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Design of Pressure Main by Using EPANET

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Abstract — Modelling intermittent water supply systems is a challenging task because these systems are not fully pressurized pipeline networks but networks with very low pressures, with restricted water supply hours per day.. The alternate emptying and refilling of water pipelines makes it problematic to apply standard EPANET based hydraulic models because of low pressures and pipes without water. EPANET source code was adjusted to allow for modelling pressure dependent demands, for adjust flows in pipe, for head loss and for velocity. Cases study of Gandhinagar water supply project NC-14 was discussed, to illustrate the practical use of this approach. The experience from using and adjusting the EPANET engine for the modelling of intermittent water supply systems is discussed in this paper.]
Keywords-EPANET, Water supply project, pipe flow, head loss, velocity]

I. INTRODUCTION

1.1 Software

EPANET is a computer program that performs extended period simulation of hydraulic and water quality behaviour within pressurized pipe networks. A network consists of pipes, nodes (pipe junctions), pumps, valves and storage tanks or reservoirs. EPANET tracks the flow of water in each pipe, the pressure at each node, the height of water in each tank, and the concentration of a chemical species throughout the network during a simulation period comprised of multiple time steps. In addition to chemical species, water age and source tracing can also be simulated. EPANET is designed to be a research tool for improving our understanding of the movement and fate of drinking water constituents within distribution systems. It can be used for many different kinds of applications in distribution systems analysis. Sampling program design, hydraulic model calibration, chlorine residual analysis, and consumer exposure assessment are some examples. EPANET can help assess alternative management strategies for improving water quality throughout a system. These can include:

- Altering source utilization within multiple source systems,
- Altering pumping and tank filling/emptying schedules,
- Use of satellite treatment, such as re-chlorination at storage tanks, targeted pipe cleaning and replacement.

Running under Windows, EPANET provides an integrated environment for editing network input data, running hydraulic and water quality simulations, and viewing the results in a variety of formats. These include colour-coded network maps, data tables, time series graphs, and contour plots.

1.2 Hydraulic Modelling Capabilities

Full-featured and accurate hydraulic modelling is a prerequisite for doing effective water quality modelling. EPANET contains a state-of-the-art hydraulic analysis engine that includes the following capabilities:

- places no limit on the size of the network that can be analyzed
- computes friction head loss using the Hazen-Williams, Darcy- Weisbach, or Chezy-Manning formulas
- includes minor head losses for bends, fittings, etc.
- models constant or variable speed pumps
- computes pumping energy and cost uses n-th order kinetics to model reactions in the bulk flow
- uses zero or first order kinetics to model reactions at the pipe wall
- accounts for mass transfer limitations when modelling pipe wall reactions
- allows growth or decay reactions to proceed up to a limiting concentration
- employs global reaction rate coefficients that can be modified on a pipe-by-pipe basis
- allows wall reaction rate coefficients to be correlated to pipe roughness
- allows for time-varying concentration or mass inputs at any location in the network
- models storage tanks as being either complete mix, plug flow, or two-compartment reactors.

By employing these features, EPANET can study such water quality phenomena as:

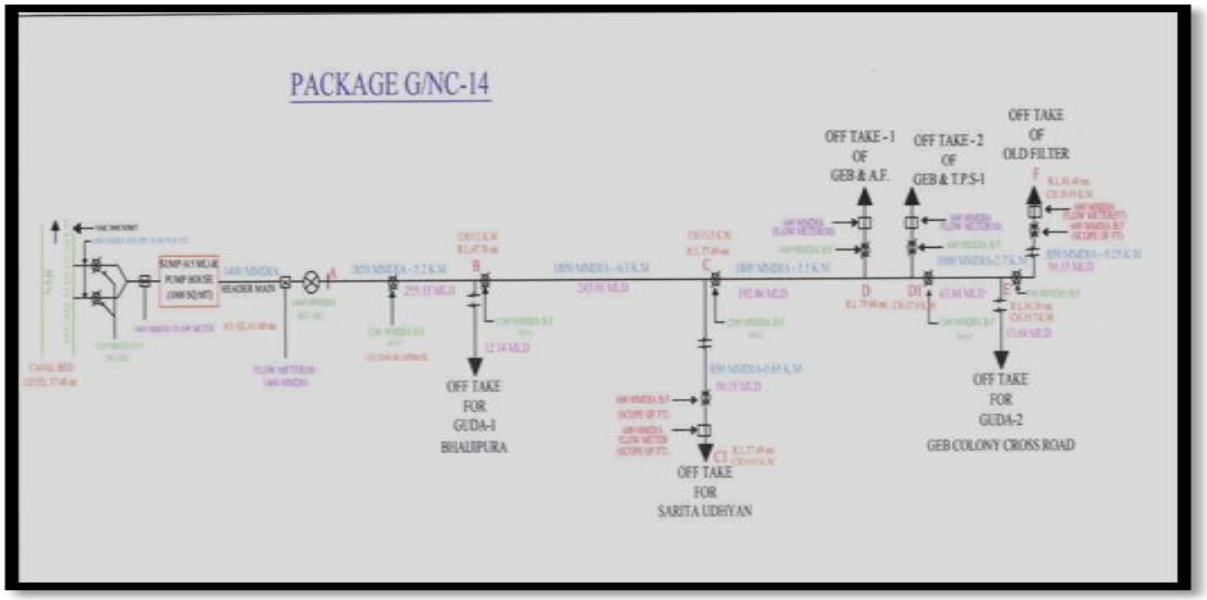
- Blending water from different sources

- Age of water throughout a system
- Loss of chlorine residuals
- Growth of disinfection by-products
- Tracking contaminant propagation events

II. STUDY AREA

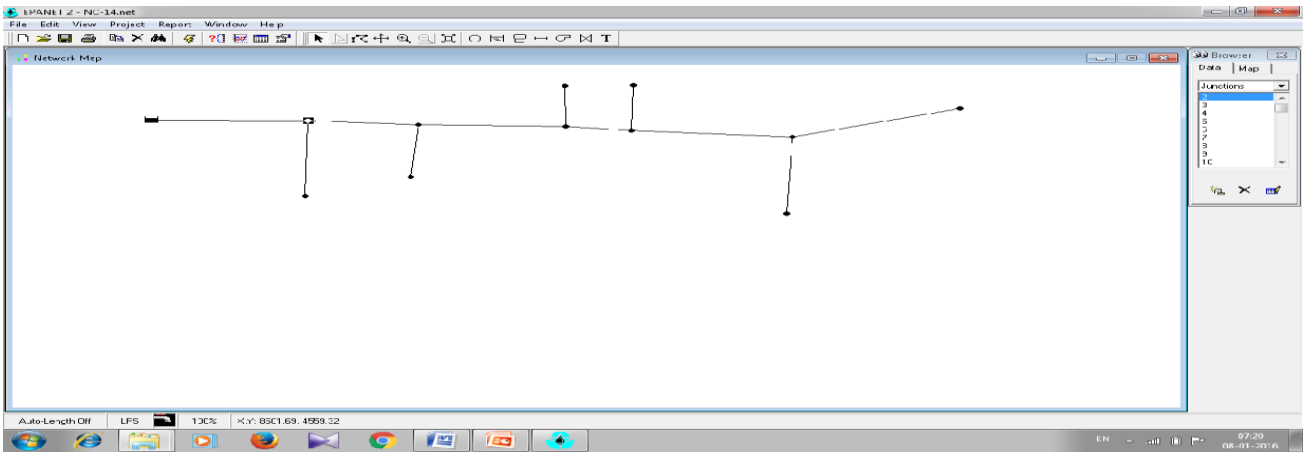
- *GANDHINAGAR WATER SUPPLY SYSTEM (NC-14)*
- Gandhinagar is about 24 km to North East of Ahmadabad and the spreads over is about 57 Sq. Km including the area of Sabarmati River which divides the town. The project is prepared based on source Narmada Main Canal passing near village Nabhoi@ NMC Ch.230.83 km 10 km away from Gandhinagar city. The off-take point is located @ 800m away downstream of main canal crossing of river Sabarmati.

- Gandhinagar City
- 39 villages of Gandhinagar District
- Gujarat Electricity Company Thermal Power Station
- Institutions like 1. Infocity 2. DA-IICT 3. National institute of Co-operative Management 4. Puri foundation 5. Institute of Hotel Management 6.NIFT 7. GIDC of Gandhinagar
- Air force, military, BSF and CRPF campus siyuated near Chiloda



III. RESULT & DISCUSSION

3.1. Input Data



Link id	Start node	End node	Length	Diameter
1	1	2	5200	1826
2	2	3	6300	1826
3	3	4	5000	1776
4	4	5	500	1776
5	5	6	2700	980
6	6	7	250	834
7	6	8	500	488
8	5	11	50	588
9	4	12	50	588
10	3	10	650	834
11	2	9	100	580

3.1.1. Output Data
Node Result:

Node ID	Demand (LPS)	Head (m)	Pressure (m)
2	0.00	97.73	29.97
3	0.00	93.59	16.10
4	0.00	91.12	11.28
5	0.00	91.01	10.96
6	0.00	87.95	6.65
7	638.48	87.56	6.16
8	174.29	86.98	5.98
9	154.56	97.67	29.87
10	638.48	92.55	14.55
11	840.28	90.40	10.40
12	827.55	90.30	10.30
1	-3273.66	101.48	0.00

Link Result:

Link id	Flow (LPS)	Velocity (m/s)	Head loss(m/km)
1	3273.66	1.25	0.72
2	3119.09	1.19	0.66
3	2480.61	1.00	0.49
4	1640.33	0.66	0.23
5	812.78	1.08	1.13
6	638.48	1.17	1.59
7	174.29	0.93	1.95
8	840.28	3.09	14.48
9	827.55	3.05	14.08
10	638.48	1.17	1.59
11	154.56	0.58	0.67

From the study, we mainly conclude that at the point at the point GEB offtake 1 and 2 (8 and 9 point in table) had maximum headloss of 14.48 and 14.08 because demand are fixed at that points.

IV. CONCLUSION

The presented solution for modeling intermittent water supply system is based on EPANET for hydraulic modeling. EPANET is a computer based programme from that we can compute flow in pipe, Velocity and Head loss. By using the Hazen-Williams, Darcy- Weisbach, or Chezy-Manning formulas we have computed Head loss. The solution is simple, and it proved to be useful and practical for the modelling.

REFERENCES

[1]. Petr Ingeduld, Ajay Pradhan, Zdenek Svitak, Ashok Terrai "MODELLING INTERMITTENT WATER SUPPLY SYSTEMS WITH EPANET", American Society of Civil Engineering,2004

[2]. N. Sashikumar1, M.S. Mohankumar1 and K. Sridharan1," Modelling an Intermittent Water Supply" American Society of Civil Engineering,2004

[3] Shamir, U. and Howard, C.D.D. (1968). "Water distribution systems analysis." *J. Hyd. Div.*, ASCE, Vol. 94, No. HY1, 219-234.