## Team 35 – Endress+Hauser

# Weather Simulator

Team: Blaz Montoya, Cohlten Green, Alexzander Gomolinski, & Jakob Bultman
Mentor: Ralph Munguia

PURDUE UNIVERSITY
Polytechnic Institute

## OBJECTIVE

The goal of this project was to create a portable, interactive weather simulator designed as an educational tool for the Endress+Hauser Design and Innovation Studio in Greenwood, Indiana. The simulator teaches middle and high school students about STEM concepts by demonstrating how Endress+Hauser sensors and a Microbit board can measure and control various weather-related conditions in real-time.

Endress+Hauser
People for Process Automation

## CUSTOMER PROBLEM AND BACKGROUND

Endress+Hauser is a global leader in industrial instrumentation, specializing in temperature, pressure, flow, and level sensors used in automation and process control industries worldwide.

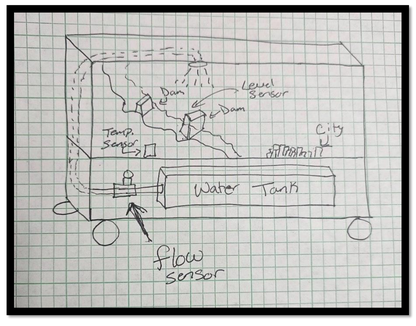
The primary challenge addressed by this project was the lack of a portable, interactive educational tool that could effectively demonstrate the capabilities of these sensors in dynamic, simulated weather environments. Traditional educational displays are often large, stationary, and limited in interactivity, making them less accessible for hands-on STEM learning.

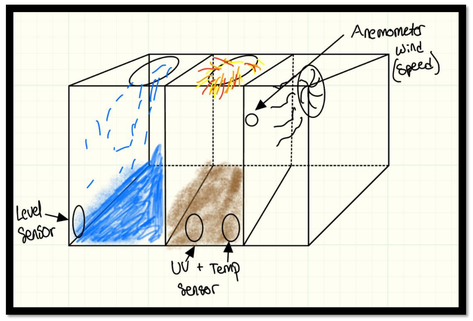
This weather simulator provides a mobile, fully enclosed platform where students can visualize sensor data in real-time and manipulate environmental conditions. By combining Endress+Hauser sensors with a Microbit based control system, the project creates a one-of-a-kind educational display that will be showcased at Endress+Hauser's United States headquarters to promote engineering and technology education.

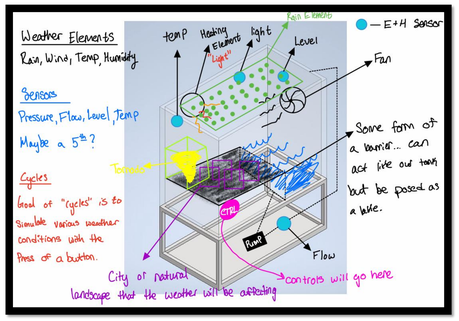
## CONCEPTS AND EXPERIMENTATION

The Multiple design concepts were developed to explore different methods of simulating weather environments. Early ideas included a three-dam system to simulate cascading floods, a three-compartment model to isolate rain, humidity, and wind conditions, and a river model to demonstrate runoff and water level changes.

Each concept was evaluated based on educational value, mechanical complexity, and sensor integration. Following client feedback and internal analysis, the team selected a cityscape model exposed to adjustable rainfall, flowing into a simulated lake. This final design offered the best balance between interactivity, portability, and effective demonstration of Endress+Hauser sensor technologies.

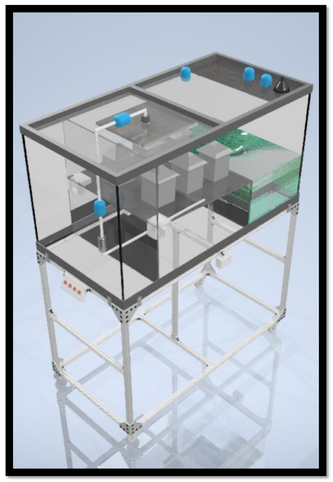


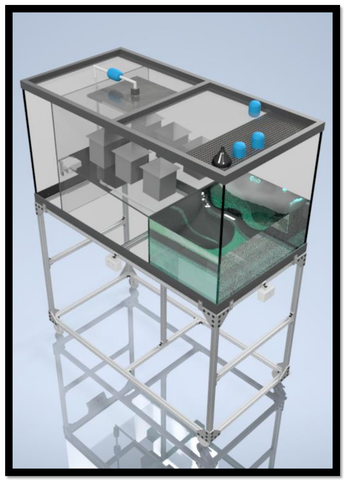




## REQUIREMENTS AND FINAL DESIGN

| Req # | Initial Requirements | Description |
|---|---|---|
| 1 | Portability | Needs to be at most 36in wide |
| 2 | Sensor Integration | 5 Endress+Hauser sensors needed to read aspects of the weather |
| 3 | Weight Limitation | Needs to be under 500lbs |
| 4 | Ease of Mobility | A minimum of 3'' diameter wheels for movement |
| 5 | Lesson Reset Time | Under 30 min simulation |





## TESTING RESULTS (Sample of Tests Run)

| Req # | Test Name | Test Description | Test Results |
|---|---|---|---|
| 1 | Water Pump Functionality Test | Validation of water circulation system operation. | The pump initiates smoothly, moving water through the piping and showerhead in a continuous, reliable cycle. |
| 2 | Pressure Sensor PMC71B (E+H) Test | Measurement of water pressure response and stability. | The system produces consistent, accurate pressure readings, confirming sensor precision under flow conditions. |
| 3 | Full System Test (Cycle 3) | Integration test of all system components and sensors. | Each sensor operates responsively, with real-time data displayed and adapting seamlessly to environmental changes. |

## CONCLUSION

The Weather Simulator integrates Endress+Hauser sensors into a portable, interactive platform designed for hands-on STEM education. Every element, from the rain system to the sensor outputs was designed with purpose, creating a direct, intuitive connection between environmental changes and sensor feedback. It stands as a strong foundation for future expansion, enhancing both educational impact and technical capability with a simplicity that invites exploration.

## RECOMMENDATIONS

- Add a wave maker to enhance level sensor feedback and realism.
- Expand Microbit controls to adjust rainfall, flow, and temperature.
- Integrate visual indicators to highlight sensor thresholds during lessons.