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Washkewicz College of Engineering

fork farms™

Rockwell Automation

Automated Hydroponic System

Andrew Zollos, Shakeeb Rahman, Ian Hennings, Brian Dowhan, Kevin Minn, Luel Mezgebe

Instructor: Toufik Aidja

Project Sponsor: Rockwell Automation **Supervisor:** Marzelle Brown

Department of Mechanical Engineering, Washkewicz College of Engineering

Cleveland State University

Introduction

- Food production increases in difficulty as the population increases
  - Food miles, erosion, soil degradation, and food deserts all contribute to this issue
- Hydroponics is the practice of growing crops without soil
  - Important values in the water such as pH, DO, TDS, temperature, and more, require manual measuring to optimize growth rates
- Rockwell Automation has tasked us to design a fully automated hydroponic vertical farming tower with the intention of creating an engaging, educational, and child-friendly exhibit

Figure 1 : Flex Farm Unit

Equipment

- Fork Farm Flex Farm unit
- Allen Bradley Micro850 Controller
- PanelView 800 7” HMI Display
- TDS, EC, pH, Temp & Humidity, Water Level Sensors
- Quick connect adapters
- Peristaltic Pumps, Water Pump, LED Tower

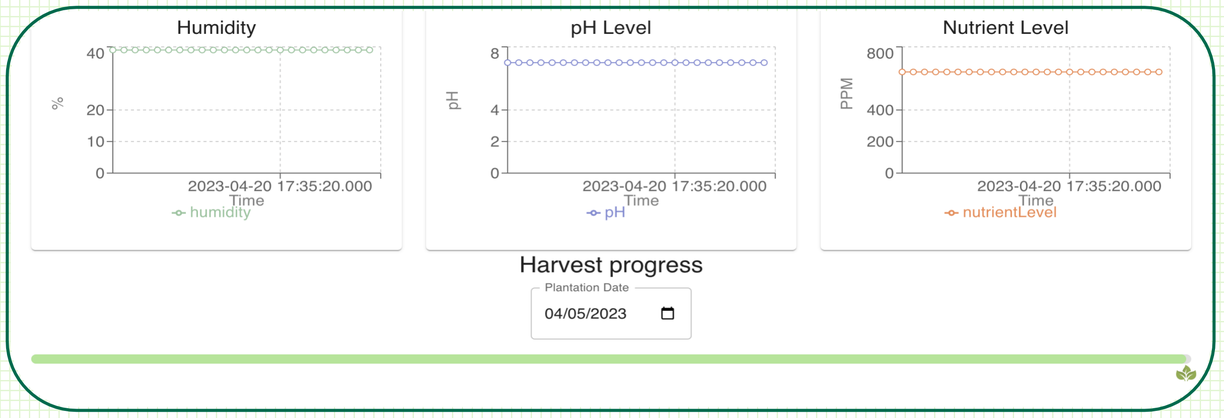

Figure 2 : Website Home Screen Display

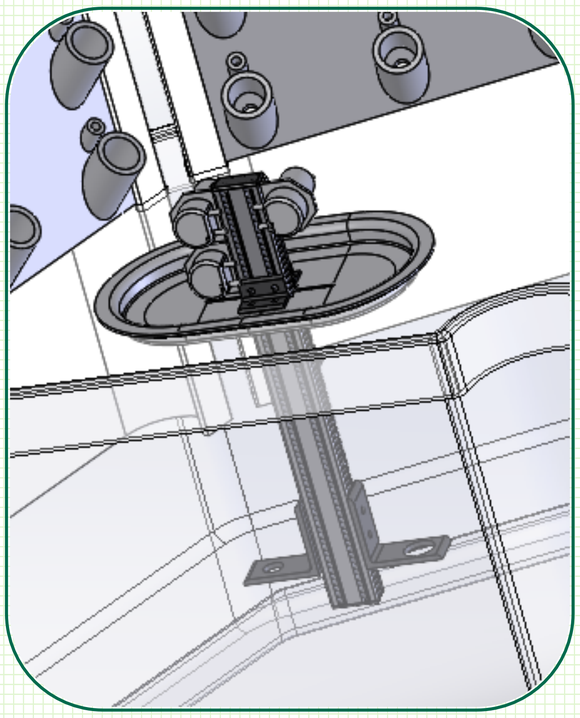

Figure 3 : CAD Sensor Module

Figure 4 : 3D Printed Sensor Module

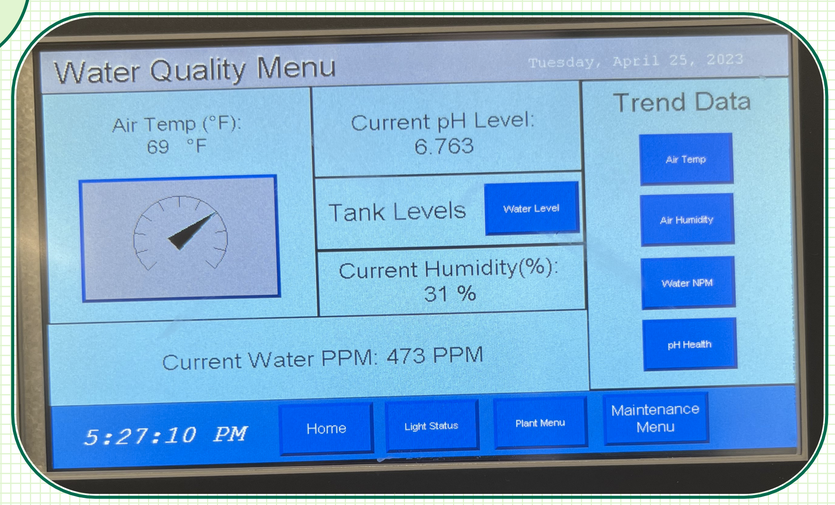

Figure 5 : HMI Home Screen

Figure 6 : AB Micro850 Controller

Procedure

- Conducted research, drafted design, acquired parts
- Designed PLC automation program in CCW
- 3D CAD modeled and 3D printed sensor module
- Designed Cloud-backed website displaying live data
- Designed and fabricated quick connect to allow a tool-free disconnect from farm to PLC

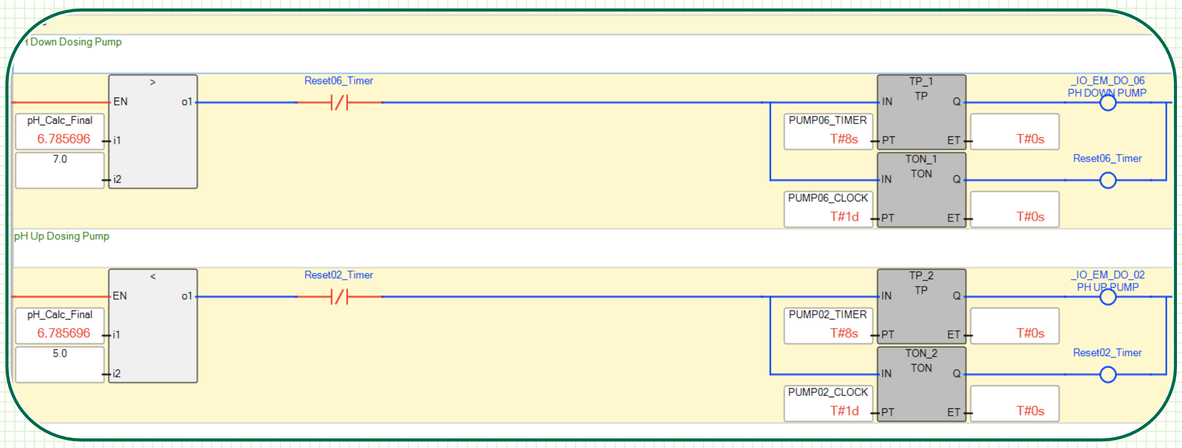

Figure 7 : Peristaltic Pump CCW Schematic

Results

- Sensor module and mounted sensors function properly
- PLC program runs smoothly, monitoring water status and making appropriate adjustments in real time
- Website displays live feed of crop vitals for remote monitoring
- Programmed various HMI presets to optimize water for specific crops; i.e. tomatoes, lettuce, basil, etc.