Automated Sealing Process for Bottom Door Rails

Sponsor: Andersen Corporation
Sponsor's General Mission: Andersen's vision is to lead the window and door industry by creating products and services that are different and better as measured by their customers.
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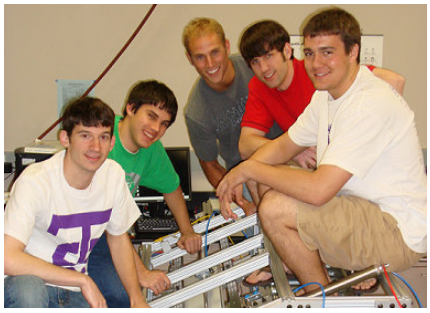
Senior Design Clinic I-II (ENGR 480-1) Project Description: Develop an automated process for applying a silicone based sealant to the bottom rail of a door frame that must meet or exceed the quality of the current application process.

Major Design Requirements:

1. Able to end seal different types of bottom rails
2. Able to handle different lengths of bottom rails
3. Able to end seal part quickly
4. Fit in allotted space on production line
5. Must be inline with manufacturing process
6. Be completed within budget
7. Must seal both ends of each part
8. Provide space for inspection



Senior Design Project Summary: This project required a detailed orientated, multifunctional team with the ability to be creative and learn new ways to solve problems to achieve the specifications required for the project. An inexpensive prototype design was synthesized from many conceptual designs and a significant amount of mechanical design work using SolidWorks. Other research areas included manufacturing control systems, automated adhesive application systems, pneumatic control, application nozzle design, and sensor usage. The system was built with equipment from the Andersen Windows Equipment Store and vendors, as well as substantial in-house fabrication. Each movement of the automated system was tested independently, integrated into the entire system, and rigorously tested for reliability and repeatability. The system combines mechanical components and programmable logic controller (PLC) which automates the process through use of strategically placed sensors. Successful completion of the project required the ability to adapt to a changing project scope, leadership and independence from group members along with direct and open minded communication.

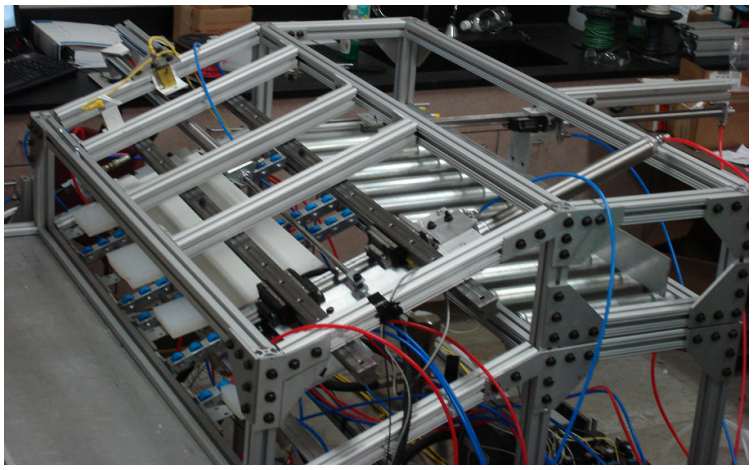


Figure 1

Shows systems flow of operations including part entry (top) and part exit (bottom).

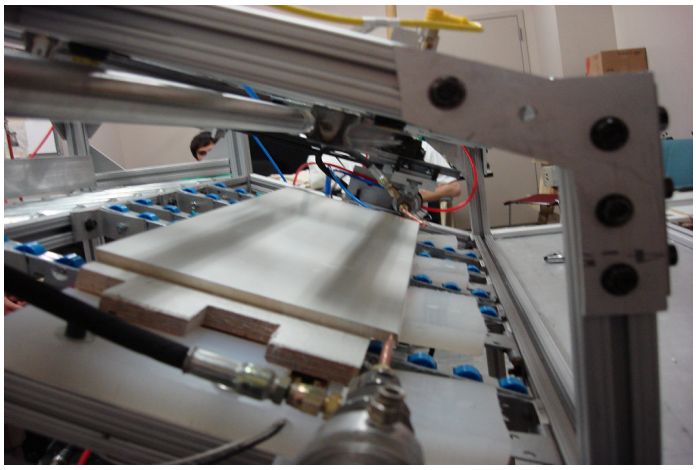


Figure 2

Shows how both nozzles are positioned relative to the angled bottom rail. The fixed position nozzle (bottom, center) and the adjustable nozzle (middle, center) are shown in the photograph.