Semiu Temidayo Fasasi- MS Mechanical Engineering

Methane is a prominent greenhouse gas proven to cause more global warming than CO2. As an advocate of the Sustainable Development Goal of clean and affordable energy, The Colorado State University's Methane Emission Technology Evaluation Centre aims to mitigate methane emission

in various ways, one of which includes my current project on developing a groundbreaking mobile emission device (control release rig) intended to perform controlled testing and create the basis of the adoption of natural gas leak detection in oil and gas facilities. The projects involve the interaction between the User (laptop), broker (MQQT), and the Modbus. The broker serves as the intermediary in the system and transfers data from the Modbus to the User and vice versa. In addition, the system involves measuring and generating emission metrics, flow rates, pressures, mass flow readings, and other associated readings stored on the Raspberry Pi (RPi) and Micro SD card within the comms box to validate the efficiency of the leak detection and quantification solution providers' technologies that measure continuous monitoring of methane emission or pipeline quality natural gas. The solar-powered control release rig (CRR) combines IOT, State-of-the-art edge computing, reliable private networking, and cloud-based analytics to create a practical data set.

The measuring involves the supply of gas (methane or other natural gas) to the inlet and metered through critical orifices. The fluid components upstream of the orifices are rated up to 3600 psig, while the mass flow meter is rated at 100 psig, protected by a pressure relief valve to open at 60 psig. Thus, the chocked flow measured by a mass flow meter is delivered to the desired release point through flexible tubing attached to the outlet, which should always be connected to an open-ended line venting to the atmosphere. The METEC solar-powered CRR device has five outlet points, which means it can measure five emission points simultaneously. Furthermore, the project also involves the use of a logger and the development of a Dash App website, which serves as the interface to control and monitor the behavior of the gas and the CRR. The logger written in SQL alchemy collects data and store it in the database at every time interval (5 minutes) Hence, the control release rig intends to aid the testing capabilities of the emission detection system by

creating a constant emission rate to validate leak detection and quantification solution prociders technologies.

RESEARCH PROGRESS

My research is currently at the validation stage. The control release rig and the website have been completely developed. In the development of the CRR, we have a three-compartment unit, with the first being the power compartment, which comprises a 24V battery, charge controller, and distribution board. In contrast, the second compartment comprises the Mass flow meter, which serves as the inlet of the gas and measures the desired mass flow of intake gases. The third compartment comprises the RPi, router, lab jack, and power controller. The solar-powered CRR also comprises the Valve lines (valve, solenoid, and limit switch), which either open or close the valves of the control release rig. Additionally, a Dash App website written in Python that monitors the gas's behavior and controls the CRR's features has been developed, as shown in Figure 2.

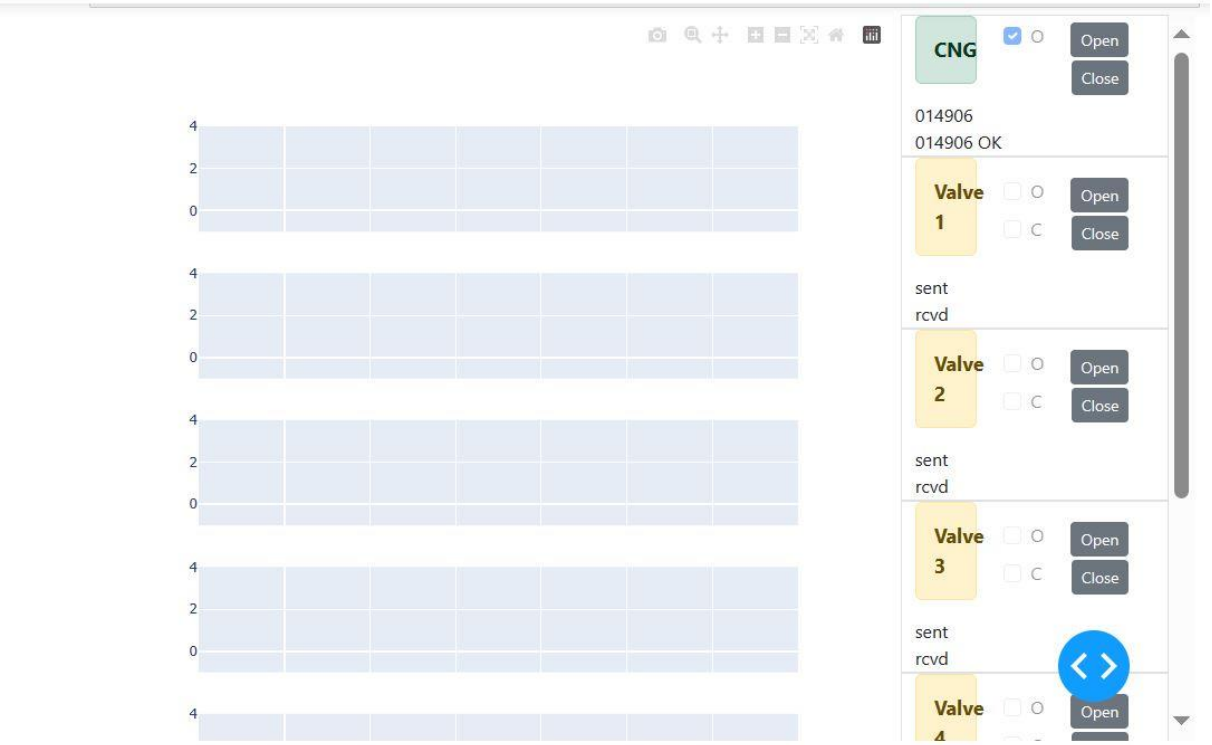

Figure2: Dash App interface

Research Plans

1. Validate the Dash App with the CRR behavior and fix code if there is any discrepancy.
2. Determine area of improvement in the system.
3. Validate the control release rig data with the data from solution provider.

Publication

No publication yet

References

No citation