Our corporate sponsor, IMI-Hydronic Engineering, designs and manufactures industry-leading hydronic products and solutions that help create energy-saving and cost-efficient HVAC installations. This project focused on the assembly of common IMI-Hydronic valve products at their Dallas, TX factory. Depending on the valve order being fulfilled, various components requiring a range of torque values are installed onto the sub assembled body of the valves. The attachment of these components creates an assembled valve.

**Project Background**

Our corporate sponsor, IMI-Hydronic Engineering, designs and manufactures industry-leading hydronic products and solutions that help create energy-saving and cost-efficient HVAC installations. This project focused on the assembly of common IMI-Hydronic valve products at their Dallas, TX factory. Depending on the valve order being fulfilled, various components requiring a range of torque values are installed onto the sub assembled body of the valves. The attachment of these components creates an assembled valve.

**Project Definition**

IMI-Hydronic currently uses battery powered impact drivers to construct their valve products and designated fixtures to hold them in place during the assembly process as depicted in the image below. The inefficiencies of this requires that every assembled valve be tested for leaks.

- Impact driver lacks torque specification making process dependent on “feel” of employee
- Battery source of impact driver does not offer consistent voltage resulting in inconsistent torque
- Employees use their hands for added valve security during assembly process which poses a safety risk under torque application
- Fixture does not offer any range of motion or articulation in order for employees to reach different sides of the valve body

**Project Goals**

1. Replace impact drivers with torque controlled tools to reduce operator decision and torque variance.
2. Design a new valve fixture apparatus to safely and securely hold valves during the assembly process.
3. Reduce assembly time and 100% product testing.
4. Address operator safety and ergonomic issues.

**Final Design**

**Torque Controlled Tool Recommendation**

For the purposes of this project, we were not directly responsible for the purchase of the torque controlled tools. Instead, we were tasked with building vendor relations and finding appropriate products that meet the torque and budget requirements for our client. Through contacting vendors and setting up demonstration meetings, we recommended the purchase of tools from two different vendors- Atlas Copco and Panasonic. In addition, all of these tools do not need reaction bars for full operation.

**Fixture Apparatus**

As a result of the transition to more accurate and powerful tools, a safer, more efficient fixture was necessary. Utilizing 3D scan technology and CAD molding, we were able to build a cavity to properly hold valves. Considering the difference in the force application between our two recommended tools, we designed two different fixture setups. In both cases, the valve can be placed into the cavity designed specifically for that model and the attached clamping mechanism can be activated by the user to firmly secure the valve.

**Panasonic Mechanical Pulse Tool**

- PAN EYFLA5PR (4 to 22 ft·lbf)
- PAN EYFLA6PR (12 to 39 ft·lbf)

**Atlas Copco ETV DC Tool System**

- ETV STR61-70-13 (10 to 58 ft·lbf)

**Low Torque Adjustable Fixture**

- Quick Release Bar Clamp
- Steel Quick-Release Pin
- Onyx 3D Printed Valve Cavity
- Onyx 3D Printed Adaptor
- Wilton Swiveling Workholding Base

**High Torque Stationary Fixture**

- Industrial C-Clamp
- Steel Quick-Release Pin
- Onyx 3D Printed Valve Cavity

A special thanks to Dr. Wooram Park, IMI-Hydronic and Jeffrey Livengood, John St. John with Southwestern PTS, Todd Rozelle with Atlas Copco, and Matt Vanderslice with CRC, as well as the entire UTDesign staff. For more information about this project or any other inquiries, please contact our team lead, Rohan Deo, at rsd140130@utdallas.edu