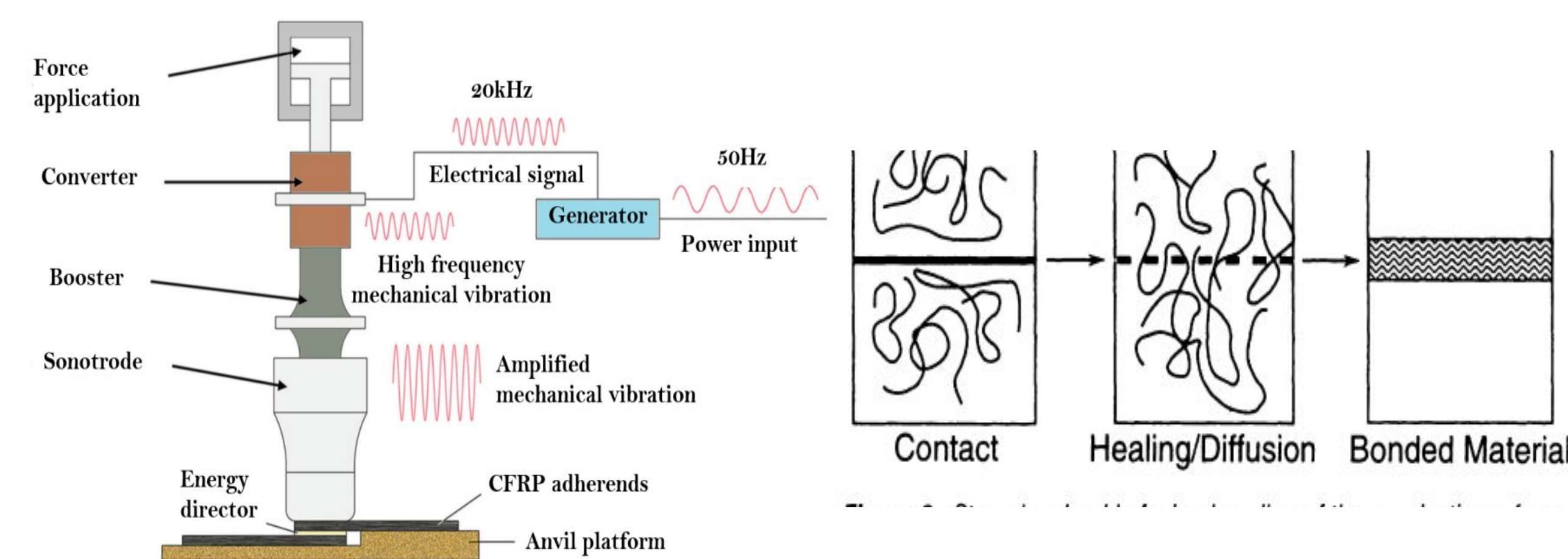


Objective: The project involves the design and implantation of an automated sonic welding robot cell. The cell will be able to weld a noise vibration harshness (NVH) pad to HDPE and PET car underliners.

Problem Statement: Automate the welding process to reduce the number of failed or inconsistent welds.



Background:

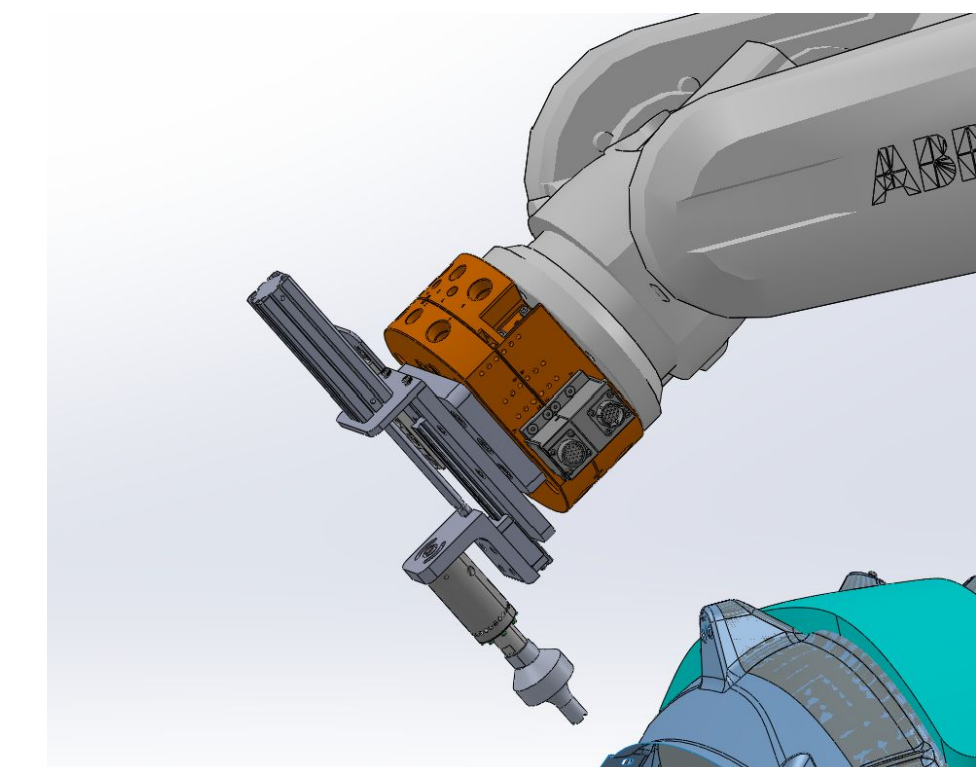
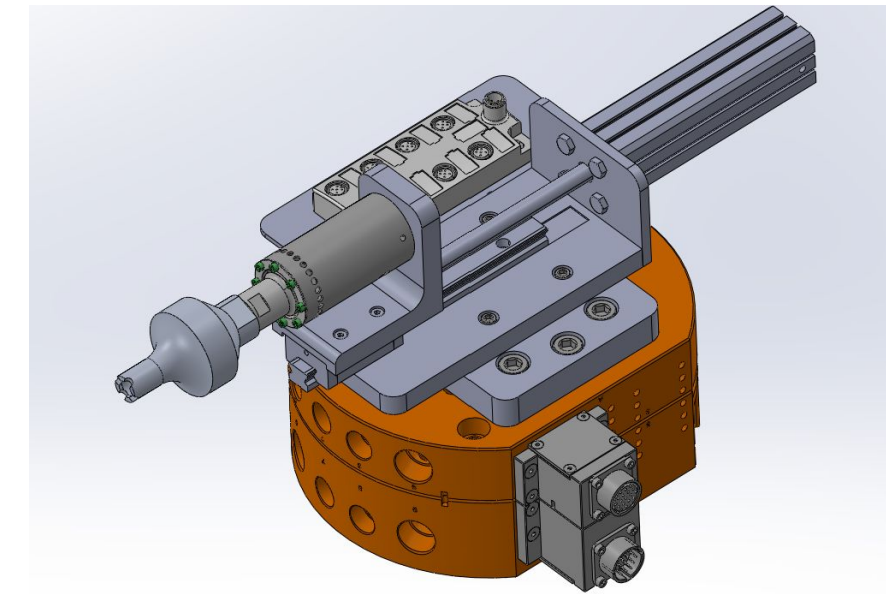


Sonic Welding: Ultrasonic welding uses ultrasonic vibrations that range between 20-40 kHz to create localized heating and diffusion to join two materials together.

Sponsors Background: Corvac Composites makes cost-leading vacuum form and compression form underbody encapsulation systems for major automotive manufacturers

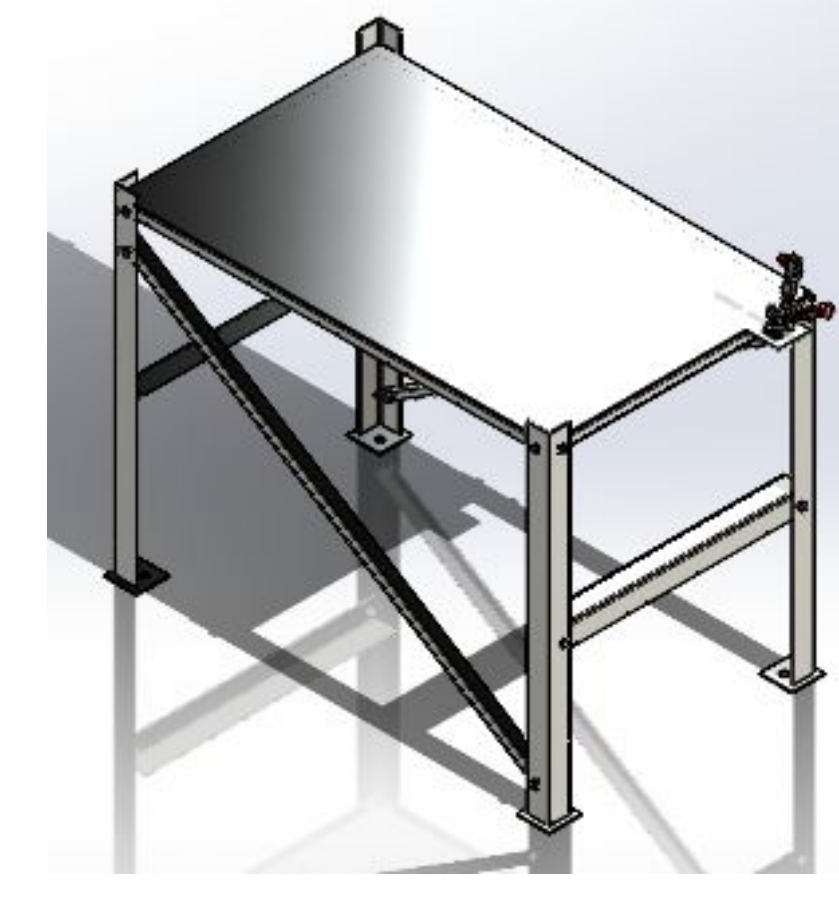
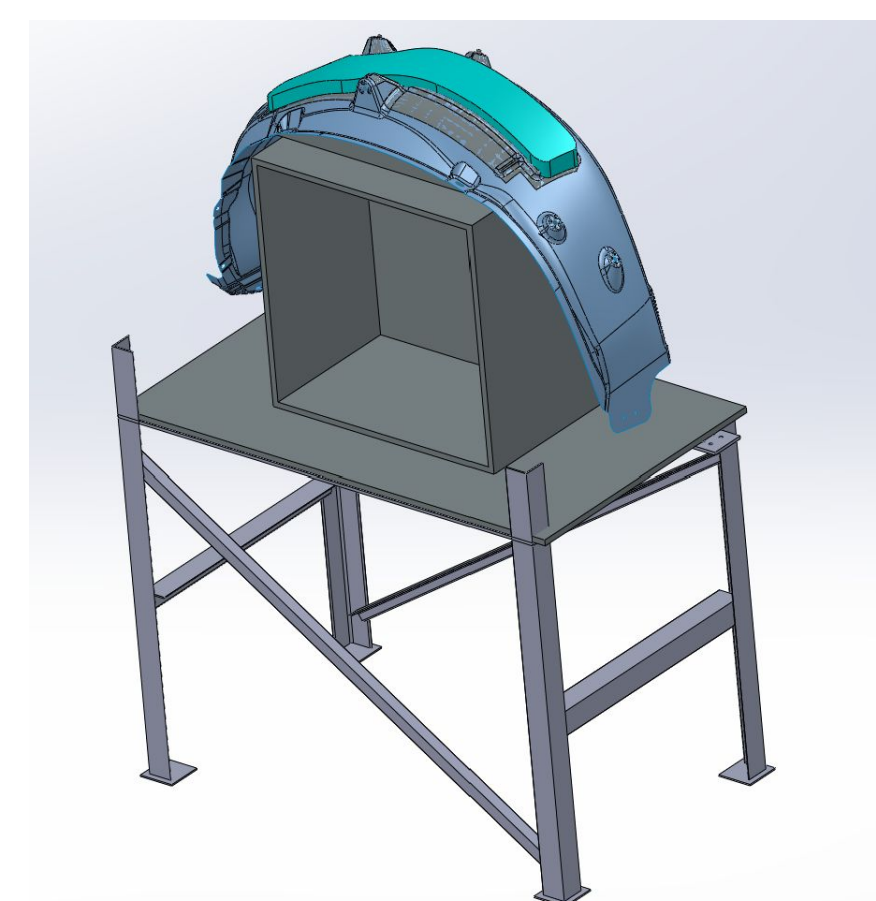
Design Approach:

- Design of End of arm (EOA)



Dual action pneumatic cylinder actuates sonic welder probe on linear slides

- Design of prototype fixture table

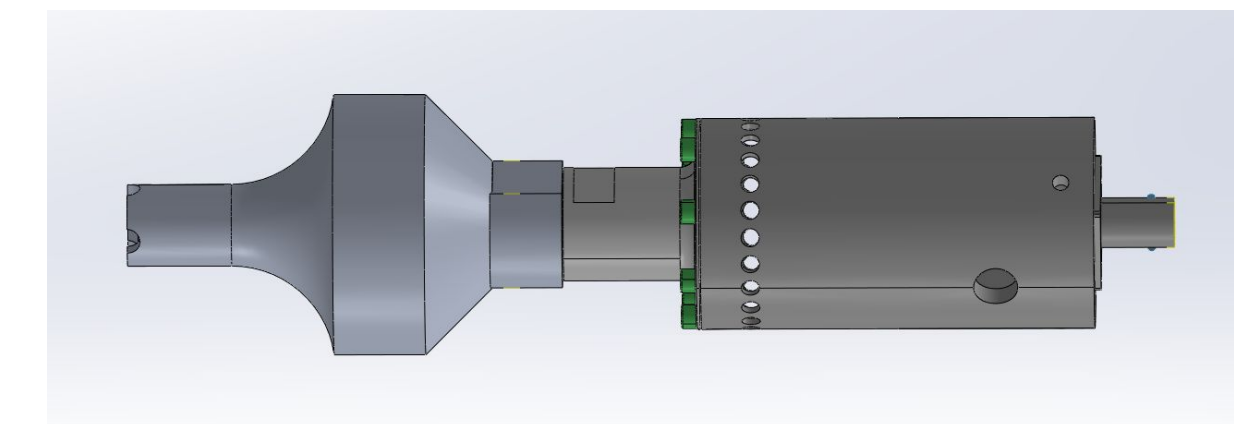


Prototype part is locked into place by prototype fixture. Fixture allows for easy installation of different parts

- Ultrasonic welder selection



Dukane IQ plus generator MPC

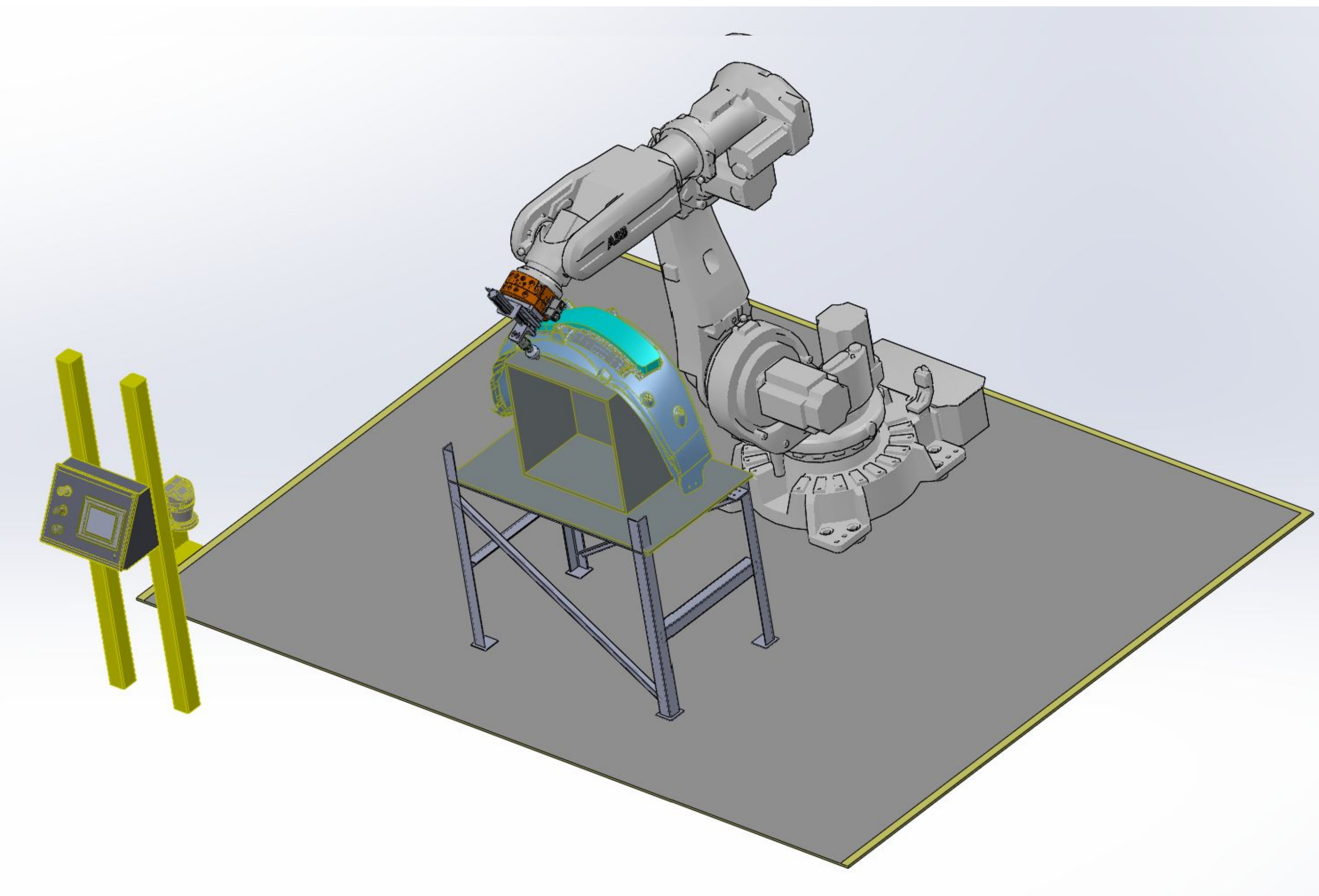


Dukane 40k 700w resonant probe

- Safety Devices and Controls



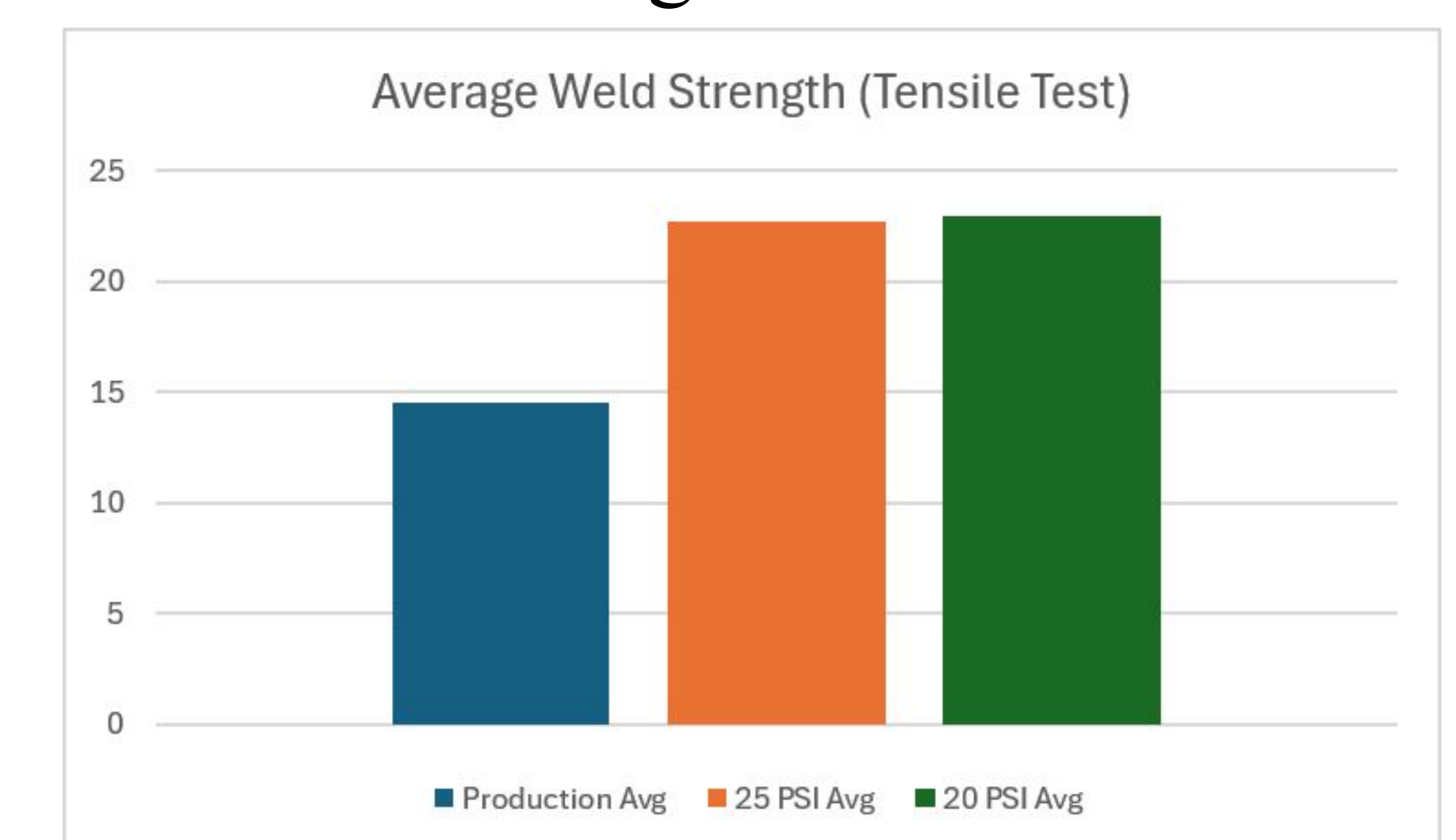
Keyence area scanner to prevent operator harm, IO Link hub for reading the part and EOAT serial number, and ABB robot arm for movement.



Full System Layout

Weld Specifications:

- Welding cycle time: < 4 seconds
- Weld failure rate target: < 20%
- Weld location: $\pm 10\text{mm}$
- Weld mechanical strength: >20 N



Operational procedure:

- Operator will load prototype part onto base fixture
- Operator will clamp a NVH pad down onto prototype part
- Operator will leave robot operation zone and hit start on the HMI once program is confirmed to be correct.