Impact Factor (SJIF): 3.632

International Journal of Advance Research in Engineering, Science & Technology

e-ISSN: 2393-9877, p-ISSN: 2394-2444

Volume 3, Issue 5, May-2016

ANALYSIS OF EXISTING WATER DISTRIBUTION NETWORK FOR CONTINUOUS WATER SUPPLY [24X7]

Amit singh solanki[1], R.B.Khasiya[2].

P.G. Scholar, Civil Engg Dept.,Dr. S&SS Ghandhy GEC,Surat,Gujarat,India [1]

Professor, Civil Engg Dept.,Dr. S&SS Ghandhy GEC,Surat,Gujarat,India [2]

Abstract: *The present paper discusses the importance of providing continuous water supply to the society by modifying the existing dead end water distribution system.The water distribution system is intermittent type providing water just at the peak hours of day. Thus the water demand is not fulfilled by the existing water distribution system. The water supply is such that it only provides water just for few hours of the day so people are forced to store water in roof tank and ground tanks or buy it from private water sellers. This reduction in water supply is not saving much of the water in fact the people in slum area are forced to use contaminated water from false supply. The study area Maghob and Dumbhal (East Zone Surat) are having the dead end type of water supply system providing water just for the few hours of the day. The people of study area are facing problems like improper pressure condition, poor water quality, unable to store water, no supply at the time of maintenance. The dead ends of the system are closed into closed loop by providing proper diameter pipe to the dead ends by using EPANET tool box.The contamination in the network will be reduced and leakage through the joints can be detected by using EPANET software.The closed looped network formed can supply water 24x7 as the system is transformed into continuous water supply system.*

Keywords: *Continuous Water supply, Present water supply Data, East zone surat, Epanet software.*

INTRODUCTION

As of 2010, only two cities in India - Thiruvananthapuram and Kota - get continuous water supply. In 2005 none of the 35 Indian cities with a population of more than one million distributed water for more than a few hours per day, despite generally sufficient infrastructure. Owing to inadequate pressure people struggle to collect water even when it

According to the World Bank, none have performance indicators that compare with average international standards. A 2007 study by the Asian Development Bank showed that in 20 cities the average duration of supply was only 4.3 hours per day. None of the 20 cities had continuous supply. The longest duration of supply was 12 hours per day in Chandigarh, and the lowest was 0.3 hours per day in Rajkot. According to the results of a Service Level Benchmarking (SLB) Program carried out by the Ministry of Urban Development (MOUD) in 2006 in 28 cities, the average duration of supply was 3.3 hours per day, with a range from one hour every three days to 18 hours per day. In Delhi residents receive water only a few hours per day because of inadequate management ofthe distribution system.

Achievements: Jamshedpur, a city in Jharkhand with 573,000 inhabitants, provided 25% of its residents with continuous water supply in 2009.Navi Mumbai, a planned city with more than 1m inhabitants, has achieved continuous supply for about half its population as of January 2009. Badlapur, another city in the Mumbai Conurbation with a population of 140,000, has achieved continuous supply in 3 out of 10 operating zones, covering 30% of its population. Thiruvananthapuram, the capital of Kerala state with a population of 745,000 in 2001, is probably the largest Indian city that enjoys continuous water supply.

There are two types of Water Distribution Network (1) Branch Network and (2) Loop Network. The looped network is more efficient than a branched network, but involves complicated design and construction. This is also not suitable for rural areas where the dwellings are far apart and hence will require long piping and large numbers of fittings. A low cost water distribution will not be possible with a looped network unless the community is densely or closely populated. The branched network is less complicated to design and construct and hence more suitable for small communities and rural areas. This branch system has a disadvantage that when the supply is terminated at one point for repairs or maintenance, the entire downstream population will lose their supply.

METHODOLOGY AND DATA COLLECTION

EPANET is a computer program that performs extended period simulation of hydraulic and water quality behavior 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

These can include:

- altering source of utilization for multiple source systems,
- altering pumping and tank filling/emptying schedules,
- use of satellite treatment, such as re-chlorination at storage tanks,
- pipe cleaning and replacement target

❖ **Present status of water supply:**

The water available for present water distribution is for the afternoon period only, from 12:30pm to 4:30pm for 4 hours only.

There are three water storage for east zone surat:

❖ Varacha WDS - 60 ML

❖ Katargam WDS- 45.78 ML

❖ Ummarawada WDS- 45 ML

Total- 150.78 ML

❖ Approx – 151 ML

STUDY AREA MAP-EAST ZONE SURAT

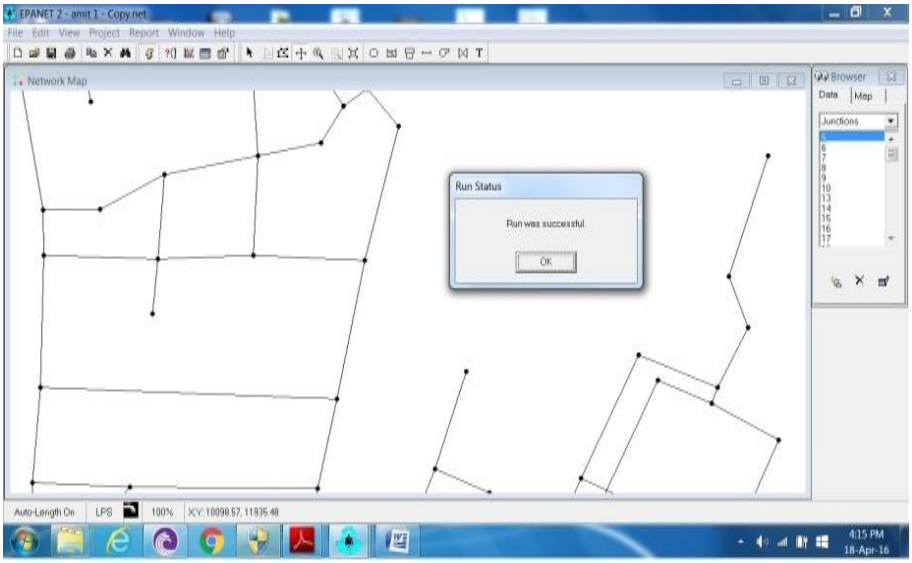

Figure 1: Print Screen of Run analysis in EPANET

The figure below indicates the message "Run was Successful" after successful run.

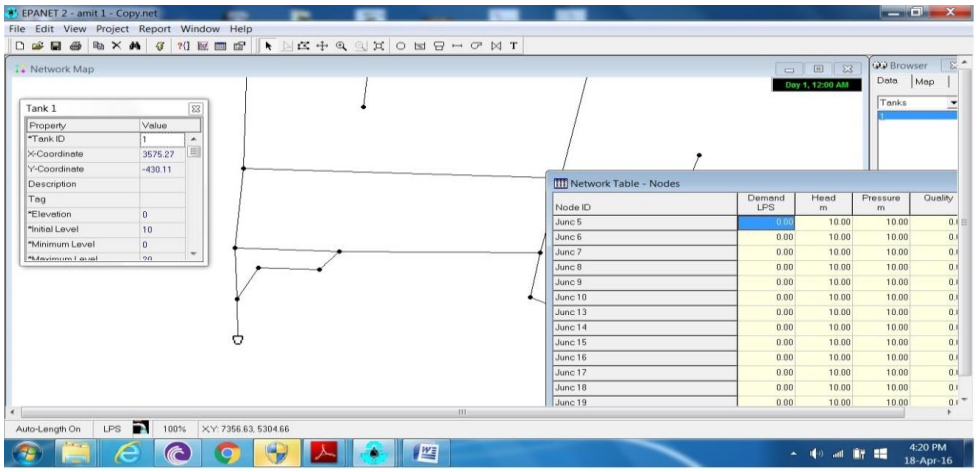

Figure 2: Tabular result of junction

Result of pipe

The table below indicates the hydrological results at every pipe of the network, making it easy to identify the elements having the results which are not logical or which may determinethe instability of network

Table 1: Results at Pipe (EPANET)

Table:Result of Pipe(EPANET)			
Pipe No	**Flow(l/s)**	**Velocity(m/s)**	**Headloss(ft/kft)**
P-1	503.76	3.58	2.01
P-2	179.83	0.68	1.43
P-3	61.94	1.05	2.96
P-4	66.41	1.28	7.3
P-5	23.16	1.71	2.49
P-6	4.71	0.26	0.53
P-7	22.53	1.23	9.6
P-8	31.28	0.62	2.67
P-9	6.39	0.35	0.93
P-10	5.55	0.3	0.72
P-11	253.73	1.36	3.2
P-12	14.96	0.82	4.5
P-13	301.99	2.56	3.7
P-14	95.71	0.96	2.26
P-15	94.73	1.3	4.69
P-16	32.05	0.99	4.54
P-17	58.84	0.81	1.94
P-18	71.22	1.41	6.72
P-19	-26.22	0.52	1.06
P-20	101.43	1.39	5.32
P-21	79.09	1.56	8.16
P-22	-19.99	0.62	1.89
P-23	-128.65	1.3	3.9
P-24	19.71	1.08	7.5
P-25	9.12	0.5	1.8
P-26	14.55	0.8	4.27

Result of Junction

The table below indicates the hydrological results at every Junction of the network, making it easy to identify the elements having the results which are not logical or which may determine the instability of network. The results obtained from the software are Head of Junction in Meter and Pressure at Junction in kg/cm2.

Table 2: Results at Junctions (EPANET)

Node ID	Head (m)	Pressure
Head	(m)	(kg/cm2)
J-2	30.72	1.47
J-3	30.63	1.46
J-4	28.89	1.33
J-5	28.33	1.33
J-6	28.27	1.33
J-7	28.7	1.37
J-8	28.54	1.35
J-9	29.91	1.49
J-10	29.81	1.48
J-11	30.16	1.41
J-12	29.56	1.35
J-13	29.13	1.31
J-14	28.67	1.27
J-15	28.49	1.25
J-16	28.77	1.23
J-17	29.29	1.23
J-18	28.3	1.23
J-19	27.36	1.33
J-20	27.24	1.32
J-21	28.37	1.24
J-22	25.59	1
J-23	26.5	1.07
J-24	26.65	1.08
J-25	26.54	1.09

CONCLUSIONS

From the above study of Pipe Network Analysis using EPANET and ground survey on study area Maghob and Dumbhal(East zone) Surat city, From the ground survey done at the study area it can be said that the study area people are not satisfied with the water supply service. Many people are facing different problems from intermittent water supply. From the survey it is clear that the people want a continuous water supply and that is possible from a continuous water supply system. The intermittent water supply system of the study area comprises severe deficiencies which lead to poor water quality and pressures, inadequate quantity, discomfort and inconveniences, contamination etc. By closing the dead ends of the existing water supply network by using 90mm pipes closed loop network is formed. The existing dead end water supply network is modified to continuous water supply system. The optimized closing of dead ends gives an output or result with minimum head loss and in efficient way. In accordance with these appropriate head is achieved with passage of desired flow at sufficient velocity through the pipe system. The network now can supply water 24 x 7 to the study area as all the dead ends are closed into closed loop transforming the existing supply network into continuous water supply network.

REFERENCES

(1) P. B. Cheung, J. E. Van Zyl, L. F. R. Reis, 2008, "Extension of epanet for pressure driven demand modeling in water distribution system."

(2) Debbie S. Shinstine; Iftekhar Ahmed; and Kevin E. Lansey,2009 "Reliability/Availability Analysis of Municipal Water Distribution Networks:Case Studies."

(3) Avner Kessler/ Avi Ostfeld,z Member, ASCE, and Gideon Sinai,3 Member,ASCE,2009, "Detecting accidental contaminations in municipal water networks."

(4) Xiongfei Xie1; Mahmoud Nachabe, F.ASCE; and Bo Zeng, 2009, "Optimal Scheduling of Automatic Flushing Devices in Water Distribution System."

(5) Thomas M. Walski, M. ASCE 2010, "Case study: pipe network model calibration issues."

(6) Mridul Joshi and Nikhil kumar, 2011, "Sugave and six village water supply scheme."

(7) Niklesh R. Murekar, Isha Khedikar, 2011, "Design of distribution network of Water supply for Kudwa and Katangi-Kala villages."

(8) Janki.H.Vyas , Narendra.J.Shrimali , Mukesh.A.Modi ,2013, "Optimization of Dhrafad Regional Water Supply Scheme using EPANET."

(9) Ms. Urmi Parikh Mr. B. M. Vadher Dr. P. G. Agnihotry, 2013, "Study of Water Distribution Pipe Network Using Epanet2.0."

(10) A Saminu, Abubakar, Nasiru, L Sagir, 2013, "Design of NDA Water Distribution Network Using EPANET."