TE Connectivity - Faster Robotic Assembly

Overview
Previously TE Connectivity challenged a capstone team to develop an automated assembly process for a two pin electrical connector. The team successfully completed an assembly, however, their cycle time was far too slow due to an inefficient assembly path and poorly designed hardware. TE Connectivity challenged this year’s team to cut the previous cycle time in half in order to determine if an automated assembly is feasible and cost effective.

Objectives
The team’s main objective was to design an automated assembly with a cycle time under 16.25 seconds (half the time of the previous assembly). The team was also tasked with keeping hardware designs flexible, allowing TE Connectivity to utilize standard hardware for multiple assemblies.

Approach
- Customer needs, requirements, and concerns with past projects were obtained through initial sponsor meeting
- Initial concept generation and prototyping took place before the team gained robot access
- Initial designs were based on sponsor information, research, and previous projects
- CAD models were generated for multiple hardware components to verify clearances
- Stress analysis was performed on initial gripper concepts
- Initial prototypes were printed on Makerbot and pieces were test fit
- After gaining robot access, further testing and refinement of designs was done
- Multiple iterations of fixtures and grippers were produced, using printers of increasing quality after resolution and strength issues
- Assembly process was continuously improved to reduce time
- Repeatability study conducted with 50 test assemblies to determine points of failure
- Cost and production analysis conducted with suggested Epson Scara robot, 12 lines, and four operators per shift
- Two 10 hour shifts are to be run per day 365 days per year

Outcomes
- Achieved final assembly time of 13.5 seconds, well within the goal of 16.25 seconds
- Repeatability study allowed team to determine metal hardware is needed for highly successful assemblies
- With suggested assembly line, TE Connectivity saves ~$700,000 versus manual assembly over a six year period
- Automated process produces 1.46 million more parts per year than manual assembly with suggested assembly line

Final hardware and components set for assembly