Assembly of a Lab Scale Anerobic Digestor

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Aim of the Project

The Aim of the project is to assemble the lab scale anaerobic digestor (AD) for Shannon ABC.

Objectives

- Research methods of pumping viscous materials in lab scale devices, and procedures used to analyze gas exhaust.
- Complete design optimization and working drawings for Anaerobic Digestor.
- Complete final assembly of the lab scale Anaerobic Digestor, including manufacturing remaining parts.
- Perform experimental testing to verify the capability of the AD.
- Create a technical specification document for the AD.

Background

- The Anaerobic Digestor is a machine that produces natural methane gas using organic matter such as slurry and leaves.
- This Anaerobic Digestor is a Lab scale version using 4 tanks 2 inner and 2 outer tanks. The Inner and outer tanks are insulated with spray foam.
- A screw pump powers the aerobic digestor by transferring organic matter from Tank 1 to Tank 2 to allow for more organic matter to be inserted in.
- Multiple pumps were researched to allow for the ideal pump selection for this process.
- Safety precautions were considered in the research to ensure that the health and safety of the individual operating the system are safe and that the assembly will not harm the environment in anyway.

Design

Shannon ABC set specific constraints that needed to be considered when designing this project.

Components	Constraints
Tanks Capacity	5 Liters
Tanks Material	304 Stainless Steel
Temperature	25 – 40 0C
Motor Speed	20 – 50 RPM

The design was recently changed to allow for improvement with the sealing of the AD tanks. The Lid was increased in size to allow for a larger lip, this would help with sealing the tanks properly. SolidWorks was used as the main application to design the assembly of the AD. Research of various pumps was performed to allow for the best selection of pumps for this project considering these constraints.

Constraints
Slow Flow rate of 0.5ml/h
Positive Displacement Pump
Support Viscous Material
Cost Effective

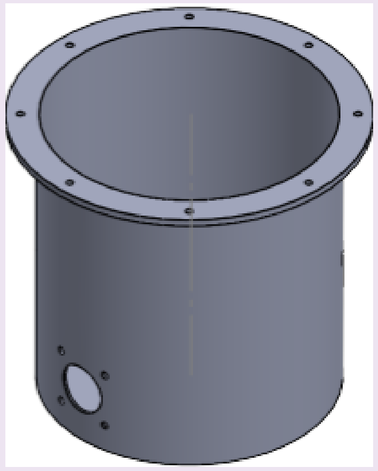

Photo of New Cylinder Tanks

Manufacturing & Assembly

A major number of parts were machines in the workshop. These components consisted of Bearing Holder Plates, Motor Legs and Shafts. The other components such as the Cylinder Thread Fittings and the Bearing holder, were CNC due to the shape and roundness needed for this project. Solid Cam was used as the method to program the path for the CNC machine.

Photo of Gear Pump

The machines used to manufacture the workshop parts were Lathe and milling machine. The tanks were manufactured by a local company willing to take on the design. The tanks were rolled from Sheetmetal and welded and polished for a more appealing look. The Lid and existing holes on each component was lasered by the company's machine.

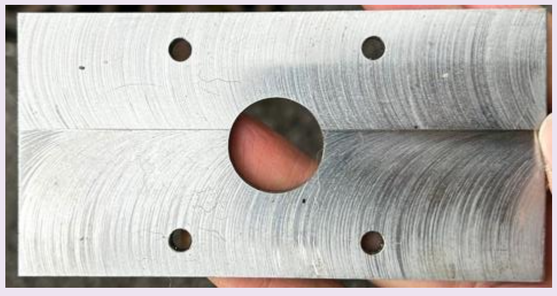

Photo of new machined parts

Conclusion

- Research of the pumps was crucial to allow the project to function properly without any problems.
- The production of the tanks has been confirmed and we wait for the delivery of them.
- A pump was successfully selected after an intense amount of research.
- All the workshop manufacturing parts are complete.
- CNC parts are being currently made.
- All the components have been ordered and will be ready for assembly.

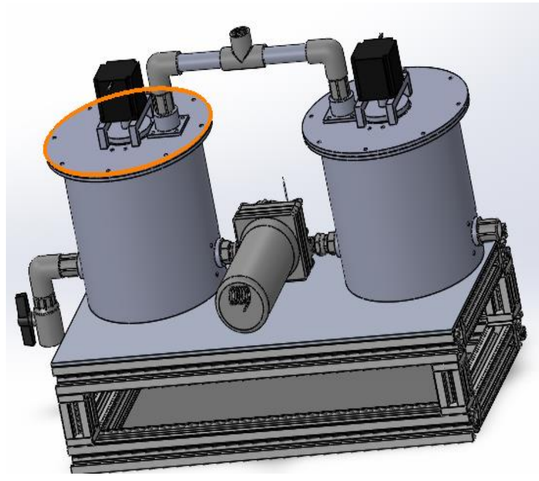

Photo of Final SolidWorks Assembly

Photo of shafts that were manufactured