Project-1

Memorandum

9/10

To: Chief Engineer Phanikumar Mantha

From: Devin Powers, Lucas Daoust

Date: March 15, 2019

Re: Water Distribution System Design Project

The purpose of this memo is to outline the design of a new water supply system for an industrial site. We recommend a standard pipe diameter of 250 mm is used in all the pipes, and the roughness value of a smooth concrete is assumed to be 0.15 mm.

In the design of the new water supply system, the proposed network in the Project-1 description is used. The design of the water supply system meets specific flow demands while taking into account a given characteristic curve along with minor losses during pipe flow. A water sourcing network system called EPANET is to be used to determine flow rates and pumping powers. The pipe system is to be made of concrete pipes with assumed pipe diameter and roughness values.

The network system of pipes proposed consists of four reservoirs, one pump, and four valves, with minor losses of K1=5, K2=8, K3=10, and K4=10. The network supports demand loads of 60 L/s at two locations and 110 L/s at 3 locations. A standard pipe diameter of 250 mm is used in all the pipes, and the roughness value of smooth concrete piping is assumed to be 0.15 mm . should try more than one to optimize

The design of the water supply system for the industrial site is shown in **Figure 1**. With the given pipe segments characteristics, including elevations at each node and pipe segment length, the data is put into the EPANET system. The assumed pipe diameter and pipe roughness meet the water supply at the necessary points in the system. The system then gives outputs of velocities and discharge values for each pipe segment. **Table 1** shows the values of velocities and discharge for each pipe segment. Using the velocity and discharge, the pressures at each node are calculated and are shown in **Table 2**. The energy use of the network is shown in **Table 3**. The results of the water distribution network, a power usage of 559.09 kw is suggested. At an average of 12 cents a kw/hr, the cost to run the system for one 24 hour period is $1610.17. We recommend that an average power supply of 559.09 kw is used to satisfy the water supply system. ✓

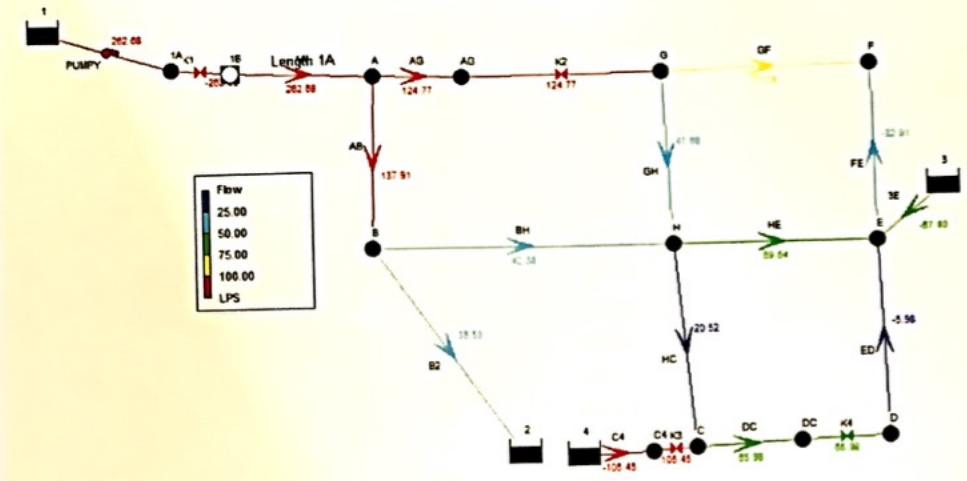

Figure 1: Water System

Table 1: Pipe Segments Characteristics

Pipe Segment	Diameter (mm)	Length (m)	Velocity (m/s)	Discharge (L/s)
A1	250	1500	5.35	-262.68
AG	250	610	2.54	124.77
AB	250	760	2.81	137.91
B2	250	975	0.72	35.53
2C	250	61	2.15	-105.45
CD	250	610	1.34	65.98
DE	250	610	0.12	-5.98
EF	250	760	0.67	-32.91
FG	250	914	1.57	77.09
GH	250	610	0.97	47.68
HC	250	457	0.42	20.52
HE	250	610	1.42	69.54
E3	250	30	1.37	-67.4
BH	250	914	0.86	42.38

Table 2: Pump Requirements

Node	Pressure (m)
1	0.00
2	0.00
3	0.00
4	0.00
A	36.87
B	20.71
C	27.20
D	17.80
E	14.83
F	10.67
G	23.33
H	21.50
1A	132.85
1B	155.55
AG	25.96
DC	17.87
C4	-0.80

attach full EPANET report

negative pressure?

Table 3: Energy Usage of Pump

Energy Usage:

Pump	Usage Factor	Avg. Effic.	Kw-hr /m3	Avg. Kw	Peak Kw	Cost /day
PUMPY	100.00	75.00	0.59	559.09	559.09	1610.17

Demand Charge: 0.00
Total Cost: 1610.17

This information is useful because it gives the engineer information about long-term operating costs for the project. one can optimize this number by trying different pipe diameters etc.

87%