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Analysis of Water Distribution System by Optimization

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ABSTRACT

Water distribution system (WDS), which is a connected hydraulic system elements ensure water supply and provision to meet demand while being efficient it is used in many systems and situations, thus making it an important paradigm technology. When we try to improve, we reduce (resource consumption, cost) or increase (profit, system performance). This paper reviews water efficiency distribution systems and introduces different aspects of WDS. It also reveals different ways to do well in a detailed way. Finally, the modern complex development methods are refined enough to solve complex real-world problems such as the design and functionality of WDS. Categories that are solved include: new WDSs design; expansion and refurbishment of existing WDS; pump operation; water quality management; system measurement and classification. Honesty, resilience and considerations of robustness are commonly found in WDS publications and are still open analysis because no model is generally accepted for permanent inclusion in it Improving WDSs.

Key words: Water Distribution System; Optimization; Water; Hydraulics; Configuration

I. INTRODUCTION

Analysis of the water distribution network (WDN) determines the output rate, hydraulic gradient (HGL) levels, nodal focus etc., to meet the needs of population. In the usual way of analysis, the unique amount of piping and hydraulic heads are available. The results are as follows findings may not provide satisfactory performance due to the many uncertainties in the nodal requirements, the pipe hardness, length, width of pipes, water levels in reservoirs, head out pump characteristics etc., due to difficulty WDN behavior, reliable standards are it is usually not possible in each area as well network links. While raising the existing network, length and width of the pipe is thought to be compatible even if the network has been in use for many years. the width and friction coefficient of the pipe may they vary due to the structure of the scale in the interior of plumbing and aging process; pipe lengths also vary as a result of the presentation of members or removal a pipeline line during normal operation. However, the same was not considered in the usual method of analysis and thus does do not give the expected result. So in the present tense study, plumbing abuse is considered uncertain parameter. All other parameters are considered crisp without the weight of the pipe in the vertex path set a vague theory of avoiding extremes computer requirements. In short the description of the EPANET is below.

II. OBJECTIVE

- ➢ To provide safe and healthy drinking water to the consumers.
- ➢ To make water available within easy reach of the consumers so as to encourage the general cleanliness.
- ➢ To supply water at reasonable cost to the users.
- ➢ To encourage personal and house hold cleanliness of users.
- ➢ Minimizing network cost and maximizing hydraulic reliability using optimization
- ➢ Minimizing transient adverse impacts

III. SCOPE OF THE STUDY

i. Currently India has taken a major initiative on developing the infrastructures such as express highways, power projects, ports and harbors, to meet the requirements ofglobalization, in the construction of pavements and other structures plays the key roleand a large quantum of concrete is being utilized in every construction practices.

ii. Foundry sand can be suitable variety of beneficial reuse as parking lots, building, roadpavement, and pieces of equipment.

iii. Also foundry sand is used as a raw material manufacturing other products, such ascontrolled, low strength material, asphalt, cement, concrete, grout, lightweightaggregate, concrete block, bricks, roofing materials, plastics, paint and glass etc.

IV. METHODOLOGY

Head loss formula by Hazen-Williams:

Friction head loss in meters (h_f)

$$hf = \frac{10.68 L Q^{1.85}}{C^{1.85} D^{4.87}}$$

Where,

h_f= Friction head loss

L= Length of pipe in meters

Q= Discharge in cubic meters per sec

C= Hazen-Williams Coefficient

V. RESULT AND DISCISSION

Example:- Consider a network of 13 nodes,21 pipes and 2sources. The total system demand is 871 Lps

Node Characterstics:

Node ID	Elevation (m)	Demand (Lps)
1	27.43	0.0
2	33.53	59
3	28.96	59
4	32.00	178
5	30.48	59
6	31.39	190
7	29.56	178
8	31.39	91
9	32.61	0.0
10	34.14	0.0
11	35.05	30
12	36.58	30
13	33.53	0.0
Reservoir 1	60.96	N/A
Reservoir 2	60.96	N/A

Table.01

Pipe characteristics:-

Pipe No.	Length (m)	Diameter (mm)	HW Coefficient	Pipe No	Length (m	Diameter (mm)	HW Coefficient
1	609.60	762	130	12	1371.60	381	108
2	243.80	762	128	13	762.00	254	106
3	1524.00	609	126	14	822.96	254	104
4	1127.76	609	124	15	944.88	305	102
5	1188.72	406	122	16	579.00	305	100
6	640.08	406	120	17	487.68	203	98
7	762.00	254	118	18	457.20	152	96
8	944.88	254	116	19	502.92	203	94
9	1676.40	381	114	20	883.92	203	92
10	883.92	305	112	21	944.88	305	90
11	883.92	305	110				

Table.02

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Analysis of Hydraulic Network:

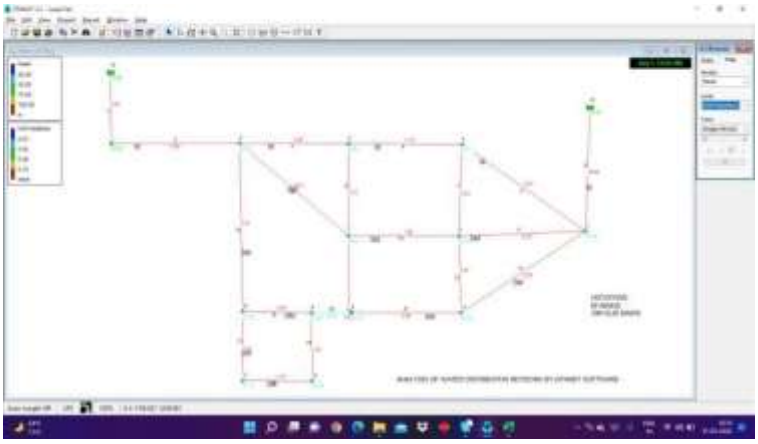

Table.03: Nodes Result

Network Table - Nodes

Node ID	Demand LPS	Head m	Pressure m	Quality
Junc 1	0.00	58.39	31.16	0.00
Junc 2	35.00	45.39	12.86	0.00
Junc 3	50.00	44.31	15.95	0.00
Junc 4	178.00	44.77	12.77	0.00
Junc 5	55.00	46.43	17.95	0.00
Junc 6	198.00	43.09	11.78	0.00
Junc 7	0.00	44.22	14.66	0.00
Junc 8	65.00	42.40	10.23	0.00
Junc 9	0.00	41.44	5.83	0.00
Junc 10	0.00	41.39	7.45	0.00
Junc 11	30.00	41.18	6.05	0.00
Junc 12	30.00	39.48	2.88	0.00
Junc 13	0.00	45.28	11.75	0.00
Resvr 14	-333.42	58.36	0.00	0.00
Resvr 15	-371.58	58.36	0.00	0.00

Table.04: Pipe Result

Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Unit Headloss m/km	Friction Factor	Status
Pipe 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 7	50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open
Pipe 20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Open

VI. CONCLUSION

From above study it was concluded that; EPANET software is time saving and has no limitation for number of nodes, number of pipes or pumps to be modelled and analysed in it so complex networks can be easily solved. As the number of iterations increase, the value of head loss becomes closer to zero and to verify the obtained answers, balancing of flows at each point is done.

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