INDUSTRIAL SOLUTIONS LABORATORY

Company Information

Company Name	*Carolina Signs and Wonders*	**Date Submitted**	*04/03/2024*
Project Title	*Design of a Tensioner Adjustment for a Graphics Plotter (CSW_TENSION)*	**Planned Starting Semester**	*Fall 2024*

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:

Carolina Signs and Wonders is a family owned and operated sign company located in Charlotte. The company has been in business for 4 years and provides signage for all types of industrial applications. The company has seen rapid growth since inception. Their products are made by a skilled team of craftspeople using graphics, printing, lighting, architectural shapes, electronics, fabrication and computer cutting (plotter, laser, router). Some examples of their work are shown below:

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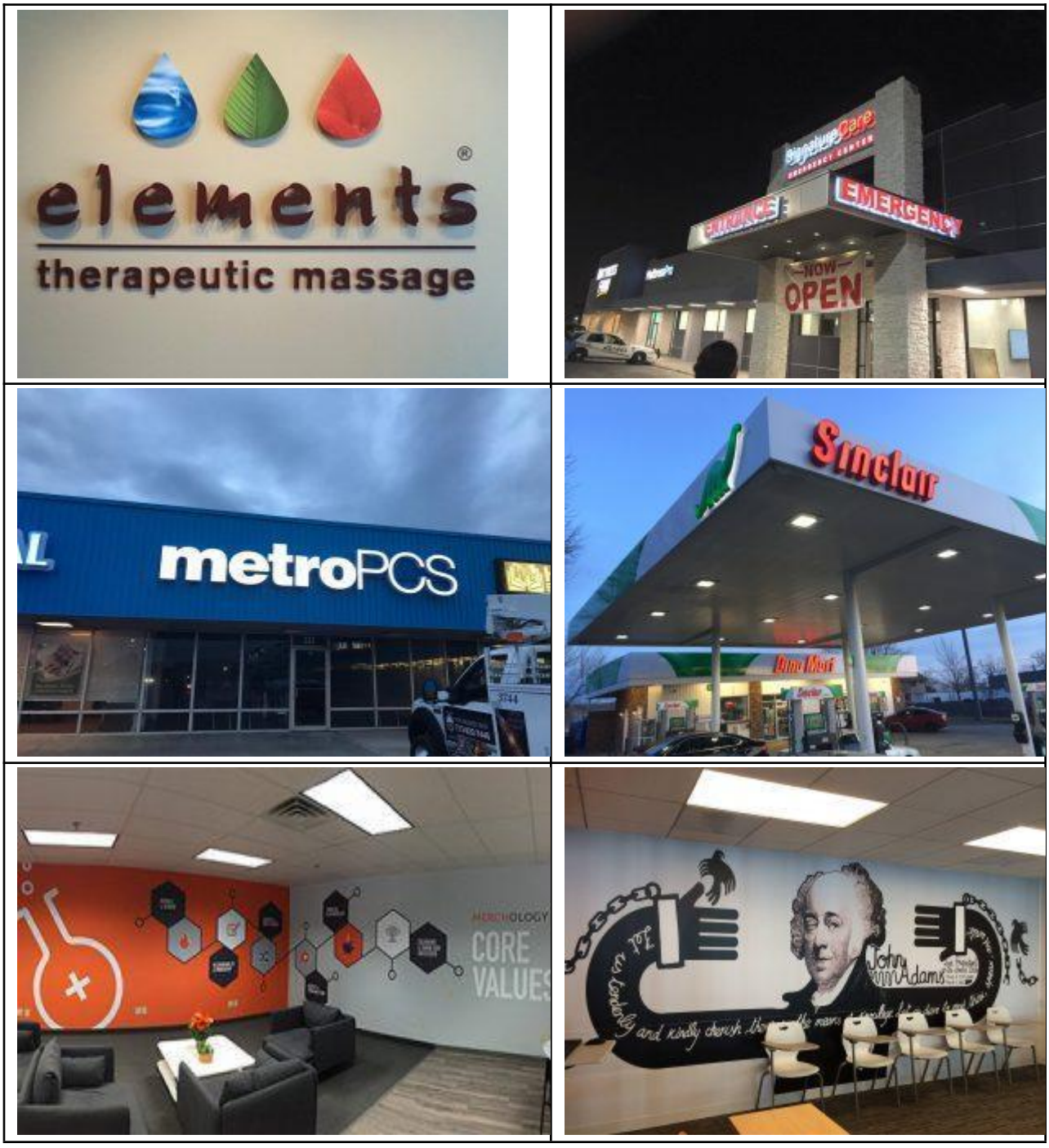

Vinyl graphics are a key part of the business and very large commercial graphics printers and plotters (also called cutters) are used for these types of products. This project will address a challenge they experience in the operation of this equipment.

INDUSTRIAL SOLUTIONS LABORATORY

NCMEP North Carolina Manufacturing Extension Partnership	This project is partially supported by a grant from the NC Manufacturing Extension partnership, an organization the helps to support business and job growth for NC companies. To learn more about the NC MEP, click on this link: https://www.ncmep.org/.

Project Requirements:

Large vinyl projects go through a series of machines – typically a large format printer, a laminator to provide a protective coating, and a high speed cutter to computer cut images, graphics, and outlines. These vinyl projects are made on machines that have very wide beds to handle the width of the role and they feed into the machine from a roll allowing very long projects to be made. Once a design is developed and programmed into the machines, large vinyl rolls are fed into the machine to print a graphic that is as long as required. Some of these prints can be hundreds of inches. See an example of the printer in the below photos:

Photo of the machine	Close-up photo of the vinyl roll being fed into the machine
	

During high speed cutting, the feeder will draw the vinyl sheet from the roll into the machine. It is critical that the tension on the roll is maintained so that no slippage occurs as the material is fed in and printed. In addition, there is a safety sensor on the back of the machine to sense if the role is exhausted. If the proper tension is not maintained, the material can slip, and the print is ruined. If not enough tension is provided, the plotter will stop, erroneously thinking there is no more vinyl available and the roll is empty. The vinyl rolls are very expensive, and by the time the project is in the cutting phase, a lot of work and material (printer and laminator) has gone into the project. By the time this happens the project is nearing completion. Significant material and time is lost when this happens and the process must be restarted. This wastes time and money, impacting the margins of the business and on scheduling. This also is a

significant source of frustration.

The purpose of this project will be to design an add on attachment to this machine that will maintain the tension throughout the cutting cycle so that no slippage (and the associated problems described above) will occur.

Expected Deliverables/Results:

- Device must be capable of being retrofitted onto the Carolina Signs plotter (graphtech 9000fc)
- Tensioner must accommodate various thicknesses of Vinyl, paper and styrene.
- Tensioner must adapt to changing force conditions as the vinyl roll is pulled through the machine and accommodate the longest runs.
- Operational training video provided
- Maintenance procedure provided
- Testing will be done on site

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):

- Machine design
- Ability to travel to company site as needed