Water Spray System
Midterm Report

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Overview

- Project Scope
- Changes to Design
- System Control
- Risk Assessment
- Expenses
- Future Work

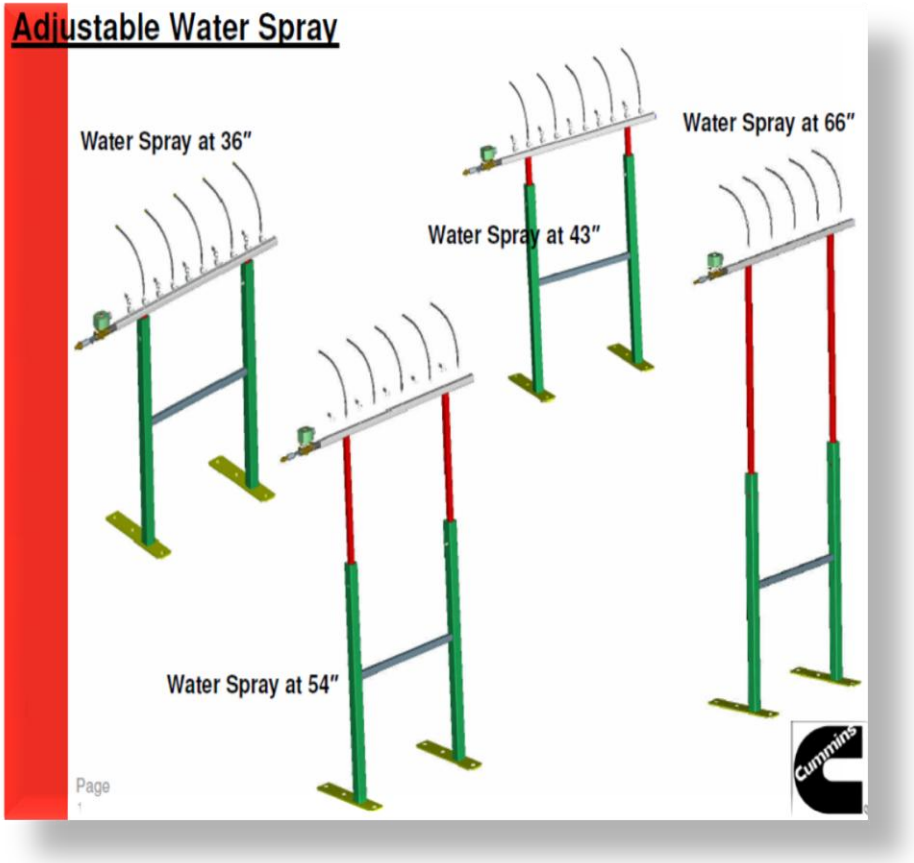

Diagram of current system at Cummins

Project Background

- Problem
  - Water interaction with engines hindering performance
- Objective
  - Design a water spray system
- Motivation
  - System to be used in water intrusion tests on engines and their electrical components

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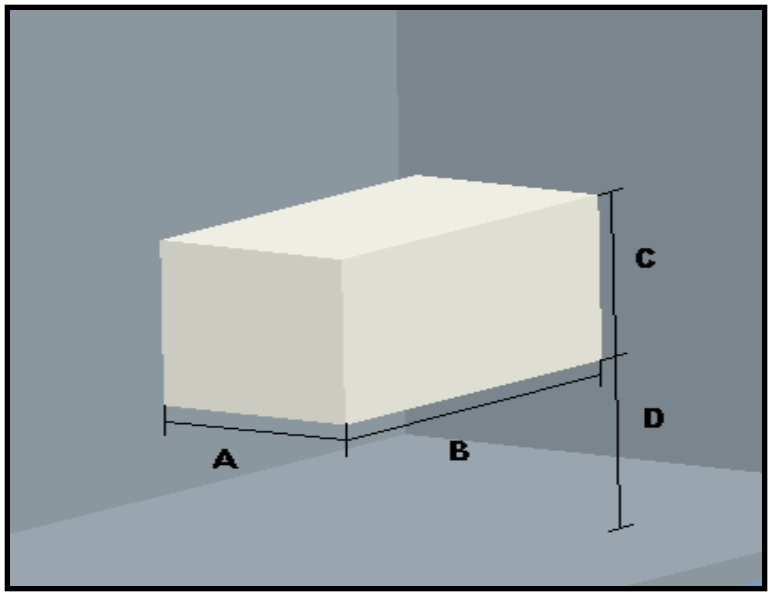
Product Specifications

- Adjustable spray settings
- Simultaneous coverage of entire spray area
  - Spray area: 6 ft long x 3 ft high
- Robust Structure
- Portability
- Ease of assembly
- Flow rate: ~ 1 gpm



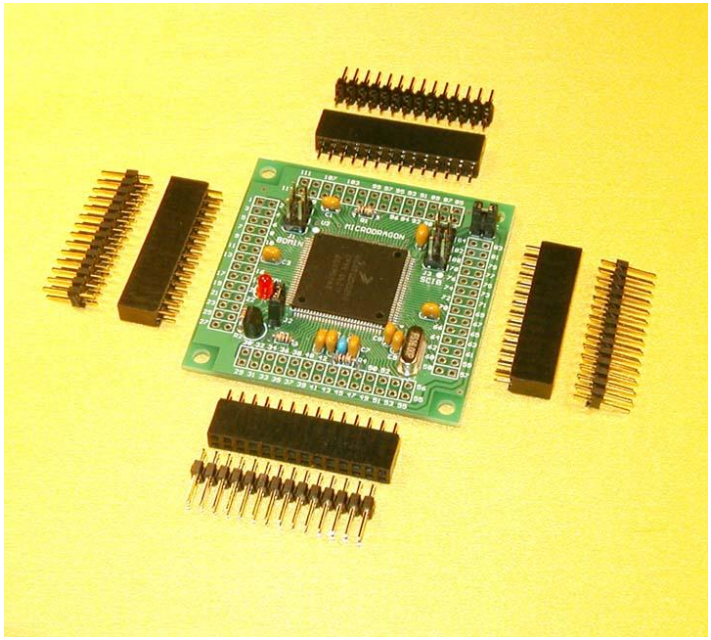
Block diagram of spray coverage area
(6 ft x 3 ft on each side 3 ft above the ground)

Design Updates

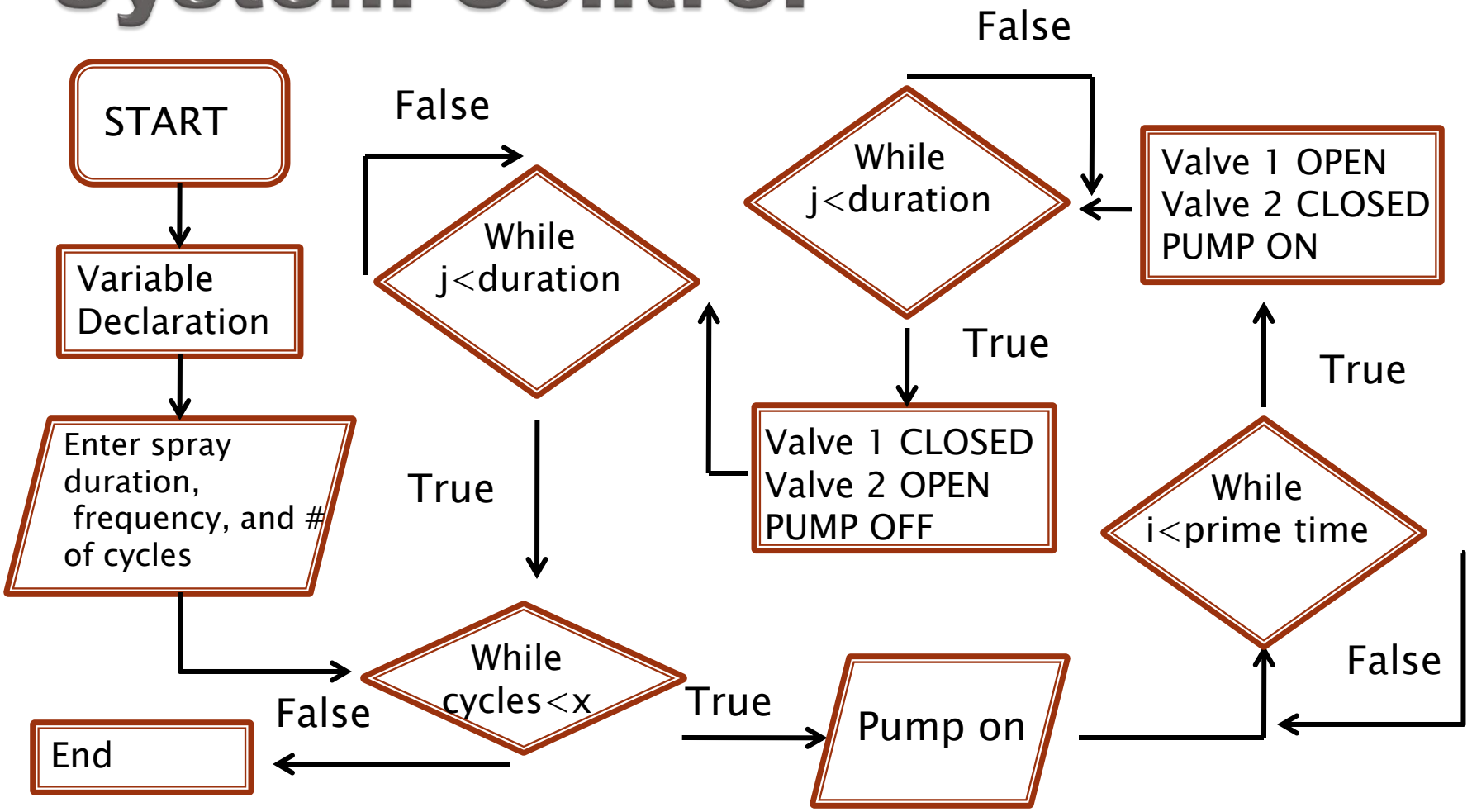
- Tilt adjustment feature removed
  - ~90% of Cummins engines are inline style
- Flow-meter incorporated along with adjustable flow valve
  - 3-18 gpm +/- 5%
- Valves to cut off water supply to either side of system
- 15+ gal reservoir with float valve

System Control

- Embedded system
  - Performs dedicated functions, PC's can perform multiple non-related functions
  - System is self-reliant
- Micro controller
  - MicroDRAGON USB
  - Receives program from PC, executes program functions
  - Sends signals to valves and pump, returns data to PC
- Solenoid valves
  - 24 VAC adjustable flow valves
- Pump
  - 24 VAC Relay for 110 VAC at 10 A



System Control



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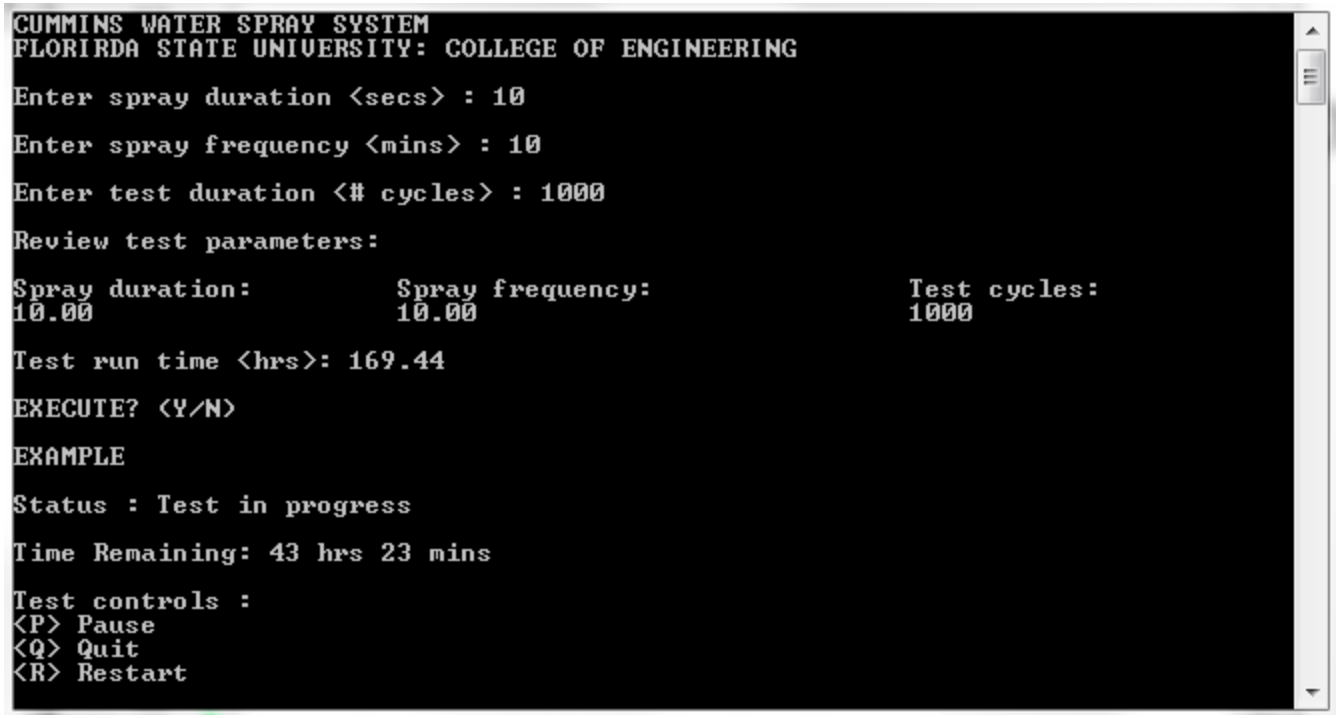
System Control

Program Window Simulation



Risk Assessment

- Mechanical
  - Pump runtime/fatigue failure
  - Pump output

- Environmental
  - Cummins facilities use separators to remove possible oil from water
  - Water waste minimal given run time and flow rate
  - Electrical system damage from water

Expenses

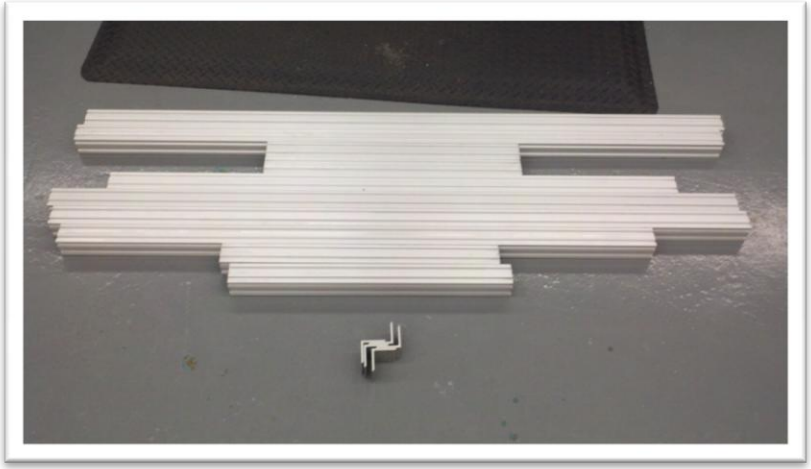
Part	Quantity	Price
Solenoid Valves	2	111.83
Centrifugal Pump	1	374.55
Versa-Mount Water Flowmeter	1	64.23
Additional Valves	2	114.9
MicroDragon Project Module	1	55
Misc. Electrical Components	3	29.35
Brackets for extruded Aluminum	12	98.88
CPVC Piping	40 ft	53.16
Flexible Tubing	8 ft	44.24
Sharkbite Fittings	23	333.67
Misc. Pipe Fittings	6	48.73
Test Nozzles	3	17.94
	Total	**1346.48**

Remaining Expenses: 11 Nozzles, Resevoir, Pipe fittings

Accomplished Work

- Pseudo code to be implemented and tested with valves and relay
- 80/20 structures for right and left arrays

Pictures

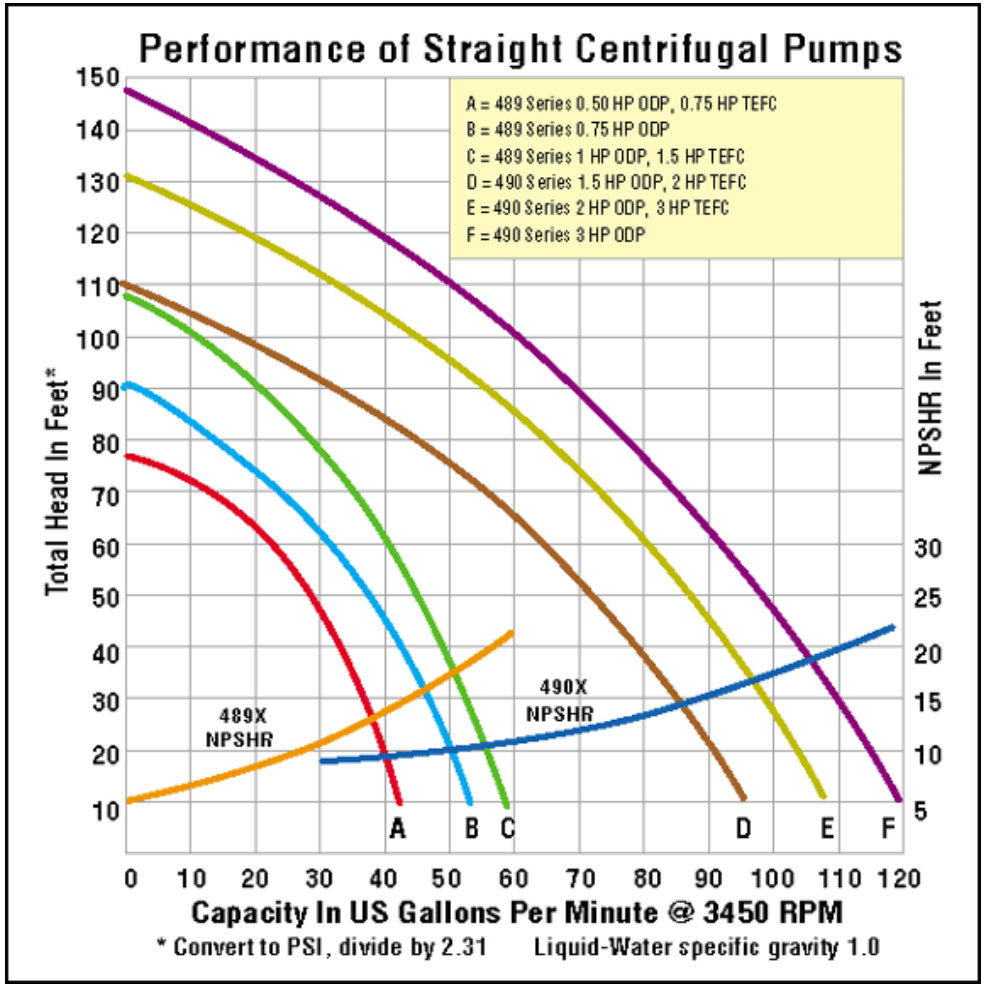


Disassembled Structure

Assembled Structure

Pump

1/3 HP pump motor connected to drip-proof, centrifugal pump



Future Work

- Current Tasks
  - Nozzle Testing
    - Verify nozzle specifications experimentally
  - System control code development
    - Configure program for real time tracking

- Overall Project Plan for Spring Semester
  - Plan to have electronics tested and assembly completed before 1st of March

Acknowledgements

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Questions