Design, Test & Simulation of An Automated Pump for a Sand Battery

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Aim of the Project

The Aim of the project is to Research, Design & Simulation of an automated water pump that will pump water through a sand battery. This design requires a Mitsubishi FX5U for complete control of the input and output components required in the circuit.

Background

Sand Battery Research

The sand battery requires a flow of water that is heated in a piping system that is placed in the sand. The heat is collected in the sand and is used over a period. A water pump is an economical system which I designed for the sand battery. The sand battery is an extremely efficient way to store energy and an automated water pump would be suitable for this project. The process allows the system to be started through a start button.

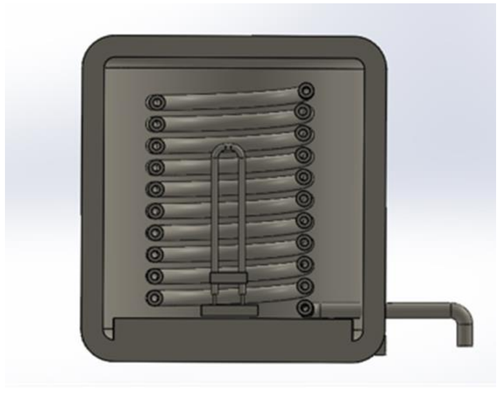

Photo of sand battery design concept

The automated water pump system that is used in a sand battery will allow for manual control of the water that flows through the piping system in the sand battery. An automated version of this allows for complete control. The Mitsubishi FX5U allows the components to be fully automated.

The Concept

The concept design developed as the design research was carried out the concept is an electrical box attached to the side of the sand battery which will allow for an automated process. The Mitsubishi FX5U is used in the process this allows for many inputs and outputs to be modified.

- Research
- Circuit Design
- Component Selection
- Gx-Works3 Ladder Program

Photo of a Mitsubishi FX5U PLC

The ladder program is generated on GX-Works3. The start/stop button are used in the circuit along with a E-Stop in the event of an emergency the pump can be stopped.

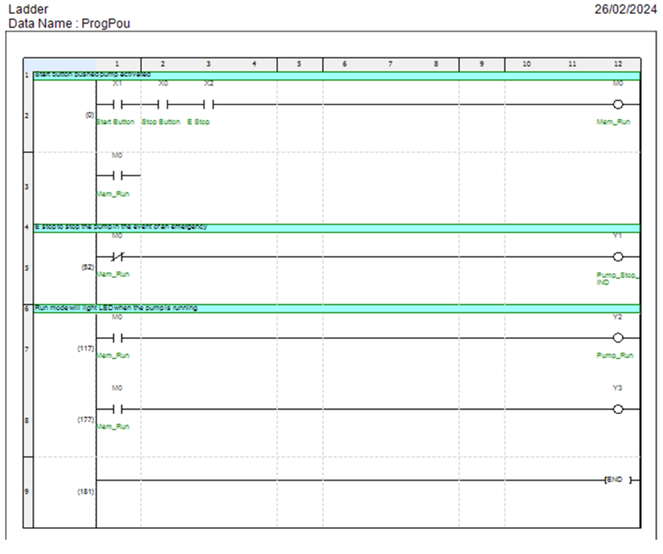

Photo of the Gx-Works3 Code

Final Design

The final design shown below in figure 4 is a rendered image of the electrical component box designed on SolidWorks. It is fully assembled on SolidWorks.

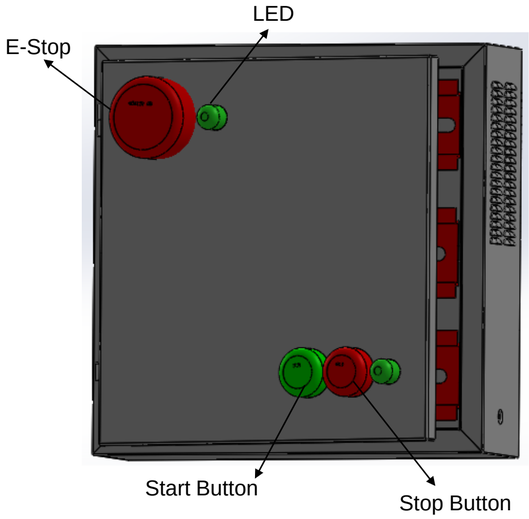

Photo of SolidWorks Electrical Box

Testing

Testing of the circuit was completed for the inputs and outputs allowed for any errors in the code to be established in the early phase of the design.

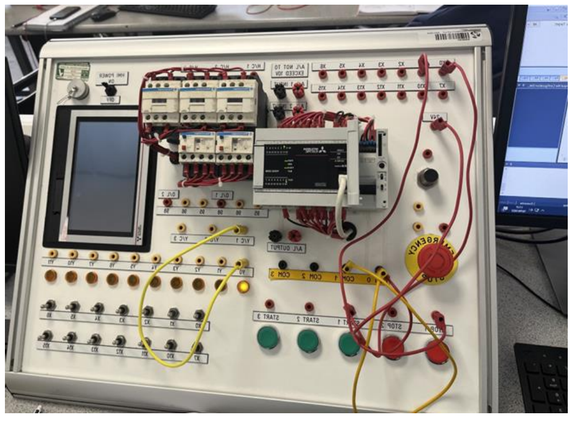

Photo of PLC Unit

Simulation

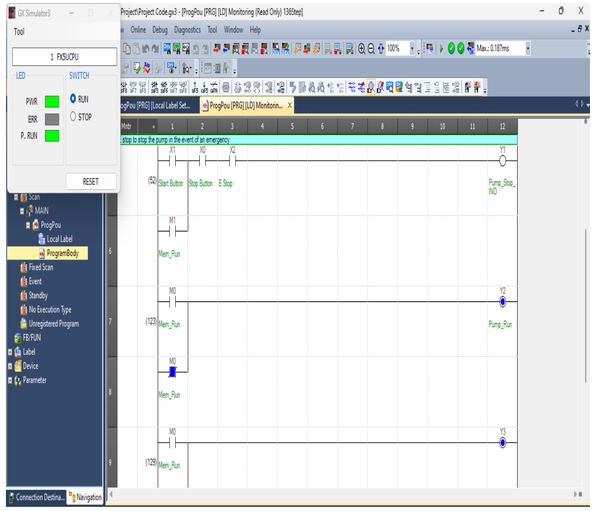

Photo of Gx-Works Simulation

Conclusion

The research carried out found that the automated flow of water through the sand battery would reduce downtime and provide a manual control system to start/stop the process of the flow of water.
The design met the aims of the automated pump for a sand battery.

References

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Acknowledgements

I would like to acknowledge my supervisor Dr.Patrick Curran for advice and commitment.