Water Spray System
Spring Progress

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Overview

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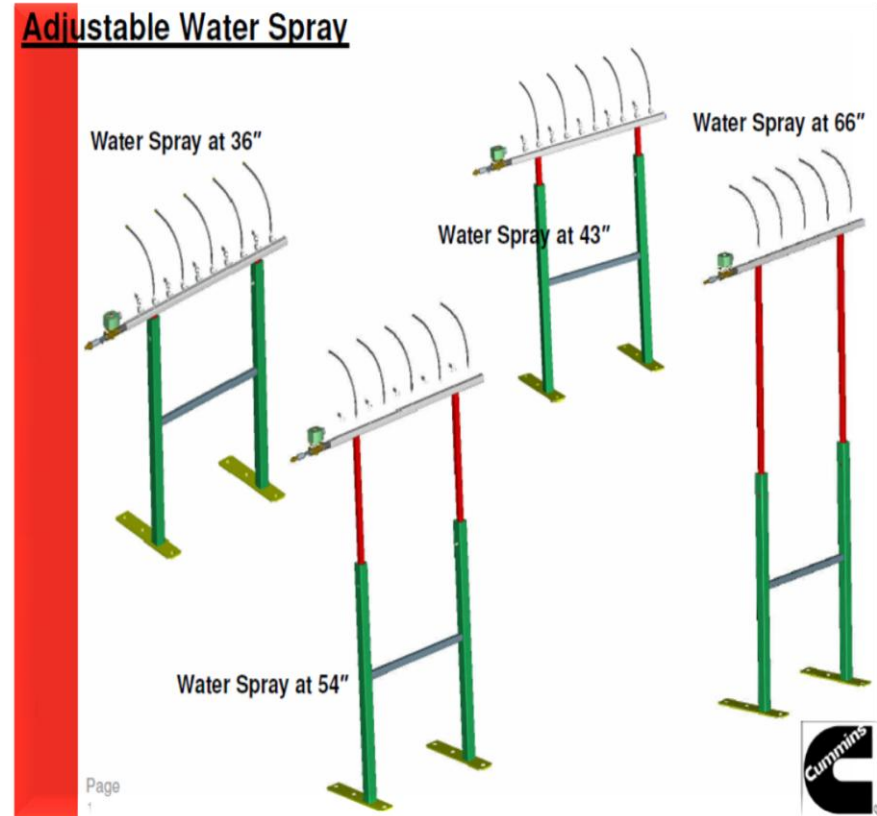Diagram of current system at Cummins

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

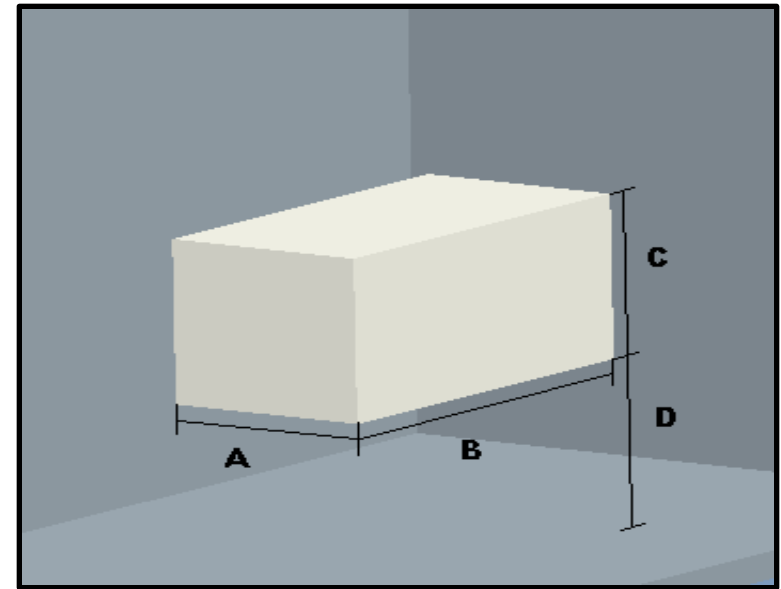| Project Scope | Changes To Design | System Control | Risk Assessment | Expenses | Future Work |

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)

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Changes to Fall Design

- 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

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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
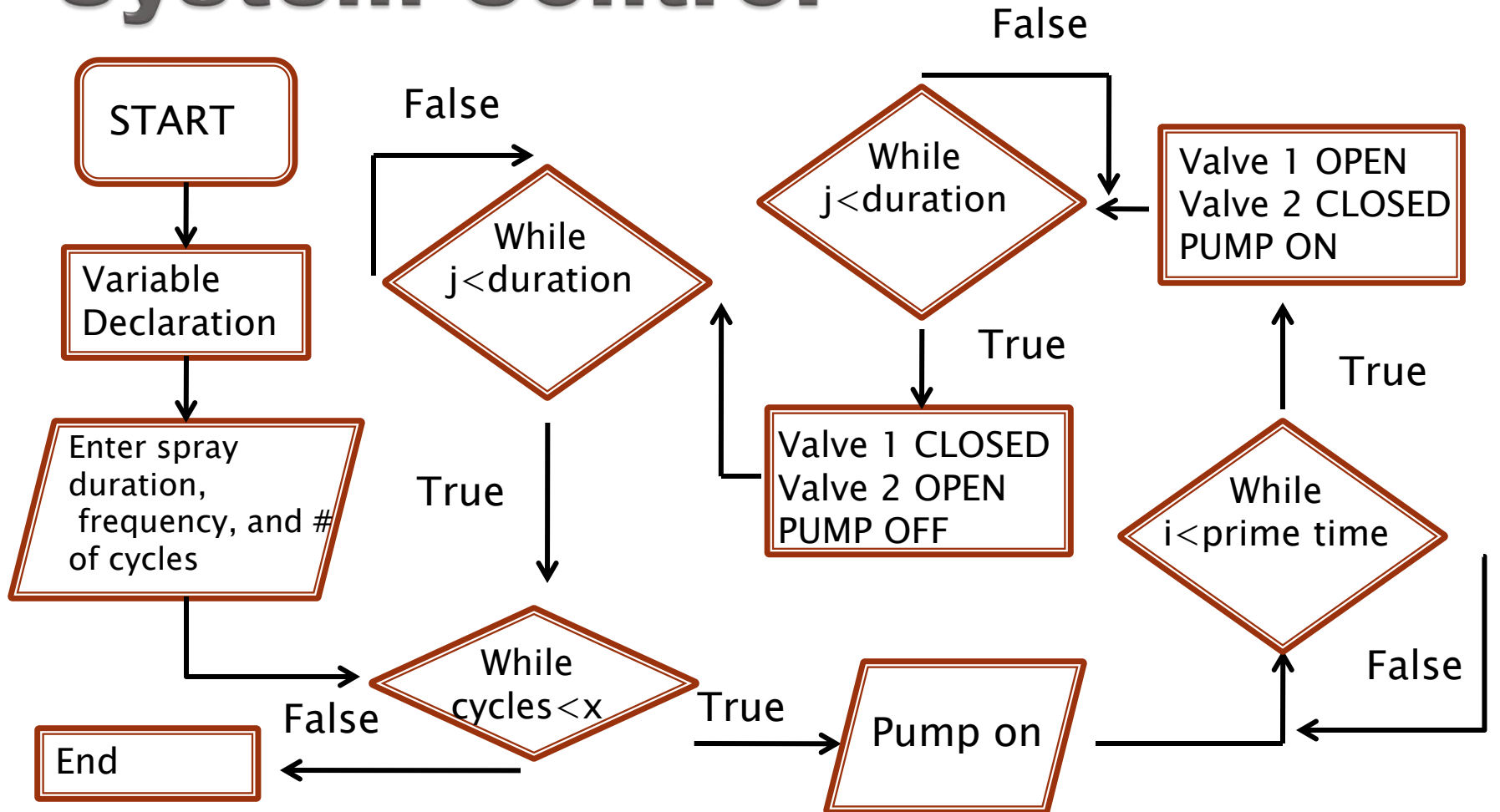 - 24 VAC Relay for 110 VAC at 10 A

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System Control

START

Variable Declaration

Enter spray duration, frequency, and # of cycles

While j<duration — False

While cycles<x — True / False

End

While j<duration — False / True

Valve 1 CLOSED Valve 2 OPEN PUMP OFF

Valve 1 OPEN Valve 2 CLOSED PUMP ON

While i<prime time — True / False

Pump on

System Control

Program Window Simulation

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CUMMINS WATER SPRAY SYSTEM
FLORIRDA STATE UNIVERSITY: COLLEGE OF ENGINEERING

Enter spray duration <secs> : 10

Enter spray frequency <mins> : 10

Enter test duration <# cycles> : 1000

Review test parameters:

Spray duration:         Spray frequency:          Test cycles:
10.00                   10.00                     1000

Test run time <hrs>: 169.44

EXECUTE? <Y/N>

EXAMPLE

Status : Test in progress

Time Remaining: 43 hrs 23 mins

Test controls :
<P> Pause
<Q> Quit
<R> Restart
```

Project Scope	Changes To Design	System Control	Risk Assessment	Expenses	Future Work

Risk Assessment

▶ Mechanical
  ◦ Sharkbite fittings attach and detach with ease if they need replacing
  ◦ System shut down feature to be included

▶ Environmental
  ◦ Cummins facilities use separators to remove possible oil from water
  ◦ Water waste minimal given run time and flow rate

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Expenses

Part	Quantity	Price
Solenoid Valves	2	111.83
~~Centrifugal Pump w/Adj. Discharge~~	~~1~~	~~801~~
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	971.93

Remaining Expenses: Pump, 11 Nozzles, Resevoir, Pipe fittings

Project Scope | Changes To Design | System Control | Risk Assessment | Expenses | Future Work

Future Work

- Current Tasks
  - Nozzle Testing
    - Verify nozzle specifications experimentally prior to purchase of all nozzles
  - System control code development
    - Configure program for real time tracking
    - Test with microcontroller on valves, relay

- Overall Project Plan for Spring Semester
  - Plan to have finished testing and assembled before 1st of March

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Questions/Comments