



Company Information

Company Name	<i>Endress+Hauser/Carotek</i>	Date Submitted	<i>6/2/2021</i>
Project Title	<i>Design and Build of a Fluid Dynamics Lab Demonstration Apparatus (EH DEMO)</i>	Planned Starting Semester	<i>Fall 2021</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	4	Electrical	1
Computer		Systems	

Company and Project Overview:

CAROTEK[®]

The Power of Solutions

a SunSource Company

Carotek provides process equipment solutions for the industrial, commercial and municipal markets across five Southeastern states. Carotek is a leader in the providing their customers with innovative solutions that help reduce manufacturing costs, lower operating costs and increase productivity. Carotek represents many manufacturers in the process industry including. An example of one of our customers is Campbell's Soup. Check out the video below:



UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE of ENGINEERING
Industrial Solutions Laboratory

Kelly Terwilliger - Campbell Soup



Kelly Terwilliger
Campbell's Soup



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See examples and links below of our product offerings.



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[Process Skids](#)



[Control Panels & Systems](#)



[Pumps](#)



[IIoT - Networks & Wireless](#)



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[Instrumentation](#)



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Endress+Hauser

People for Process Automation

One of Carotek's primary manufacturers, Endress+Hauser USA, will play a supporting role in this project. Endress+Hauser is a global leader in measurement instrumentation. Their products provide process solutions in flow, level, pressure, analytics, temperature, and digital communications.

Both companies have recently been collaborating around workforce development initiatives and are investigating ways of introducing the process industry and technology to young talent. One way that they plan to engage is through partnerships and programs with colleges and universities. Specifically, they would like to provide training units to engineering and engineering technology programs.

The project will design and produce laboratory demonstration equipment to reinforce concepts taught in engineering courses in the UNC Charlotte Mechanical Engineering department.

Project Requirements:

Project Objectives:

- Provide a general awareness, overview, and understanding of the process industry and instrumentation to college engineering students
- Provide process industry hands-on experiences and lessons for university faculty and students in fluid dynamics/mechanics, instrumentation, and hydrology focused engineering courses
- Collaborate with and serve clients from various stakeholder groups (faculty, representative, manufacturer) to meet the needs of the customer and end-user

The equipment will be used to reinforce pressure measurement, temperature measurement, flow measurement, flow of fluids, Bernoulli's equation, and energy loss concepts.

The whole system is to be on a mobile platform that is able to fit through standard doorway.

The system will include a circulation pump and fluid tank housed in a metal frame. Any electrical devices should be sized to utilize a 110V outlet.

The system will have the ability to change flow configuration through the system of pipes by altering valve alignment.

Multiple pressure, flow, and temperature sensors will be placed throughout the system of pipes.

The Station should be capable of the following:

- Demonstrate fluid energy losses through a system that includes various fittings, valves, and three more pipe sizes
- Display flows, velocities, pressures at various points in the systems with digital readouts
- Provide flow path alternatives to demonstrate the effect of three or more pipe sizes on head/energy loss
- Include a fluid motor or similar device that removes energy from the system
- Pipe system should be constructed of pipe with sizes ranging from ½” to 2” with shutoff valves to control flow to each pipe size within the system
- The system should be flexible enough to connect to other lab trainer systems (past or future)

Note: all gauges/measurement devices must be capable of measuring the properties of the system at a scale small enough to ensure calculable difference.

Expected Deliverables/Results:

- Lab apparatus as specified above
- User manual
- Video User guide
- Lab exercises that can be utilized by instructors to both learn and teach the methods of the training unit. These exercises can be in multiple formats (written, video, hybrid, and should include accompanying tools such as slide decks, etc.)
- A final report with future action necessary to implement system, as well as success/learnings throughout project that would be beneficial to future instructors

Disposition of Deliverables at the End of the Project:

Hardware/curriculum developed will be donated to the UNC Charlotte Engineering Programs. However, Carotek would like to be involved in future trainer design projects, as well as future opportunities for student interactions through guest speaking, company visits, etc.

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

- Interest in fluid dynamics and instrumentation
- Applicable courses:
 - MEGR 3114 - Fluid Mechanics
 - MEGR 3171L - Instrumentation Laboratory
 - MEGR 3171 - Introduction to Measurements and Instrumentation



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- MEGR 3216 - Thermal/Fluid Design
- MEGR 3237 - Introduction to Control Systems
- ECGR 2155 - Instrumentation and Networks Laboratory