Robotic Connector Assembly

Overview
TE Connectivity challenged a team of Industrial Engineers to introduce a robotic connector assembly to automatically assemble various parts of a product family. The goal was to use the provided components, the current operator process video, and current work instructions to investigate if the automated process was optimal. There were three main constraints including budget, schedule, and costs. The team introduced a 3D-printed gripper and fixture design to evolve the automated process. The process design was developed with the final end-effector and fixture design. FMEA analysis was performed for all parts of the process as well as the final process design. The introduced prototype and process design aimed to decrease cycle time, increase savings, and reduce manual labor.

Objectives
The goal of this project is to introduce a robotic connector assembly. The team designed and prototyped an end-effector and fixture design in SolidWorks to then establish an efficient process design. The female and male parts were analysed for all possible orientations to ensure the assembly was successful.

Approach
- Understand and satisfy all customer needs – analyze scope against time constraint (Site-Visit)
- Analyze current manual process using given operator video and work instructions
- Evaluate all alternatives using Pugh Chart – quality, cost, functionality, durability, etc.
- Design SolidWorks model of end-effectors and fixtures
- 3D Print SolidWorks models (rapid prototyping)
- Test and Troubleshoot Samples (FMEA Analysis)
- Develop Process Design for all possible part orientations
- Morph Process Design, End-effector, Fixture to meet necessary constraints
- Standardize procedure to increase quality of process design
- Calculate cycle time, labor costs, rework and rejection ratio, safety analysis, idle time, up-time for new process
- Evolve Final Process Design, Gripper, Fixture
- Provide research on Vision System as Future Work Recommendation

Outcomes
The automated process design will help TE Connectivity standardize assembly process, reduce human labour, increase product quality thus increasing consumer confidence in their product.

- TE Connectivity will save $81,309.10 in one year and $1.58 million over an 8-year period
- Eliminate 90% of rework
- Reduce 100% of idle time
- Introduce a new CAD design of an end-effector and fixture