



UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE of ENGINEERING

Senior Design Project Description

Company Name	<i>Charlotte Pipe</i>	Date Submitted	<i>08/07/2018</i>
Project Title	<i>Design of an Automated System to Detect Leaks during a Pneumatic Test (CP_LEAK)</i>	Planned Starting Semester	<i>Spring 2019</i>

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	1	Systems	
Other ()			

Company and Project Overview:

For over a century Charlotte Pipe and Foundry Company has been manufacturing pipe and fittings exclusively in the USA, employing 1,400 loyal, hard-working Americans. Today they manufacture the industry's broadest range of standard and specialty DWV products, including cast iron and plastic pipe and fittings.

Charlotte Pipe is headquartered in Charlotte, NC, and has seven plant locations across the United States.



Cast Iron Foundry – Charlotte, NC

Charlotte Pipe produce a full line of service and extra-heavy cast iron soil pipe and fittings from 2” to 15,” and double-hub pipe from 2” to 6”. We also manufacture a full line of hubless pipe and fittings, from 1 ½” to 15”. In addition to these standard products, the casting facility does custom

castings for a wide variety of customer products. This project will focus on the automation of a pressure test operation in the pipe production area.



Project Requirements:

After the iron pipe is cast and painted, the pipe is tested to ensure that no leaks are present from pinholes, cracks or voids from the casting operation. Currently, this is a semi-automated work station where the pipe enters the work cell and it is pressure tested pneumatically while immersed in a water tank. An operator looks for air bubbles which would indicate a leak. Pipes with leaks are directed into a reject bin to be re-melted. The pipe segments are 10 feet long. The water tank is slightly longer than the pipe. Two pipe segments are tested at a time. A stream of air bubbles that indicates a leak could appear along any part of the pipe length.

A pair of pipes is tested roughly every 12 seconds with approximately 7 seconds submerged. Once submerged, the pressure is gradually raised in the pipe to the prescribed pressure level. The pipe is held at the max pressure for a few seconds. If the operator sees bubbles during the test, he then activates controls to move both of the pipes under test to the reject bin.

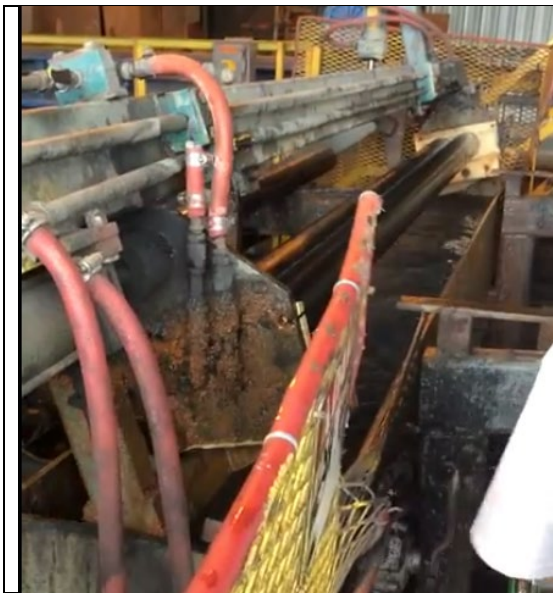


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Pipe entering the test station

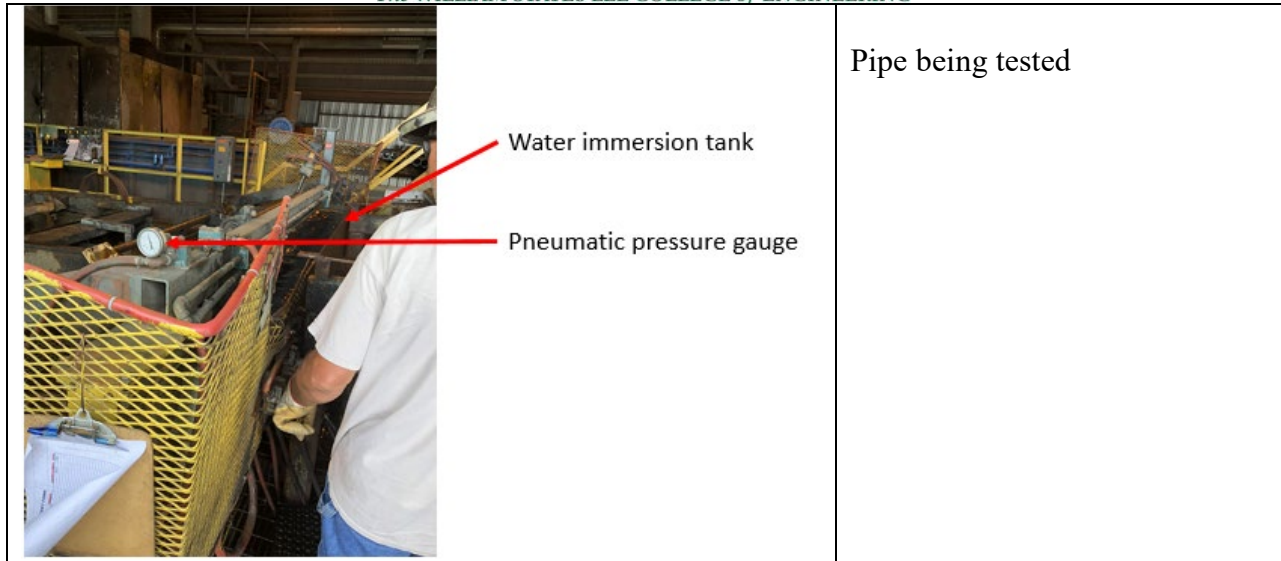


Pipe loaded into pneumatic tester, getting ready to be lowered into water tank



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Due to the difficulty that a human operator would have detecting leaks across the entire length of the water tank on an extended shift basis, Charlotte Pipe is interested to examine the feasibility of automating the operation.

This project would have the scope to design and build a proof of concept prototype that can be added to this workstation that would detect leaks in the pipe under test. This prototype can be a stand-alone system and does not have to be integrated into the current machinery. The current operation cannot be interrupted, so a test apparatus will be constructed as part of the project to simulate the production test and demonstrate the leak detection system that is prototyped.

Expected Deliverables/Results:

- Prototype/proof of concept that can be added on to the current station to detect pipe that leaks
- Cycle time for test to be no longer than the current system.
- Test tank that is used to demonstrate prototype

Disposition of Deliverables at the End of the Project:

Provide the system to the supporter at the conclusion of the Expo

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

- Interest in optical recognition systems
- Design reviews to be held at Charlotte Pipe's Charlotte location.