



Company Information

Company Name	<i>Polymer Center of Excellence</i>	Date Submitted	<i>05/12/2023</i>
Project Title	<i>Design of Heated System for Injected Liquids (PCE_HEAT)</i>	Planned Starting Semester	<i>Fall 2023</i>

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

Discipline	Number	Discipline	Number
Mechanical	3	Electrical	1
Computer	1	Systems	

Company and Project Overview:

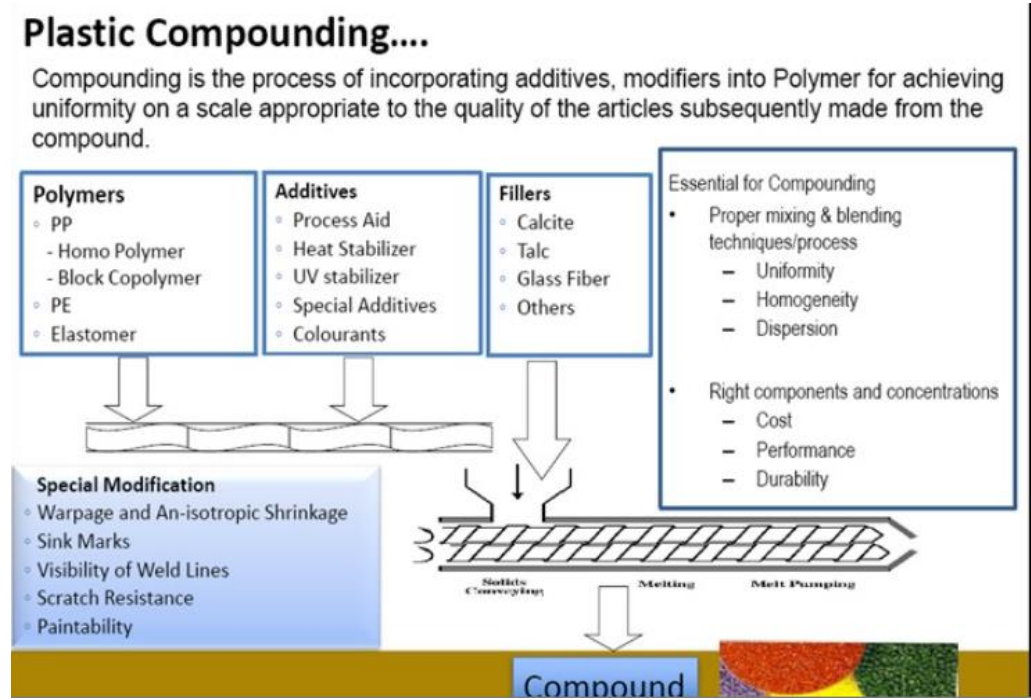
The Polymer Center was founded in 1972 when the State of North Carolina funded plastics specialists in the Industrial Extension Service program at UNCC. The center, located at that time on the UNCC campus, expanded in 1994 when a joint venture was entered into with NCSU to form PEP (Polymers Extension Program). By 1999, PEP moved off of the UNCC campus (to the close by University Research Park) 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.

This project is an improvement to the method PCE uses to inject liquids into their compounding line.

Project Requirements:

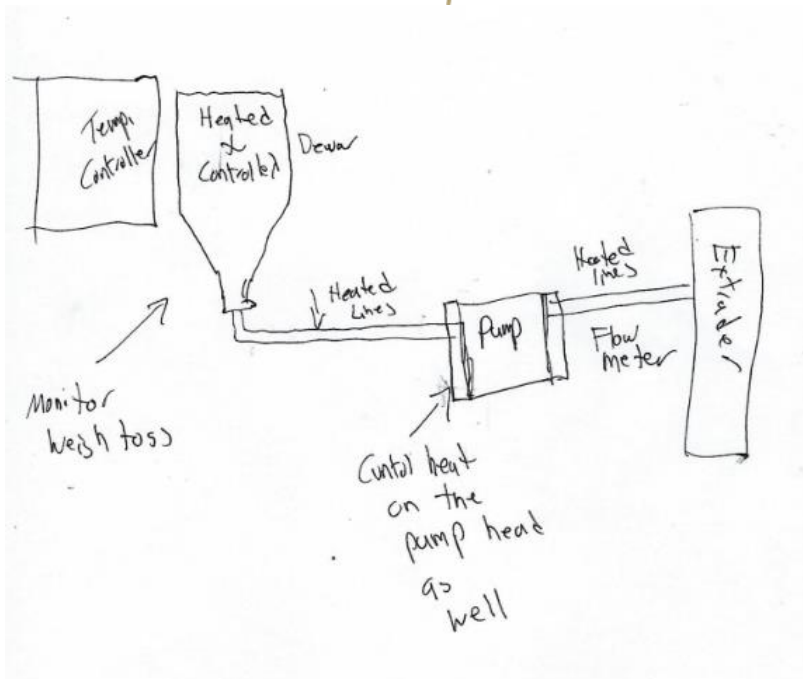
Plastics compounding is the process of taking basic, raw plastic material and customizing it with

various additives to achieve color, property, and performance requirements. This diagram shows the Compounding process in more detail:



Credit Tasnee, from 2nd GPCA Plastics Summit

As shown in the chart, additives are injected into the plastic being compounded. Some of these liquids need to be heated before they are injected. The current method is to heat the liquid in an oven and then pump it to the line. This method is inefficient and a new process and equipment is desired. The following is a sketch of the concept:



What we propose is a liquid injection system that will heat the liquid at a specified temperature and have the lines and pump head at the same temperature. We would also like to know the flow rate or weight loss as we inject it in the machine. The pump is an existing piece of equipment that is available. We would like to have both copper and stainless-steel lines and also we would like to be able to change out the size of the dewar/tank to $\frac{1}{2}$ liter up to 2 liters in size. The tank should be stainless steel.

Expected Deliverables/Results:

- Design of this system including all drawings, SW and BOM
- Prototype of the system tested and validated at the Polymer Center
- Operations and maintenance manual (paper and a video)

Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

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

- Heat Transfer
- CAD



- Controls
- Travel to the Polymer Center in Charlotte