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# EXPERIMENTAL PIPE LOSS

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# PROJECT DESCRIPTION

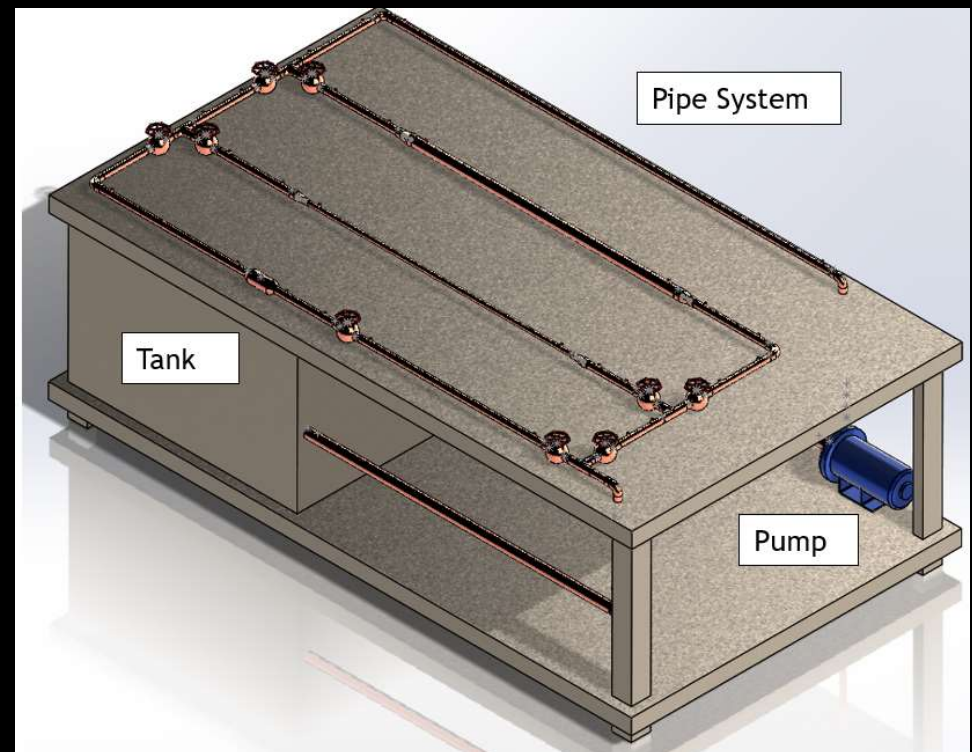
- Primary Objective is to create an experiment to facilitate learning and education
- Create an apparatus for measuring the head loss across a pipe system
- Replace the old experiment used in ME 495
- Client:
  - Dr. Cornel Ciocanel



Keith Caton

# DESIGN FUNCTIONS

- Measure Pressure at many different points
- Measure flow rate using several different methods
  - Two invasive
  - One non-invasive
- Variable flow rate of the system
- Multiple types of fittings and different pipe diameters



# ENGINEERING REQUIREMENTS

- Power Requirements
  - 20 Amps, 220 Volts
- Reynolds Number Operation Range
  - $10^4 - 5 * 10^5$
- Maximum Pressure
  - 250 kPa (36 psi)
- Smallest Pipe Diameter
  - 12.7 mm (1/2 in)
- Selected a pump that requires the Maximum of 220 Volts and 20 Amps
- Reynolds number spans from  $10^4 - 3 * 10^5$ , not quite to the maximum but is all we could achieve.
- Our maximum psi for the system is ~30 psi
- The smallest pipes that we will use are 1/2 in. pipe

# DECONSTRUCTION PLAN

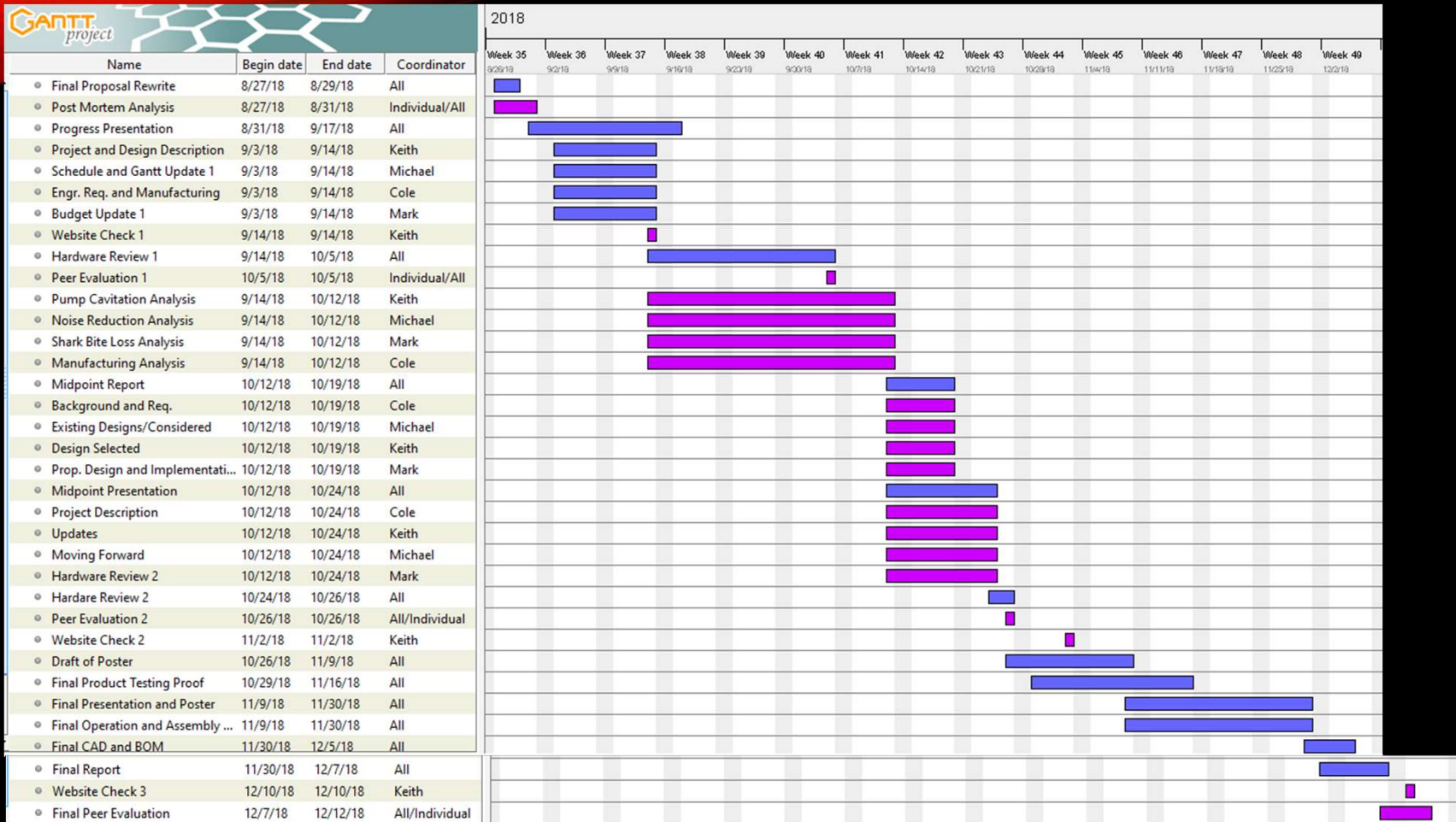
- We are tasked with deconstructing the old experiment.
- Intact fittings will be kept in the lab for potential reuse, as well as copper piping.
- The current table will be evaluated and potentially reused if it meets the criteria for the new design.
- The pump, reservoir, and non-functioning parts will be disposed of.

# MANUFACTURING PLAN

- The piping structure will be the first section built using Sharkbite fittings and the machine shop.
- Pressure taps are a part of the Sharkbite fittings, pipe tapping is avoided.
- The pump will then be secured to the table that is selected, in the ME 495 lab room.
- We will then route the pump to the reservoir tank
- Bring the connected piping into the lab and link up the pump and reservoir to the pipes on top of the table.



# SCHEDULE <sup>7</sup>



Michael Garelick

9/28/2018

# SCHEDULE CONTINUED

- Completed up to Hardware Review 1.
  - Half-construction: The pipe system and sensors.
- Currently on-schedule with regards to assignments
  - Behind-schedule with regards to construction.
    - Pipe system able to be purchased now.
    - Only testing parts have been purchased.
    - Pipe system construction not started.
- Pump has been selected recently, which took most of the time last semester.
  - Time will be saved on the second half of manufacturing.



# BILL OF MATERIALS <sup>9</sup>

Item	Quantity	Amount (\$)
1 in x 10ft Copper pipe	3	107.79
½in x 5ft Copper pipe	1	6.84
2in x 3ft Copper pipe	1	44.15
1 in x ½in Copper reducer	1	4.51
2in x 1in Copper reducer	1	11.83
1in Sharkbite Copper Elbow Joint 90°	6	98.82
1in Sharkbite Copper T-joint	4	76.96
1in Sharkbite Ball Valve	4	26.65
½in Sharkbite Ball Valve	1	16.78
2in Sharkbite Ball Valve	1	88.77
Centrifugal pump	1	1190.00
Table	1	118.96
Total		1793.13

# BUDGET

- Two separate budgets
  - Dr. Ciocanel
    - Main purpose: sensors
    - Amount available: Unknown
  - Capstone fees
    - Main purpose: everything else
    - Amount available: \$2500
- Purchased items
  - 2, 1in Copper pipe
  - 1, 1in Sharkbite Copper Elbow Joint 90<sup>0</sup>
  - Total: \$42.11

# QUESTIONS?