

UNC Charlotte College of Engineering Senior Design Program

Senior Design Project Description

Company Name	<i>The Polymers Technology Center</i>	Date Submitted	<i>April 11, 2019</i>
Project Title	<i>Automation of Precision Weighing Station</i> PTC_FILL	Planned Starting Semester	<i>Fall, 2019</i>

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person.

Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical	3	Electrical	2
Computer		Systems	
Other ()			

Company and Project Overview:

The Polymer Center was founded in 1972 when the State of North Carolina funded plastics specialists in the Industrial Extension Service program at UNCC. The center, located at that time on the UNCC campus, expanded in 1994 when a joint venture was entered into with NCSU to form PEP (Polymers Extension Program). By 1999, PEP moved off of the UNCC campus and became today's Polymers Center of Excellence (PCE). In 2012, Polymers Technology Center (PTC) was added for small scale production for plastic injection molding and compounding plastics. Since then, the Polymers Center has continued to impact economic development through education, research and development, and trial production.

Polymers Technology Center supplies compounds to a variety of industries including automotive, textiles, home goods and recreation. Compounding is a process of melt blending plastics with other additives. The resulting polymer blend will provide a specific physical, thermal, electrical, etc. characteristic that is desired by the customer. Compounding is accomplished by feeding the resins and additives into an extruder. The material exits the extruder and is pelletized and packaged for shipment. From 500 pound orders to truck load orders, PTC has a broad capability for various compounding needs.

Sample compounding line:



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After products are compounded to customers, the resulting material must be packaged and shipped. This project will automate one of the packaging operations.

Project Requirements:

The picture below shows a compounded product being dispensed into a shipping container:



Here is a close up view of the compounded material going into the shipping box:

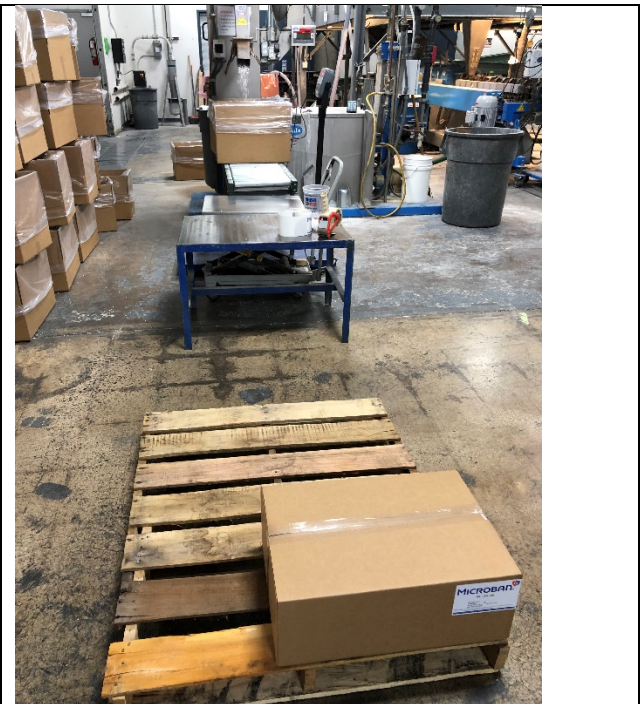


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Each box contains a precise amount of compound. This is measured using the weight of the box. An operator monitors the scale and moves the box out of the pellet stream once the scale indicates the weight has been achieved. The next box on the conveyer is then moved by the operator to the filling location. The filled box moves down the line to be sealed and loaded onto a pallet:



During the process, an operator is required to be present as the boxes are filled and manually moves each box down the line when it reaches the target weight. When the filled box is moved, an empty box is moved into place to start filling and the full box is re-weighed to verify proper contents, then sealed and placed on a shipping pallet.

The box fill rate is determined by the extruder/pelletizer process. As the rate is relatively slow, the operator must stand idle waiting for the box to fill up. The objective of this project is to reduce this operator idle time as much as possible so the operator can productively utilize his time in other areas of the factory.

The project team will automate the conveyer line so that once set up, the boxes will fill, upon reaching the proper weight, be moved down the line and an empty box be moved automatically into the filling position. The box weight will be monitored and displayed during the fill cycle. Due to the exacting nature of the required weight, a second operation is currently performed to weigh the filled box and small amounts of material added or subtracted to make the precise weight specification. It is desired to eliminate this step as well through the design of the automated station. Once a prescribed number of boxes are filled, the operator will return and seal each box and load it onto the pallet

Expected Deliverables/Results:

- Automated conveyer line with “X” box positions. X is to be determined with PTC based on a trade-off of conveyer footprint vs. time savings from the automation
- Full documentation including drawings, bills of materials and vendors
- User’s manual and maintenance procedure

Disposition of Deliverables at the End of the Project:

The system will be tested and verified at PTC. The system should be shown at Expo and Post Expo, delivered and re-installed at PCE.

List here any specific skills, requirements, knowledge needed or suggested (If none please state none):

- PTC is 2 miles from UNC Charlotte, travel to the site is required to the extent required by the project.