



### Company Information

<b>Company Name</b>	<i>HUBER Technology, Inc.</i>	<b>Date Submitted</b>	<i>04/05/2023</i>
<b>Project Title</b>	<i>Improvements to Recirculating Hydraulic Testing Apparatus for Mechanical Water Treatment Equipment (HUBER_WATER2)</i>	<b>Planned Starting Semester</b>	<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.

<b>Discipline</b>	<b>Number</b>	<b>Discipline</b>	<b>Number</b>
Mechanical	4	Electrical	2
Computer		Systems	

#### Company and Project Overview:

HUBER Technology, Inc. is a leader in the municipal and industrial wastewater equipment markets, with over 50,000 pieces of wastewater treatment equipment installed worldwide, and an order intake of over 150 million Euro in 2021. HUBER was officially founded in 1786, with the company rebranding under the HUBER name in 1872 through the continued growth and direction of Johann Huber. Celebrating our 150<sup>th</sup> anniversary this year, the Huber Company is still a family-owned business headquartered in Berching, Germany, manufacturing stainless steel equipment for water treatment facilities around the world. Huber Germany is based in a 400,000 sq. ft. manufacturing facility that produces only the highest quality stainless steel, with state-of-the-art cutting, bending, and surface treatment equipment. Huber US was founded in 1999 due to significant company growth in the US market, and now stands as the largest fully owned subsidiary in the Huber Group Worldwide, with yearly order intake exceeding \$50 million. In early 2020, Huber US finalized a 70,000 sq. ft. manufacturing facility in Denver, NC, and stands to expand to 195,000 sq. ft. by the end of 2023. By this point, Huber US will produce their entire product portfolio in their Denver, NC factory. Huber's goal has always been to transform waste



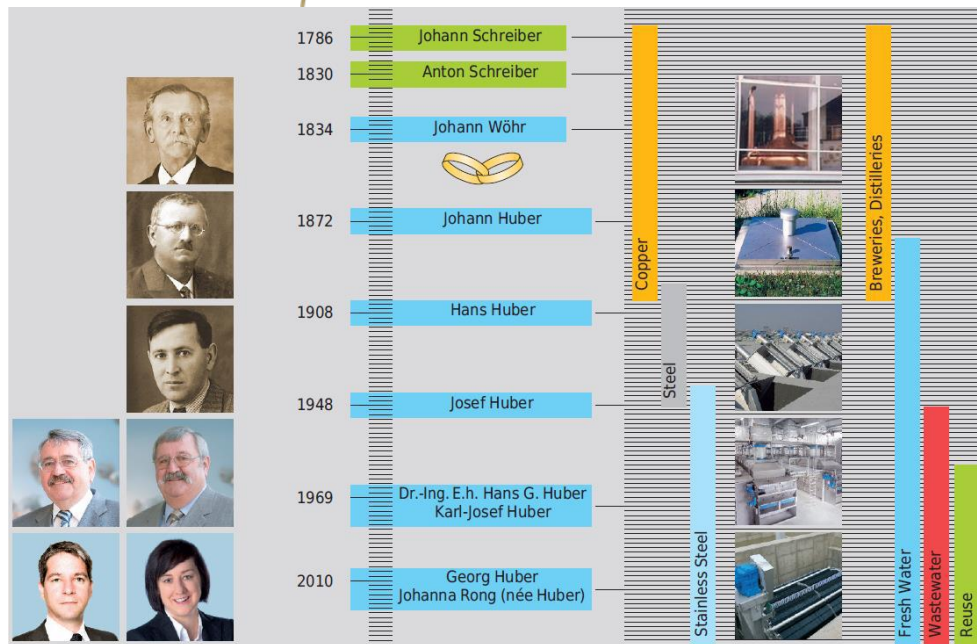
into resource and takes pride in their role in treating water for beneficial reuse.

Huber US currently employs around 100 full-time staff members in their Denver, NC factory, including engineering, sales, aftermarket, manufacturing, and service personnel. Thanks to continued growth, Huber expects this number to increase significantly over the coming years, as Huber looks to expand their reach into new and evolving market segments within the broader water treatment industry. Some product examples:






## INDUSTRIAL SOLUTIONS LABORATORY



*A family owned company in the HUBER name for 150 years*

US based Research and Development (R&D) is becoming more of a factor as the US market is vastly different than the rest of the world. As Huber US continues to innovate for the US specific market, the demand for US based testing will no longer be an option, but a requirement. This project aims to improve a UNCC designed Recirculating Hydraulic Test Channel (HUBER\_WATER – Phase 1, Fall 2022) that will assist Huber in their growth as a company, and as a North Carolina based manufacturer.

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

This is a Phase II project directly following Phase I completed by an excellent team of future



engineers from the 2022/2023 calendar year. The original project consisted of the complete design and manufacturing of a versatile, closed circuit circulating water channel used for experiments in fluid dynamics and debris loading on water and wastewater mechanical screens. This Phase 2 project will allow the testing of multiple types of water and wastewater screens in a controlled environment to both improve upon designs, design new functionality, and demonstrate performance to potential customers.

The 2022/2023 project experienced multiple lead time setbacks from the 20HP Flygt pump (moving 6400 gpm clean water), multiple electrical and control panel components and stainless-steel procurement and fabrication delays. The Phase II Fall 2023 team is challenged to take a completed or nearly completed apparatus and improve upon its design with several different options listed below. Current overall footprint of apparatus is roughly 23ft long x 13ft wide – HUBER prefers to keep current footprint limitations but may accommodate additional length if required and the new design ideas are attractive enough to justify expansion. The Apparatus currently is composed of five main components that will be the basis of the Phase II design: 24” HPDE piping, 20HP column propeller pump, two nozzles and one open channel testing section with tempered glass viewing panels. The Phase II team is challenged with utilizing all of these components and making necessary corrections/improvements to achieve a more user-friendly and accurate testing apparatus to provide a reliable testing apparatus for fluid dynamic experiments.

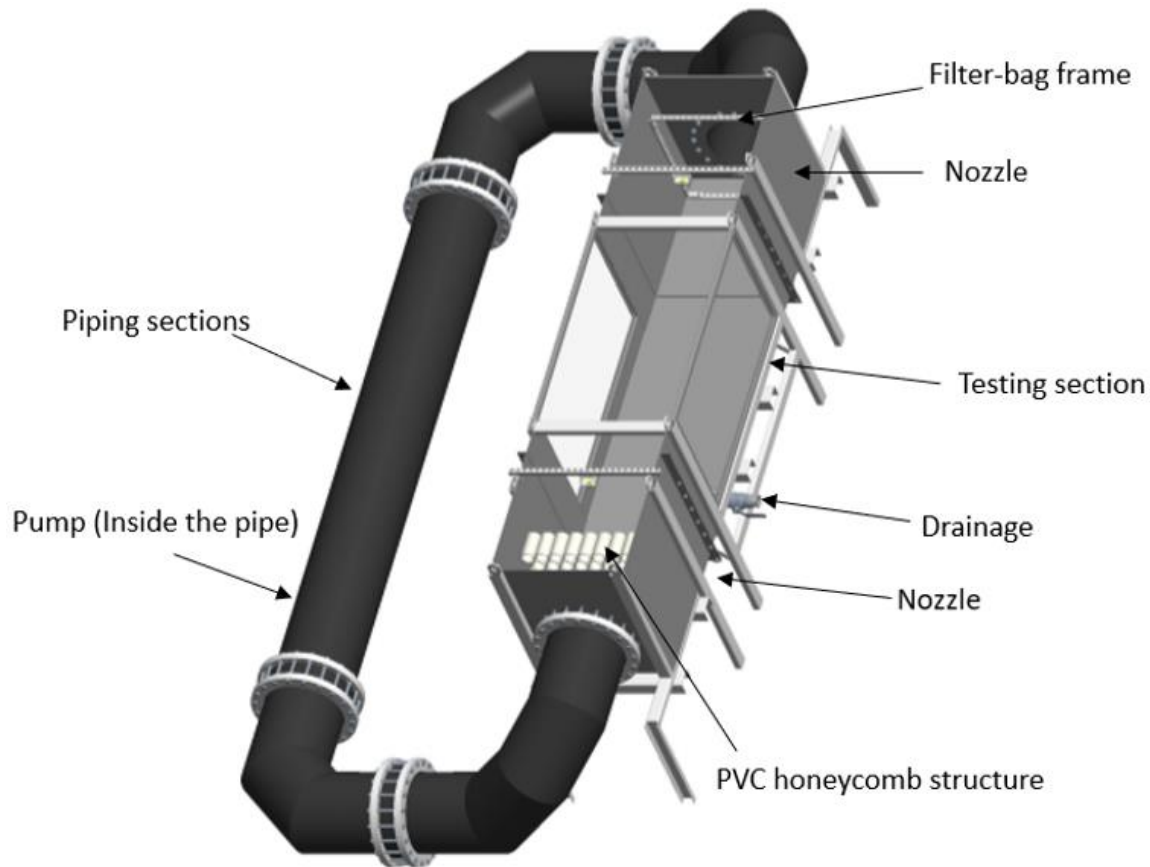
Possible improvements identified by the Phase I UNCC Design Team (2022/2023) and HUBER Technology, Inc:

- Mechanical Design Improvement Possibilities:
  - Improve pipe flange design, fabricated bolts
  - Design new fixed piping support system
  - Design and implement a more user-friendly adjustable footing method
  - Design and test a baffle system for thinner screen products
- Fluid Design Improvement Possibilities:
  - Further improve flow characteristics/reduce channel turbulence by:
    - Designing an open channel expansion module for longer fluid flow length
    - Improving/redesigning nozzle “PVC honeycomb structure” design
    - Designing/testing various flow correction alternatives (vanes, etc. to redirect flow toward the edges of the channel)
- Electrical/Instrumentation Improvement Possibilities:
  - Add pump controls to HMI
  - Add remote alarms to PLC (text notifications for leakage)
  - Develop a laser optics system for velocity profiling
  - Incorporate a system for adding tracer particles into flow



## INDUSTRIAL SOLUTIONS LABORATORY

- Install a pitot tube array for accurate readings of flow distribution
- Improve the HMI design



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### **Expected Deliverables/Results:**

- Multiple flow analysis to show “laminar flow” in testing section with different options, ranging from practical, low-cost to best possible solution for our existing apparatus
- Improved channel design with CAD/3D models
- Manufacturing drawings in both .pdf & .dxf
- Detailed components list (BOM)
- Improved control panel drawing
- Revised O&M manual – anticipated design conditions, pump care, lifting instructions, etc.
- Cost estimate
- Design alternatives with cost estimates for evaluation

### **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):**

- ANSYS analysis
- FEA analysis
- Fluid mechanics
- Mechanical design
- CREO/Solidworks
- CAD
- Instrumentation design with a PLC/HMI (ELET 2241 as a pre or co-req or equivalent experience)