Automated Adhesive Dispensing System for Klein Tools Rebecca Smith, Connor Teague, Zina Yonten Faculty Advisor: Dr. Sue Gong

Background

- Klein Tools is a major hand tools manufacturer in US focused on electrical and utility applications for professionals. One of Klein Tools products is called a fish rod that is used by professional electricians to pull wiring through walls, conduit, and plenums to route wire from one place to another.
- At Klein Tools, the application of glue to the fishing rod connectors is currently a manual process. An operator manually squeezes out drops into a connector before affixing the connector to the fiberglass rod.
- If too few drops are applied the connector fails the tensile strength requirements. If too much glue is applied the excess is pushed out of the connector, and this excess has to be removed using a solvent.





Automated Controlled User Interface

Programmable Logic Controller (PLC) Diagram

- Controls the movement and alignment of the conveyor belt, as well as the timing of the glue dispensing system.
- Controls System diagram on Allen Bradley Compactlogix PLC via Localized Ethernet.
- Ethernet: A system for connecting a number of computer systems to form a local area network, with protocols to control the passing of information.

Human Machine Interface (HMI)

- Operation Modes
- Part size Selection
- Production rate

Glue Dispensing System

- The purpose of the Glue Dispensing System is to accurately dispense enough adhesive into each connector to firmly hold each rod in place, but not so much that the adhesive leaks out of the connector when the rod is attached.
- The adhesive is stored in an airtight reservoir, and when the PLC gives a signal to the Glue Dispensing System, the adhesive is dispensed through a specialized nozzle.
- Each connector stops directly underneath the nozzle on its path around the conveyor belt.









- Connectors will fall into fixture blocks and be carried by the conveyor belt to the glue dispensing system
- 3200 Precision Move Conveyor by Dorner with dimensions of 1.17' x 6' x 3.01' mounted vertically on its side.
- Kevlar Belt with tolerance of +/- 0.007" between each slot.
- Fixture Guides prevent belt sag from weight of fixture blocks.
- Fixture Blocks are made from two components: base block which is aluminum and two different types of main blocks which are UHMW polyethylene.
- Fixture Blocks share centerline and constrained to belt
- Various diameters per block prevents tool change.













providing us with support.

A system of vibratory hoppers will be implemented to correctly orient each connector piece for gluing. It will operate as follows:

- orient the connector for gluing.
- fixture block.
- Decreased cycle time by 50%.
- Pays for itself in less than 2 years.
- Improves overall system efficiency.
- Saves on glue.
- Safe, consistent, and reliable.
- overall system.

- the customer.

Orientation System

• Large quantities of a single type of male connectors will be placed in one hopper. The female counterpart of those connectors will be placed in the second hopper. The hoppers will vibrate, feeding the connectors out one-by-one into an pneumatic gripper.

• The iVue camera will view the end of the connector, and, using previously saved settings, determine which way to

• The rotary table will then rotate up to 180 degrees to correctly orient the connector, and the gripper will release the part, allowing it to fall down a channel and into the waiting



Benefits



Future Work

• Continue testing and evaluating each component, as well as the functionality of the

• Troubleshoot the overall system as needed.

• Complete final documentation including an operating manual, maintenance manual, system diagrams, and final project report and presentation.

• Deliver the complete Automated Adhesive Dispensing System and documentation to

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