RE-DESIGN THE WATER SUPPLY PIPELINE FROM IFRAZ WATER STATION TO WATER CONTAINERS LOCATED AT NORTH ERBIL CITY BY USING EPANET SOFTWARE

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5 May 2024

01

INTRODUCTION
TO IFRAZ WATER STATION

INTRODUCTION

In ifraz-3 to avoid too much pressure, they now give out 192,000 cubic meters of water a day instead of 210,000. Right now, they provide 8,000 cubic meters of water every hour. Ifraz 3 gives water to about 40 neighborhoods

Ifraz water station-3 contains big reservoirs to collect the water from the sea that surrounded the station then goes under treatment to make a potable water

The pipe that used in that station is Fiber Glass Pipe because it has the following properties:

- Durability
- Corrosion Resistance
- Lightweight
- Insulation
- Customization
- Cost-Effectiveness

After we entered the station and watched how the control room operates their job, then we went to Tank Room (Operation Room) which all the water goes there and the pump held there to move the water through the pipes to Marooda station then moves the water from the station to Erbil

At Ifraz Station, our main focus lies in gathering critical information essential for determining the pump size and simulating the pipeline network using specialized software. Our primary task involves exactly collecting data from pump catalogues in the operation room.

Finally after the water have been treated then entered the operation room so the pump pushes the water through the pipes, before the water flows they have a flow meter which it's a device for measuring flow of water.

02

METHODOLOGY

To determine heads and flows, the conservation of flow equation for each junction and the headloss relationship across each link in the network must be solved all together

This process, known as “Hydraulic Balancing" the network, requires techniques to solve the nonlinear equations involved

There are three empirical formulas available to calculate the hydraulic head lost due to friction with pipe walls:

- Hazen-Williams formula (H-W)
- Darcy-Weisbach formula (D-W)
- Chezy-Manning formula (C-M)

Each formula employs a specific equation to determine the head loss between the start and end nodes of the pipe:

$$hL = Aq^B$$

Where:

hL represents the headloss per unit length

q denotes the flow rate per unit time

A stands for the resistance Coefficient

B represents the flow exponent

Formula	Resistance Coefficient (A)	Flow Exponent (B)
Hazen-Williams	$4.727\, C^{-1.852}\, d^{-4.871}\, L$	1.852
Darcy-Weisbach	$0.0252\, f(\epsilon, d, q)\, d^{-5}\, L$	2
Chezy-Manning	$4.66\, n^2\, d^{-5.33}\, L$	2

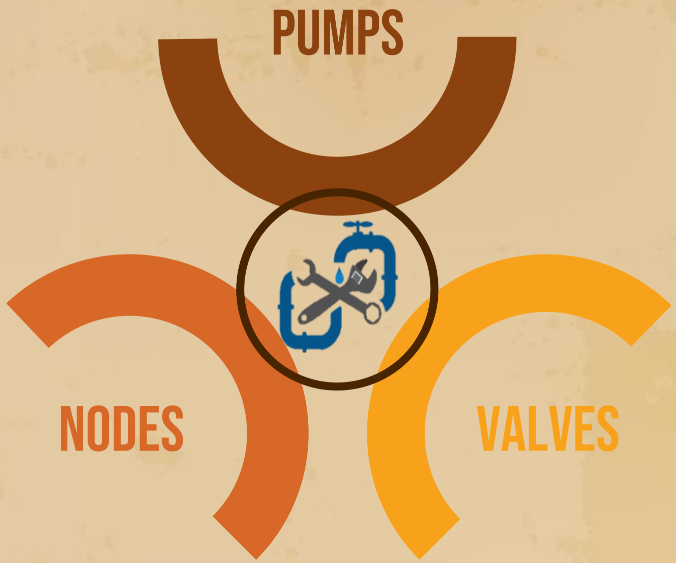
Table 1 Pipe Headloss Formulas for Full Flow

Table 2 Roughness Coefficients for New Pipe

Material	*Hazen-Williams* C *(unitless)*	*Darcy-Weisbach* ϵ (ft x 10^{-3})	*Manning's* n *(unitless)*
Cast Iron	130 – 140	0.85	0.012 – 0.015
Concrete or Concrete Lined	120 – 140	1.0 – 10	0.012 – 0.017
Galvanized Iron	120	0.5	0.015 – 0.017
Plastic	140 – 150	0.005	0.011 – 0.015
Steel	140 – 150	0.15	0.015 – 0.017
Vitrified Clay	110		0.013 – 0.015

FUNDAMENTAL COMPONENTS IN FLUID SYSTEMS

- Valves are used for regulating the discharge by varying the head loss accrued by it
- Pumps are used infrequently to add energy to the system
- Nodes are the locations where pipes connect



PUMP & PIPE LOSSES

Losses in a water pump system encompass the reduction in energy or pressure as water moves through different components. These losses arise from several factors:

- Friction Losses in Pipes
- Fittings and Valves
- Elevation Changes
- Entrance and Exit Losses
- Cavitation

REDUCE PUMP AND PIPE LOSSES

Reducing both pump and pipe losses is essential for improving the overall efficiency of fluid systems. Here are some strategies to achieve this:

- Efficient Pump Selection
- Optimize Pump Operation
- Minimize Pipe Friction
- Regular Maintenance
- Optimal Pipe Material
- Proper System Design
- Insulation

03

EPANET SOFTWARE

EPANET

A computer program called EPANET simulates hydraulic and water quality behavior over a long time period in pressurized pipe networks the network is made up of pipes, nodes (joints in the pipes), pumps, valves, and reservoirs or storage tanks.

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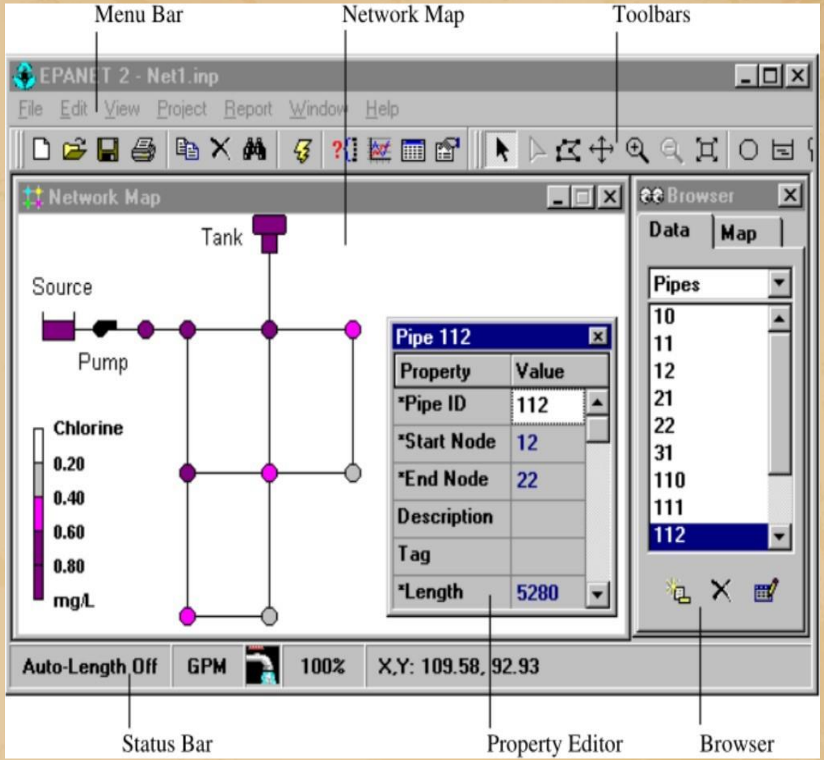
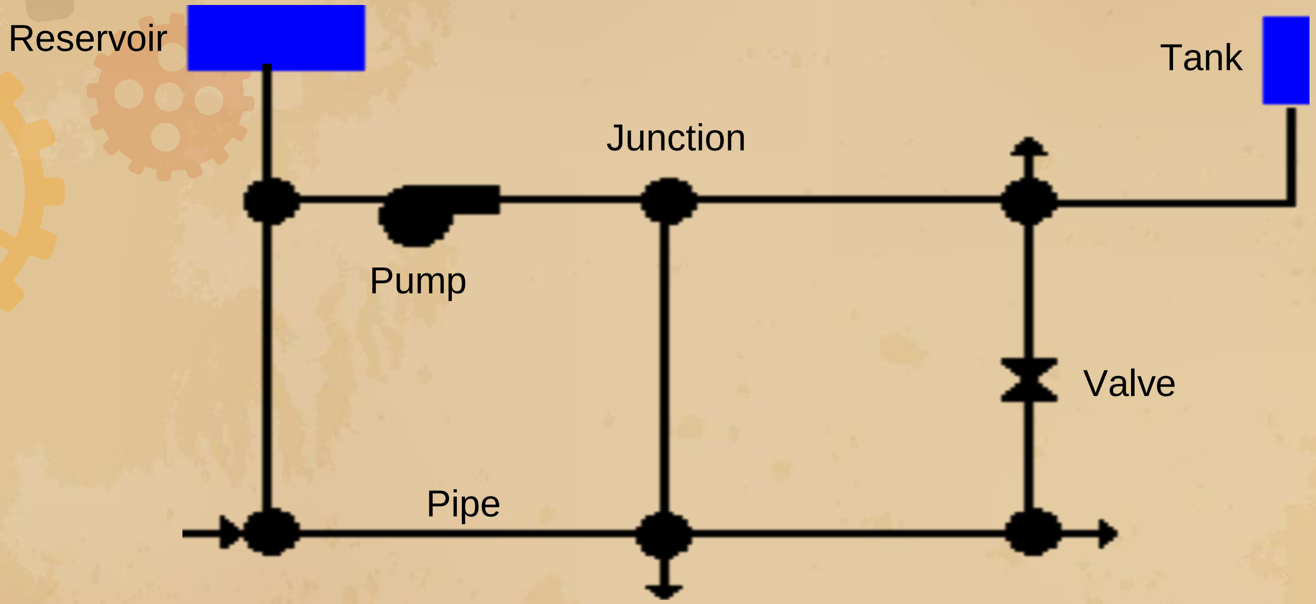


WATER DISTRIBUTION COMPONENTS

EPANET models a water distribution system as a network comprising links and nodes. Links represent pumps, control valves, and pipes, while nodes symbolize reservoirs, tanks, and junctions.



EPANET OUTPUT

In EPANET software, the outputs circle a wide array of information and analyses derived from hydraulic and water quality simulations conducted on the water distribution network model

These outputs include :

1- Hydraulic Results

- Pressure at nodes
- Flow rates in pipes
- Nodal demands

2- System Performance Metrics

- Energy usage
- Pump efficiency
- Overall network performance

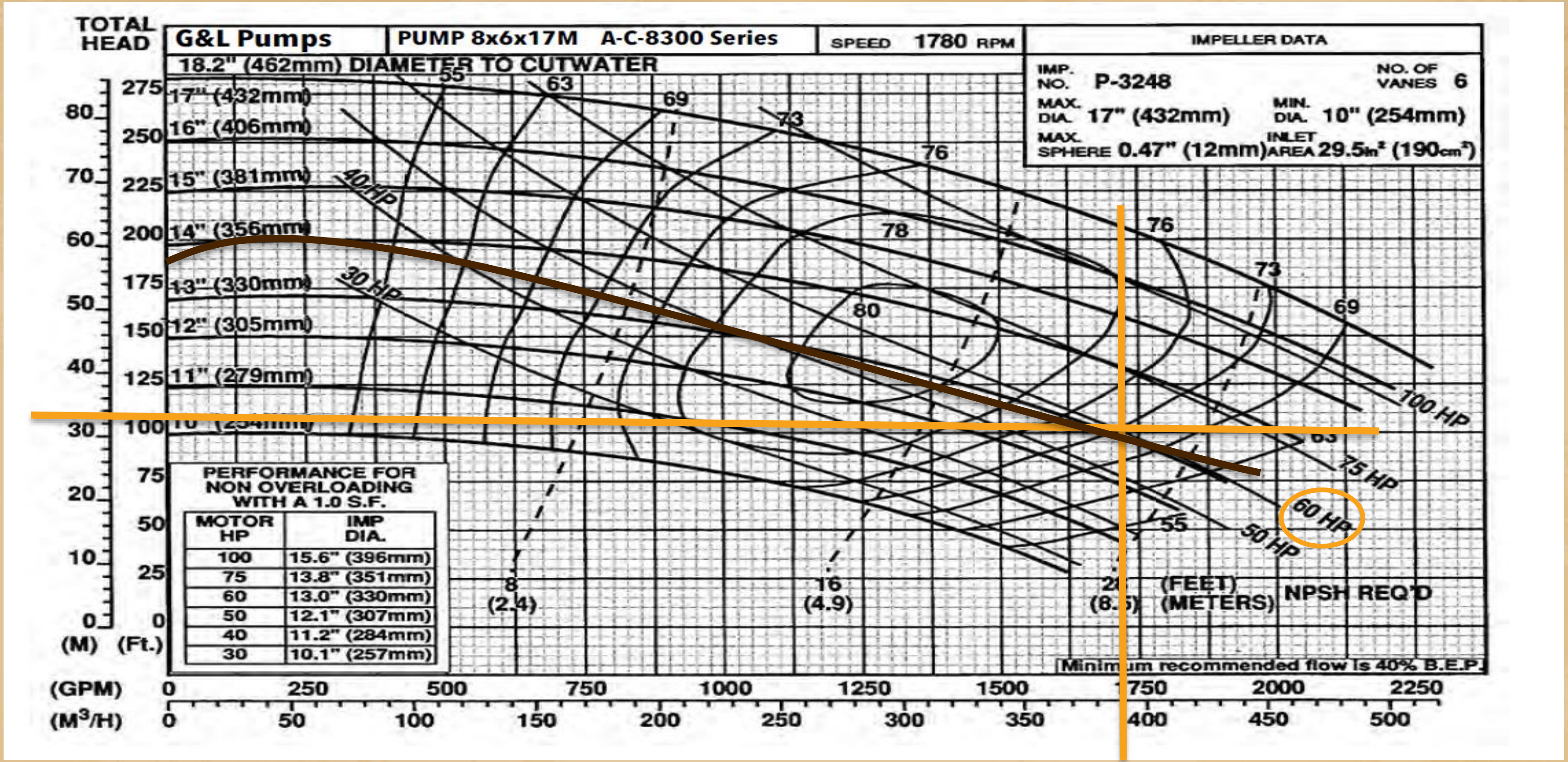
3- Visualization Outputs

- Data tables
- Time series graphs

04

ANALYSIS AND DESIGN

USING TACO CHART AND THE GIVEN DATA DETERMINE THE PUMP HORSEPOWER



THANK YOU