy area of the country (New England, Gulf Coast, Southwest and Northwest coasts)
- Phase III proposal will build out a mobile training trailer and a brick and mortar facility in the San Diego area.
- NSRP funds the initial effort as R&D. Expansion and sustainment requires additional funding streams (MIB subsidized, state and regional workforce development funding, fee based offerings)

Shipbuilding CoBot Alliance

Questions?

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and

https://genedge.org/programs/shipbuilding-cobot-alliance-sca/