A REVIEW STUDY ON USE OF EPANET FOR WATER DISTRIBUTION NETWORKS.

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ABSTRACT - The very basic need of every living organism is food and water. Hence water plays an very important role as far as the life is concerned. Hence it becomes necessary to conserve water and use water efficiently. If there is shortage of water then it will result in inconvenience to human life as well as it will impact city function and Industrial production. Design and analysis of water distribution network is important, not just because water is an important economic parameter, but also because water plays vital role and is a deciding factor as far as the future is concerned. Hence a formulated water distribution network is required to get optimal discharge. EPANET is a computer based program which performs extended period simulation of hydraulic as well as water quality analysis. EPANET is designed as a research tool to understand the movement and fate of drinking water constituents in better way. This study represents the role of EPANET software in water distribution network.
Keywords – EPANET, Water distribution network.

I. INTRODUCTION TO WATER DISTRIBUTION NETWORKS.

It is impossible to imagine human life without water on earth. Humans require water for drinking, cooking, washing, sanitation, agriculture etc. Hence to provide these various uses, the supply of water should meet the demand of the user, and should be satisfactory in quality. Water should be readily available to users with adequate pressure and be relatively cheap. It is essential to provide water to each and every consumer of water at desired discharge and in sufficient amount. In today's age water distribution network is must , a water distribution network is nothing but a hydraulic infrastructure which consists elements such as pipes, valves, reservoirs pumps etc. The conventional methods of water distribution had approach of trial and procedure. The efficiency of the method used was completely dependant upon the knowledge, skills, experience of the person executing the task. Hence this method becomes inefficient when a comparatively large complex system has to be analysed and designed. And it leads to a better approach and use of computational techniques to solve the water distribution problems. Intense review were carried out for software's that are used in designing water distribution networks. Software's for water distribution including public domain software's like EPANET, Water Gems, WaterCAD etc. EPANET is a public domain software using which we can design any sort of water distribution   network. What makes EPANET different than other software's is it can track the flow of water in every pipe, the pressure in every node, and the height of water in every tank, the concentration of chemical constituents in the present network. This software gives many advantages like water quality analysis, extended period simulation, residual chlorine calculation etc.
EPANET can be helpful in assessing alternative strategies in improving quality of water throughout the system.
It includes :-
  (i) Utilization of Altering source within multiple sources of system,
  (ii) Altered pumping, tank filling or emptying schedules
  (iii) Use of satellite treatment in network, such as re-chlorination of storage tanks,

WaterCAD is a whole different application that is being used to model water distribution networks. The software

is published by Bentley Systems Inc. which is one of the leading network in modeling applications. In last many years the application has become more focused to an great extent on integration with GIS (Graphical Information Systems) which is used nearly by all developed countries to map their networks. WaterCAD mainly allows users to construct models from scratch and at the same time import different drawings of networks which are being prepared with AutoCAD and other drafting systems.

WaterGEMS is a user friendly and less complicated application which provides users a comprehensive yet user friendly tool for design and analysis of water distribution networks. The software helps in improving our knowledge of how the infrastructure works as a system and how does it react to different operational strategies as well as how it should grow as population and demands increase.

II. LITERATURE OVERVIEW

A study was carried out using EPANET 2.0 to evaluate and assess public water supply system for the design period of 30 years by Arunkumar M & Nethaji Mariappan. The Hydraulic model was built and successful run was carried out with EPANET 2.0 for "A" zone, Thirumullaivoyal, Avadi city of Tamilnadu, India. The test was carried out for 24 hours supply and intermittent supply of 6 hours and the resulting pressure at different nodes were checked. Pressure for intermittent supply of was observed almost double (24.03 m) that to pressure observed with 24 hrs. supply (12.02 m). On other hand equal pressure was observed throughout the model by providing pressure break and pressure release valves. (1). It was observed that water distribution system modelling faces problems with large number of variables which could be uncertain in nature when Shibhu A. & M. Janga used EPANET for water distribution newtork. These uncertainties are mainly due to Formula used for computation ,The coefficients used in formula., Lack of knowledge of different parameter's values.(2)

A research was carried out on the efficiency of water distribution network using Arc GIS and EPANET software's. The study area selected was Utkhana, Nagpur, Maharashtra, India. Mohapatra S , S Kamble et.al. basically reviewed simulated results pertaining leakages in continuous as well as intermittent water supply system. EPANET was successfully used for simulation of both continuous as well as intermittent supply. They concluded that if direct tapping to transmission mains and immediate repairing of leakages is done then the system could be improved. (3)

A study was carried out using EPANET for water distribution network of a small area from Punjab city, India by Gupta I et.al. The work basically included the design of water distribution network with help of EPANET software along with the study of hydraulic parameters required in design and corresponding variations in their functions and values. Design and development of network consisted data collection, building water distribution model and calibration of it with bore-well as source of water supply. Comparison of pressure was also carried out between results obtained from field survey and from the build model. The study showed that results obtained from EPANET based model and actual network are close enough to each other.(4)

Using EPANET for intermittent water supply scheme with two case studies of Shillong, India and Dhaka, Bangladesh Ingeduld P & Zdenek Svitak carried out a investigation. The intermittent water supply systems were highly influenced by the low pressure and "dry pipe" situations and hence adjustment in basic EPANET source code were carried out so as to design water distribution network. Authors developed a configurable tool for incorporating roof tanks into the water supply analysis and for better formulation and schematization of the system hydraulics. Results were obtained. (5)

After a research Zongwoo C & Han observed that when the present water distribution model was interfered with popular hydraulic simulator, EPANET , to check the hydraulic constraints the model was successfully applied to five networks. The obtained design that were either the same or 0.28-10.26 % cost less than those of competitive meter-heuristic algorithms such as GA, SA, TS under similar or less favorable conditions. The results showed that Harmony search linked with EPANET software is suitable for water network design. (6)

III. OUTCOME & CONCLUSIONS

Here we observed that even though there are different applications to design a water distribution network still EPANET software is very easy and cost saving method when compared to other methods. The uncertainty may be observed if values of different parameters varies.The main focus of this research was to analyse the water distribution network and identify deficiencies in it (if any) , implementation and its usage. This extensive review of softwares for designing and modeling water distribution networks concludes that the choice of design softwares mainly and entirely depends upon the availability of the data, time, financial, implications, resources, applicability, compatibility and overall purview of the project. Design of water distribution network is based on the projected population of a particular city or town, estimated for the design period. Any underestimated value will make system inadequate for the purpose intended; similarly overestimated value will make it costly.

REFERENCES

1) Arunkumar M, Nethaji Mariappan V.E. (2011), "water demand analysis of municipal water supply using EPANET ", International Journal on Applied Bioengineering, Vol.5, No. 1.

2) Shibhu A. and M. Janga Least cost Design of water distribution network under demand uncertainity by Fuzzy-Cross Entropy Method by Reddy, Journal of Environment Research and Development Vol.6 No.3A, Jan - March 2012.

3) Mohapatra S, S. Kamble, A. Sargaonkar & P.K. Labhasetwar (2012), "Efficiency study of a pilot water distribution system using EPANET and ArcGIS10", conference CSIR-NEERI.

4) Gupta I, Dr.R.K. Khitolya, Dr.Shakti Kumar (2013) "Study of water distribution network using EPANET", International journal of computational Engineering Research, Vol.03, Issue 6.

5) Ingeduld P ,Zdenek Svitak (2006) , "Modelling intermittent water supply systems with EPANET " ,International Journal of Computational Engineering Research, Vol. 03, Issue 6.

6) Zongwoo and Han (2006)., Application of Harmony search to multi-objectives optimization for satellite Heat Pipe Design. AST -1.1.