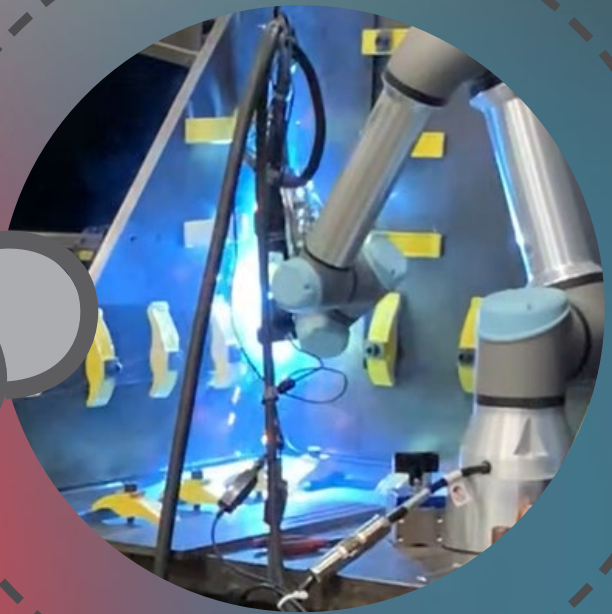


TELE-MANUFACTURING

*APPLYING ADVANCED
AUTOMATION SOLUTIONS
FOR ENHANCED PRODUCTIVITY*



What is “Tele-Manufacturing?”

The direct,
accurate transfer
of manual skillsets
from on-site personnel
to remote automated
systems

Why Tele-Manufacturing?

Companies in manufacturing and processing are facing an unprecedented challenge in meeting their sustainment and growth goals. Even before the Covid pandemic, the existing pool of experienced workers in manufacturing had been diminishing, while the changing industry and expanding economy continued to require more skilled workers to meet technological advances and global demand.

Recognizing the growing workforce problem in 2018, EWI took on the challenge of developing “tele-manufacturing” technology beginning with a *tele-welding* application in which a skilled technician could operate a functional welding system from a remote location.

2018

Problem IDENTIFICATION

Skilled workers in manufacturing decrease exponentially year over year. There is an urgent need to address workforce challenges to meet the needs of industry and develop a future-forward, technology-based labor pool.

Conceptually, a tele-welding solution would offer critical benefits to manufacturing by widening the potential labor pool of skilled welders, it could engage both older welders who could no longer physically work under weld site conditions and younger workers who were opting out of the trade because they did not want to work onsite at distant and potentially hazardous job sites.

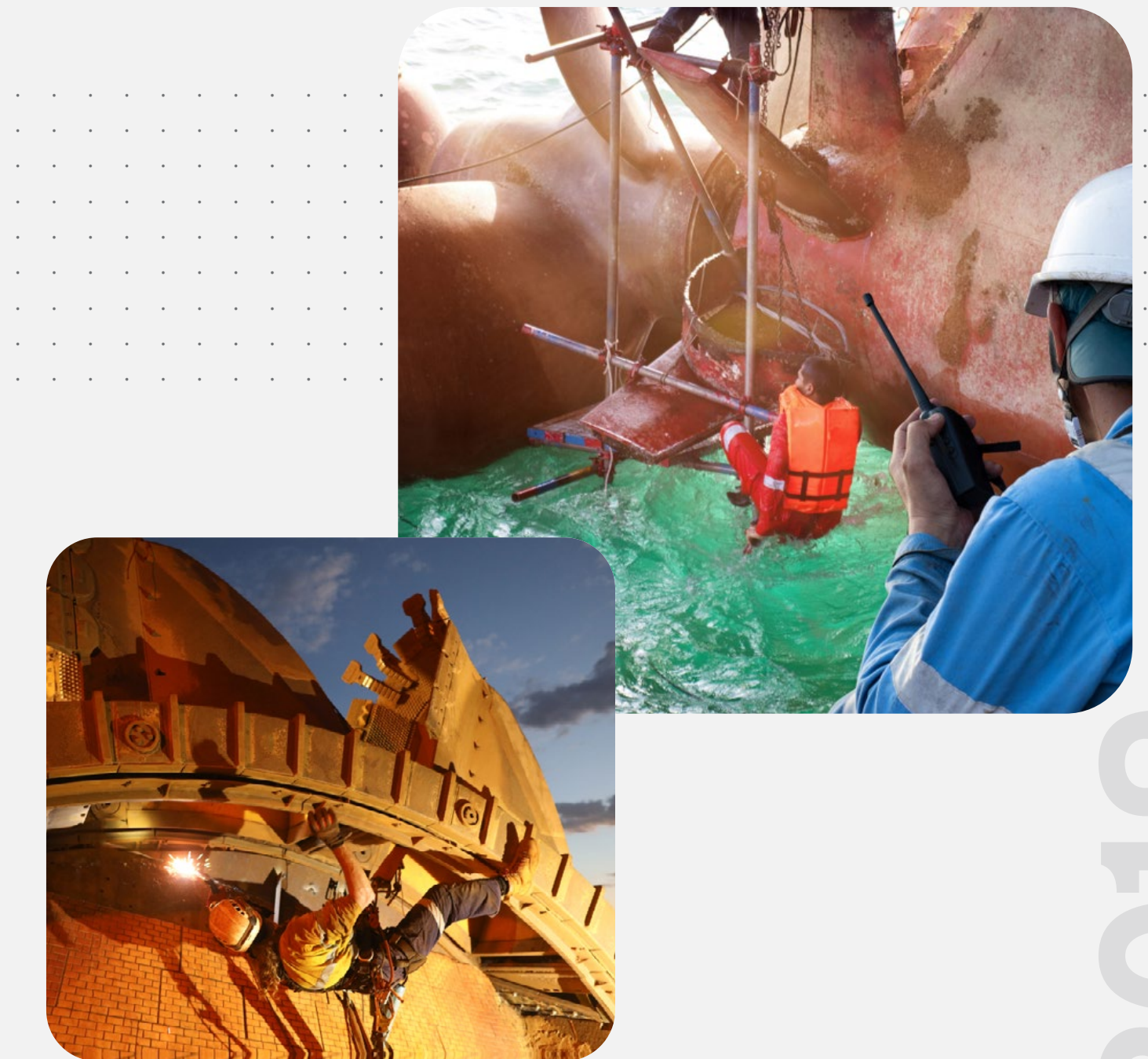
Tele-welding would take away the restriction of being onsite, eliminating physical health issues for older workers and drawing in younger workers who are attracted by the new remote tele-welding tech.

In 2019, an EWI-led research team* initiated the effort to make high-performance tele-welding a reality.

[Click here for the original concept presentation.](#)

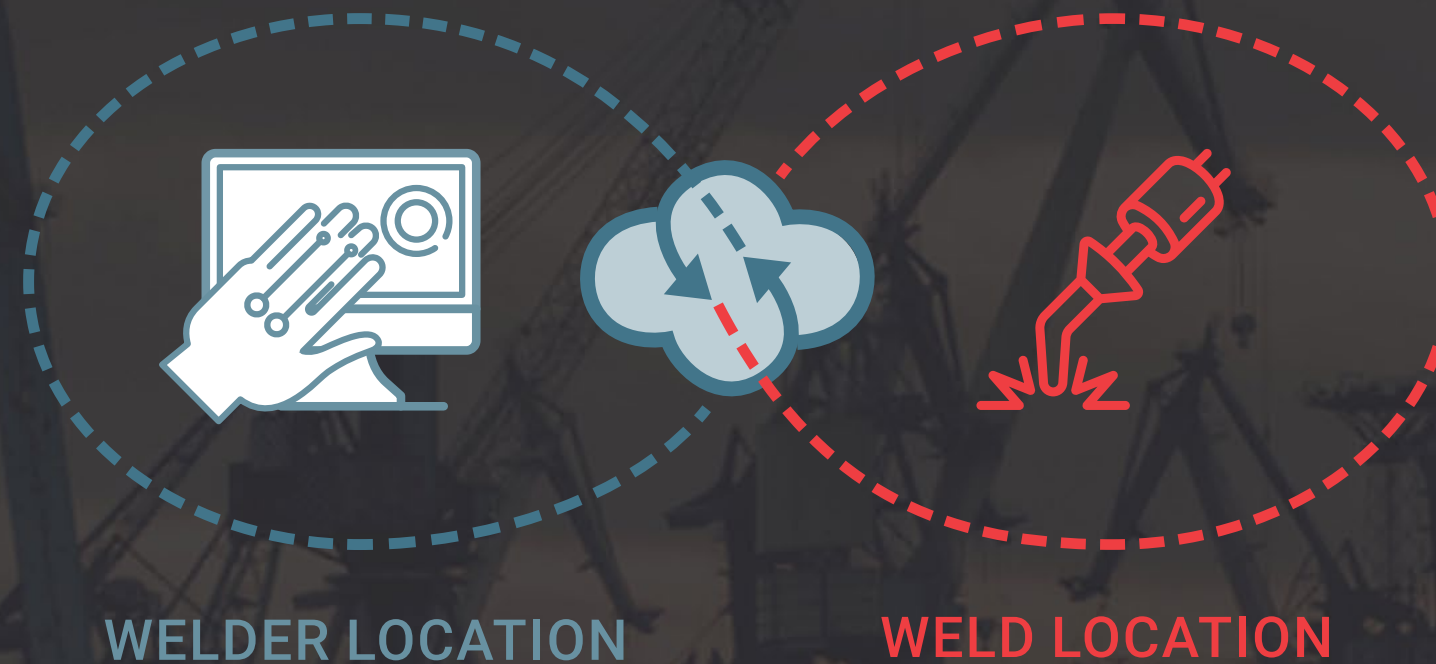


The research team included EWI, General Dynamics Electric Boat, HII-Newport News Shipbuilding, Robotic Technologies of Tennessee, and Visible Welding. The project – to develop a mechanized welding system completely controlled by a worker remote from the site – was sponsored by the U.S. Navy and funded through the National Shipbuilding Research Program (NSRP).



INSPIRATION

The goal: to give a skilled welder the ability to join components from a remote location with the aid of robotics and still be in complete control of the welding process.



The challenges to creating a tele-welding system were complex and multifaceted:

- Realistic transmission from a welding site – both sights and sounds – needed to be livestreamed remotely to an operator
- A mouse or weld torch-shaped device needed to be developed for the operator's use
- A robotic arm at the site had to be able to respond and execute every move made by the operator

The research team reviewed the most current methods and sensors available. Both high-resolution streaming cameras and specialized arc-puddle viewing cameras were investigated to determine how best to get the welding process conveyed in real time. 3D digitizers and similar tools were considered to make certain that the welder and robot shared the same environment and frame of reference. Different sensing methods and different streaming protocols were tested. [Click here to learn the details of the early research.](#)

INNOVATION & DEMONSTRATION

The tele-welding system prototype is designed, the technology is tested, the equipment is refined, and the system is customized for site use.

PHASE 1

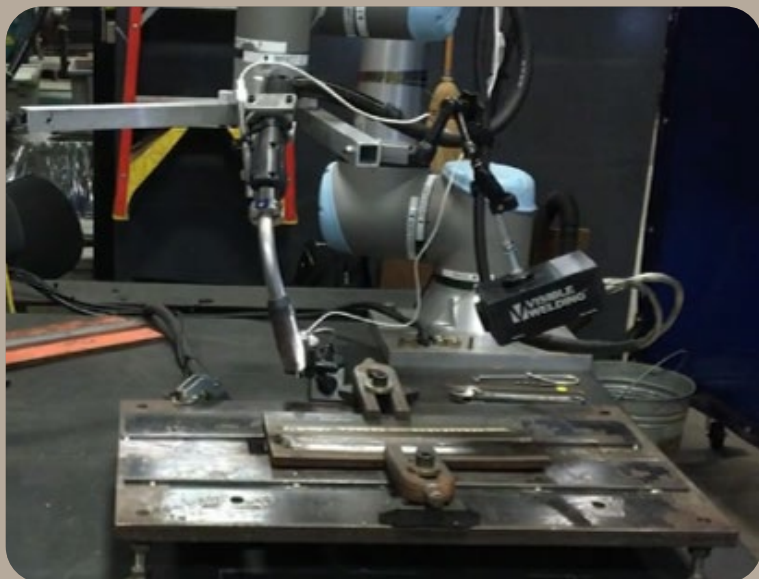
May 2020

PROOF OF CONCEPT

Skilled welders located in New England are able to execute remote welding at the labs at EWI headquarters in Columbus, Ohio, demonstrating that a mechanized welding system can be operated successfully by an operator remote from the welding site.



User Interface and control of robot using stylus



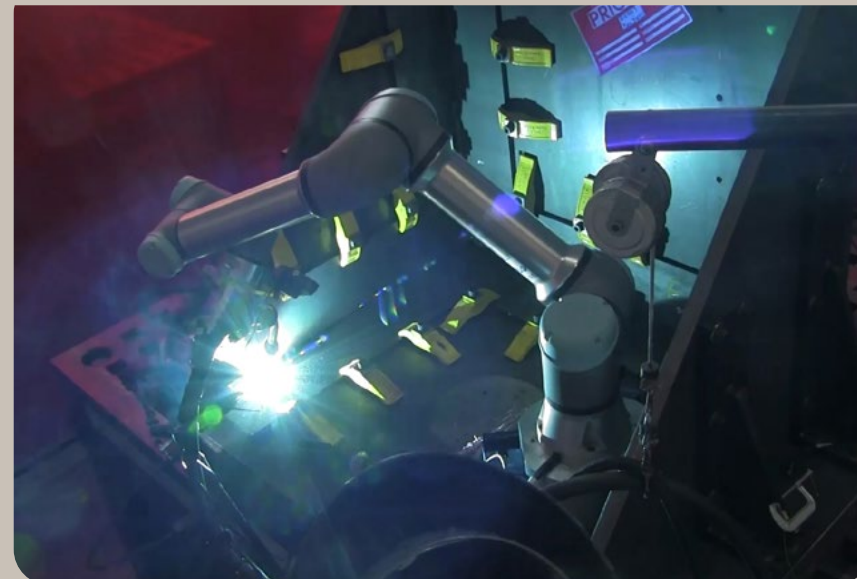
UR10 cobot on table in weld station

PHASE 2

April 2021

CUSTOMIZED TELE-WELDING SYSTEM PREVIEW

Two systems were completed, a portable cobot arm system and a portable mechanized crawler system. Both systems were demonstrated to personnel from two shipyards, enabling project leaders to test them out before delivery and installation.



Shipyards test session

May/June 2021 SYSTEM TESTING AT SHIPYARDS

Two demonstration systems were installed at shipyard test locations allowing shipyard personnel to try remote welding and provide feedback.

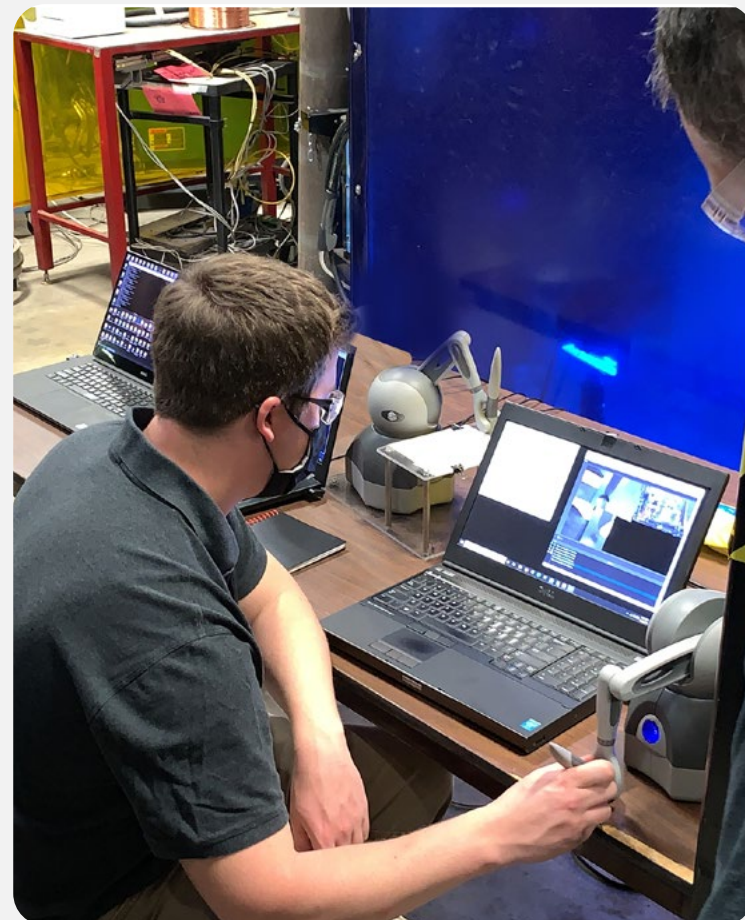
Customer VERIFICATION

Welders and technicians put the new system to the test. Their initial responses are captured immediately following the trials.

What did you think of the tele-welding system?

“It’s a very user-friendly system, limiting the pendant to two directions simplified the process. I was impressed with the x/y adjustments and video quality. It was very clear to see where your wire was.”

– Ryan Lottes, Welding & NDT Engineer, HII – Newport News Shipbuilding



What was it like to use the system?

Click left for feedback from
Tim Moore, Welding Instructor,
The Ohio State University



How realistic was the experience?

Click left for comments from
Gary Thompson, Lead Welding Technician,
EWI



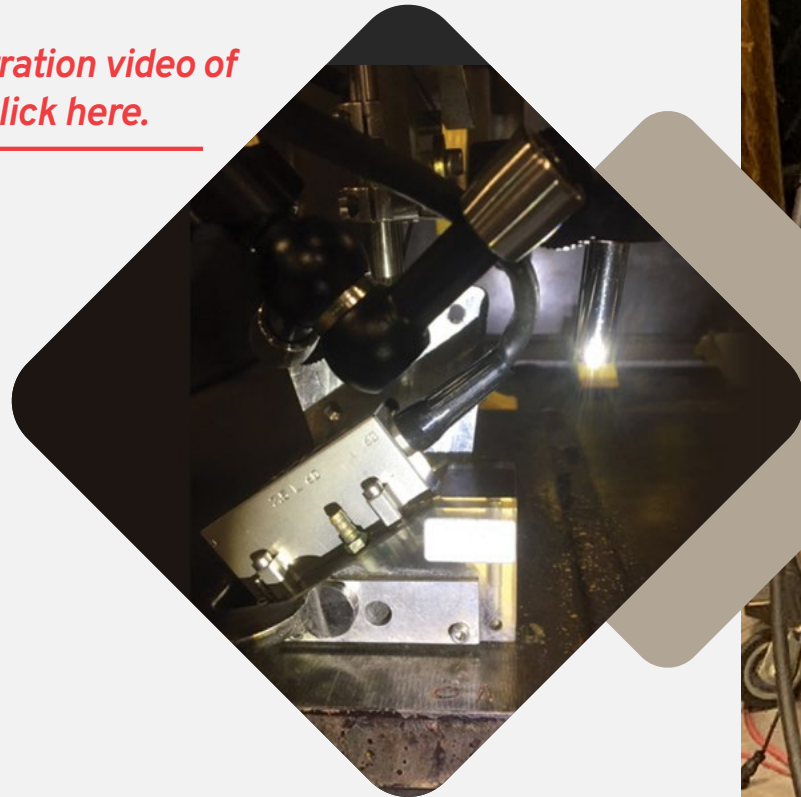
Did the system meet your expectations?

Click left for first impressions from
Scott Grove, Welding Engineer,
HII-Newport News Shipbuilding

Further INVESTIGATION

New projects are underway to investigate tele-inspection using typically manual NDE techniques, tele-gouging, and implementation of the newest livestreaming protocol to decrease further latency. In addition, the shipyard tele-welding systems are planned to be merged onto a mobile device with a small robot arm which will increase portability and functionality. EWI is also pursuing other tele-manufacturing applications like tele-inspection.

[To see a demonstration video of tele-inspection, click here.](#)

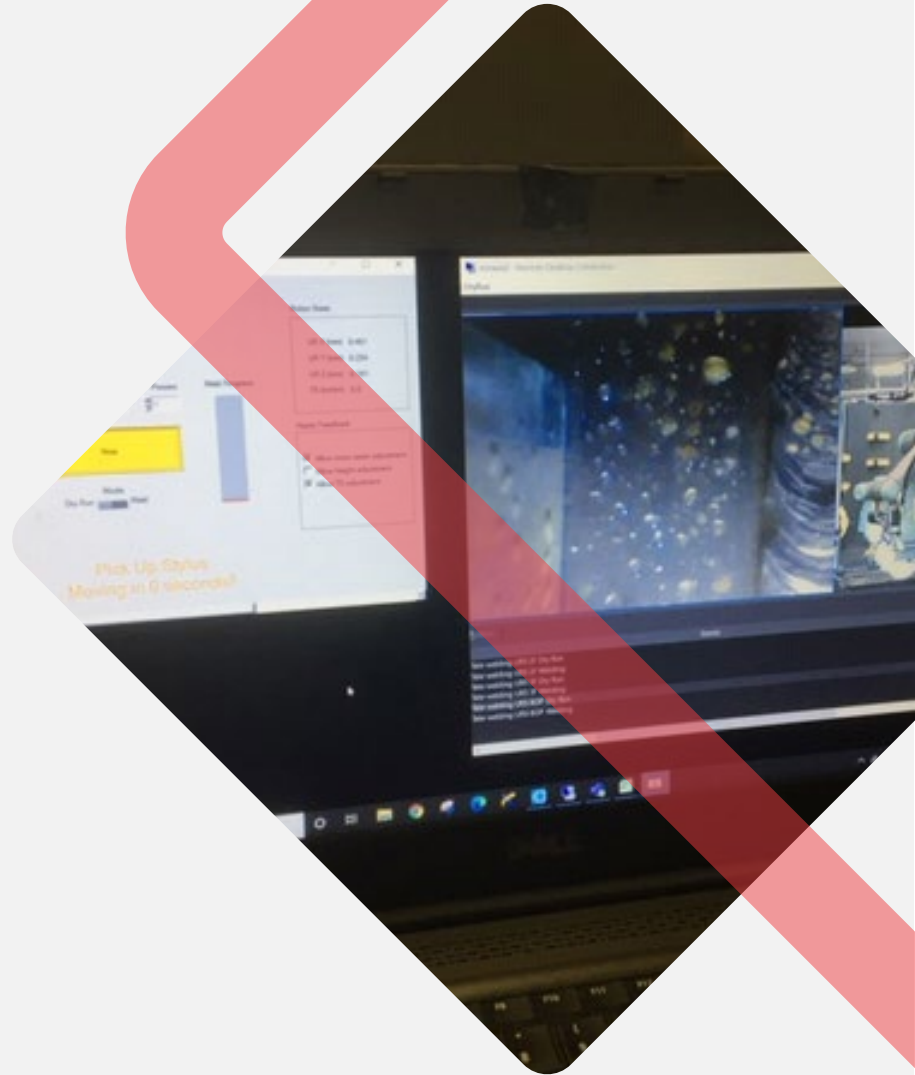


EWI is currently reviewing a variety of manufacturing processes to adapt for tele-manufacturing. If you want to learn more about this technology or are interested in working with EWI on future research and development, contact Connie LaMorte at clamorte@ewi.org.

About EWI

EWI empowers industry leaders to overcome complex manufacturing challenges and integrate new processes to bring products to market more quickly and efficiently. Since 1984, EWI's comprehensive engineering services have helped companies identify, develop, and implement the best options for their specific applications. Backed by unmatched professional expertise, state-of-the-art lab facilities, and technology resources, we offer customized solutions that deliver game-changing results. How can EWI help your organization?

Visit ewi.org or call **614.484.7600** to learn more.



EWI[®]
We Manufacture Innovation

ewi.org
info@ewi.org