Vortex Shedding Flowmeter
Team FlowTec
Joint ME and ECE

SAN DIEGO STATE UNIVERSITY

FLUIDRA

FLOWTEC

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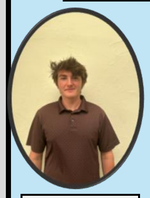

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Fluidra: The largest leading manufacturer of commercial and residential pool and spa equipment. They develop and distribute a diverse product offering that covers every aspect of the industry striving to deliver the perfect pool experience.

Acknowledgements

The team would like to thank Dr. Shaffar and Professor Dorr for arranging and advising the project. In addition, the team would like to thank Mark Smith and everyone else at Fluidra who assisted and saw the project through.

Project Overview

Vortex Shedding Flowmeter: A device that utilizes a bluff body inside direct flow to obstruct the flow and create vortices. These vortices cause pressure drops and can be used to calculate the flowrate.

Project Objective: Fluidra tasked the team to design, optimize, and prototype a single hole vortex shedding flowmeter. The prototype must maintain a 5% accuracy across a flow range of 10-100 gpm, fit in a ¾” hole in a 2” schedule 40 PVC pipe and withstand up to 40 psi of internal pipe pressure. Sensors must be paired with a signal processing algorithm that can operate in the presence of a 60Hz pump equipment with the output signal being transmitted to an RS485 serial.

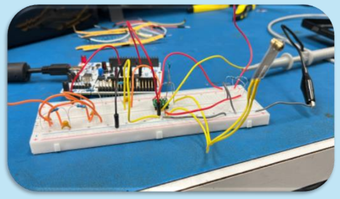
Final Design: The team settled on a saddle clamp design with removable bluff body shapes to generate vortices. A piezoelectric sensor with waterproof coating is then used to record the vortices as a frequency. The reading is then sent through an autocorrelation algorithm to determine the flowrate.

System Integration

PCB Board

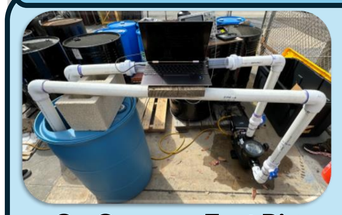
LCD Screen

Piezoelectric Sensor



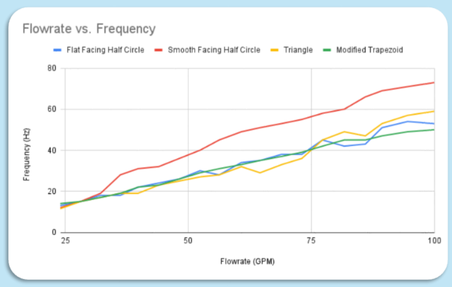
Initial Breadboard Circuit

Testing and Results



On Campus Test Rig

Omega Paddle Flowmeter

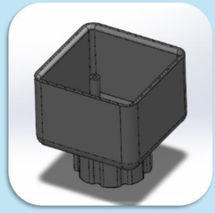


The graph represents the calibrated flowrate from the Omega Flowmeter versus the recorded frequencies from the piezoelectric sensor and the autocorrelation algorithm. With the frequencies of vortices a K-factor can be found for each bluff body and can be used to calculate the actual flowrate.

Fluidra Facility Test Rig

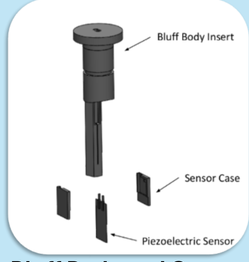
Initial Disturbance Test

Flowmeter Design

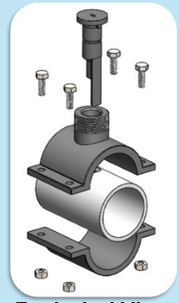


Electronic Housing

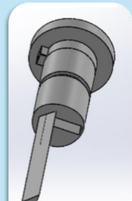
In-line Assembled View



Bluff Body and Sensor Housing



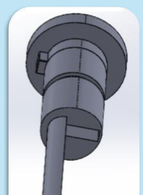
Exploded View



Triangle Bluff

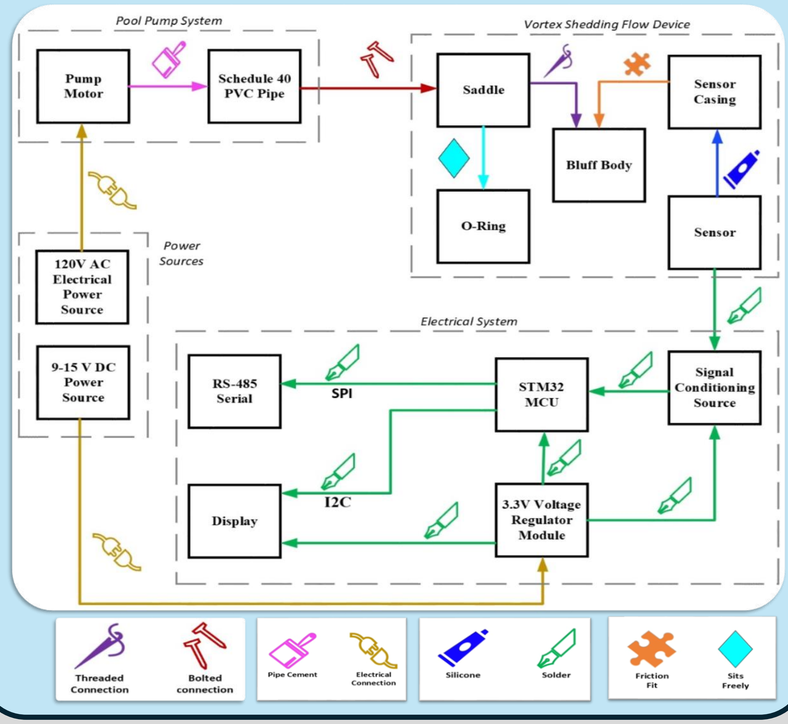
Modified Trapezoid Bluff

Flat Facing Half Circle Bluff



Smooth Facing Half Circle Bluff

System Description Diagram



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