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Leakage Detection through HL in Gurthali Water Supply Distribution Network using EPANET

Neeraj, MeenakshiNawal, Mahesh Bundele, P.K.Suri

***Abstract:** Water distribution network (WDN) design of hydraulic model Gurthali, NARWANA-JIND, HARYANA and objective of this paper to detecting the leakage in it.In current research work to find out the Hl through normal valve and leak valve control setting with randomly value.To detect the Head Loss to usedDarcy Weisbach methodwhich calculate the major and minor loss with friction in pipes links. EPANET tool is used to create enlarge hydraulic model and simulate the data. All the pipes to be analysis unit head loss and nodes analysis head loss foe every houses. For leak detection, four normal valve include to compute head loss or pressure drop on nodes, pipes and leak detection valves. Also find out the pressure and head loss on the all nodes and pipes.MS Excel used for leak detection data, at the various head loss values in valves, nodes, pipes links. Plot the various graphs with head loss on valves which generated that HL reduces drastically.*

***Keywords:**Head Loss (HL), Leak Detection, EPANET*

I. INTRODUCTION

Water distribution network to become important part of life to save the water for future. In EPANET modeltransmits water from main water supply to all houses through linksand it's include reservoirs, nodes as houses, pipes as links, normal valves and leak valve. In this tool no limits of tanks, pipes, junctions, pumps and types of valves. We can also take elevation, diameter of pipes, length of pipes and roughness. EPANET can be used for small and large water distribution network. EPANET tool work at three formulas Darcy-weisbach, Hazen-Williams and Chezy-Manning formula.

I also have used Darcy weisbach formula. Firstly real map import in AutoCAD 2017 software to select the dimensions of the map after this convert in EPACAD file because EPANET can't use direct file of AutoCAD.EPANET only import EPACAD files. In EPACAD software to select a needed area. A network to be designed for analysis the data in excel with multiple tables and simulation done.

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The objective of this paper to optimize the HL on normal valves with vary different settings on v1,v2,v3,v4 and set the leak detection valves at the different open or close status and also optimize the data at junctions with Head loss and pressure, data of pipes links with friction, unit head loss and velocity. Valves to be include PVC type.

First section described introduction and section two briefly about literature review. In section third explain methodology. In section fourth EPANET implementation. Section five describes the results with graphs. Section six give the details of conclusion and future work. At last, include the references

II. LITERATURE REVIEW

EPANET tool used by various countries for analysis of water distribution network such us H2O map, Water Gems, Water CAD, WATSYS, Water CAD, HydrauliCAD,etc.This software can be easily installed at free of coat. United States Environmental Protection Agency's developed this tool for Water Supply distribution network and monitoring the leak. With the help of EPANET tool can be optimized minor and major losses.[18].

Head Loss Ratio to be calculated at nodes, pipes, valves and leak valves with different ratio and conclude pressure drop. It use the emitter property at junctions [1]. Node labels were mapped to actual distance and accuracy was calculated by dividing all predictionswith sample and multiplying result by one hundred. Correlation coefficient and RMSE for each set was also calculated [2].

EPANET can be used in different modes and it drives from Water Net Gen that completely describesleakage detection in links **[3].** The optimal control setting for the present time steps (in this case 24 hours) is implemented using EPANET 2.0 Software which tracks the flow, velocity and pressure on the nodes and elevation at every reservoir [4]. The calculation of the flow to be calculated at minor and major losses using mathematical formulas [5].

III. METHODOLOGY

3.1 Objectives of EPANET

- Detect the leakage in water supply distribution network.
- Find out the HL or pressure drop on the nodes (houses), pipes (links) and valves.
- Designed a network according to real map scenario.

Gurthali water supply, narwana is located in Jind district, Haryana. Thepopulation count is approximately18000. Its design based on existing municipal water supply distribution network. In this area water supply network designedby according to consumption and it'sconsistsmanually reading, but leakage are not found easily, find out the leaks it take more efforts.

Water is necessary for every person anddemands of persons increased day by day and save the wastage of water. EPANET tool simulated WDNand examined leakage area. It's also have four boosting station which calculated flow and pressure.

3.2.1Area Network

Area network of Gurthali to have all public and houses and street consists of 115 pipes of uniform material and diameter, 116 junctions with elevation, 4 normal valve,6 leak valve, 1 tanks and 1 reservoir. Normal valve placed at the main pipe lines link and leak valve placed at the sublinks. Reservoir placed at the starting point of network and after that distributed water to the entire network. There are multiple pipelines with 16,12,4 and 0.5 diameter then running for each way. In designed network to include two map network large and small. But in this paper included small map network.

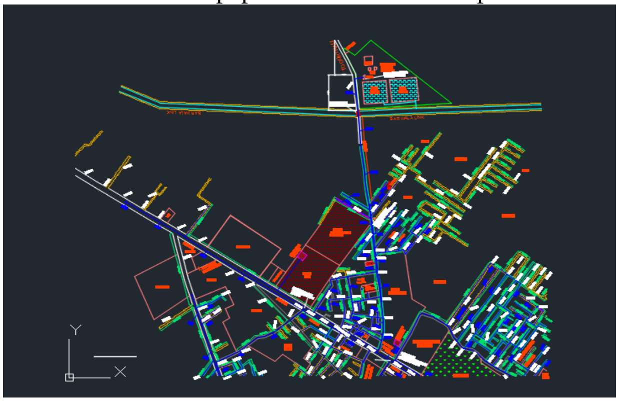

Figure1: Gurthali area network diagram designed in AutoCAD

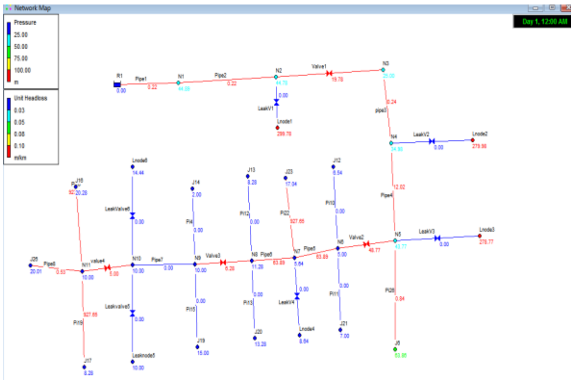

Figure 2: Network Representation with Pressure on nodes and Unit HLon links in small map network

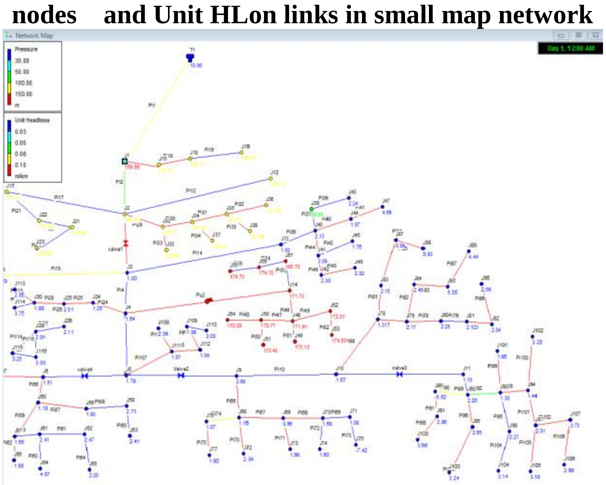

Figure 3: Network Representation with Pressure on nodes and Unit HL on links in large map network

3.3. Mathematical equation: Complete formula explain with parameters and pipeline diagram.

3.3.1. Darcy Weisbach equation:

In water distribution network multiple pipes connected with different size. In pipes to calculate the head loss with friction factor to using the Darcy Weisbach method. Every pipes have minor loss and major loss but we have calculate only major loss at every pipes. Here D1=D2 and A1=A2=A

Darcy Weisbach method is used for to calculate the Head Loss in pipes. When fluid travel in pipes due to some losses it means pressure drop that pressure drop calculate as Head Loss. This method apply all the pipes in the network.

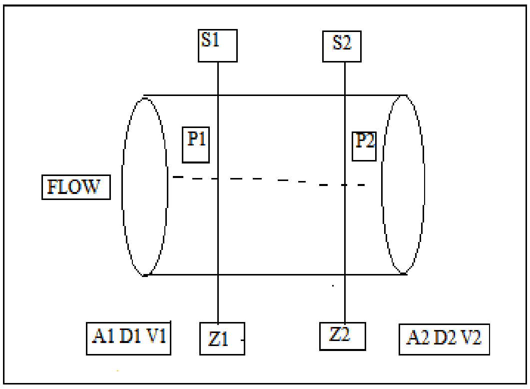

Figure4: DW method apply on a single pipe for calculate HL

Suppose I have a pipeline with a central line that have two central section. At the section one pressure that will be P1, Area A1, Diameter D1, Velocity V1and section two have pressure P2, Area A2, Diameter D2, Velocity V2. Fluid flow in pipe with pressure P1 and pressureP2.Suppose at the section one pressure is high compare to pressure P2 that means P1-P2 called pressure drop. It means fluid travel in pipe. If p1=P2 that means fluid is not travel in pipe.

For to calculate the pressure drop applying Bernoulli's equation between section one and two:

$$\frac{p^1}{\delta g} + Z^1 + \frac{v^1}{2g} = \frac{p^2}{\delta g} + Z^2 + \frac{v^2}{2g} + hf$$

Here hf is the Head Loss friction that help in fluid flow. In the pipe at the section one Head Loss is h1 and at the section two Head Loss is h2 that is like h1- h2 that create some losses that called Head Loss due to some friction. Z1 and Z2 is distance from center line to data line of pipe it means Z1=Z2, also A1=A2,D1=D2. If diameter same then velocity V1=V2.

$$\frac{P_1}{\delta g} = \frac{P_2}{\delta g} + hf$$

$$\frac{P^1}{\delta g} - \frac{P_2}{\delta g} = hf$$

$P^1 - P_2 = \delta g hf$" (1),"

According to force: which force to oppose the fluid flow that called force of friction. Here F is frictional force. $\Sigma fx = 0$

According to scientist in frictional force πDLmeans curve surface area and πD is the parameter of circle.

F=f' πDLV^2

f' is frictional resistance which work on area curve surface area and unit velocity.

$$F_1 - F_2 - F = 0 \because F = f'PLV^2$$

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F_1-F_2=F P=F/A

F1 at the section one which equal P1A1 and F2 at the section two which equal P2A2

P_1A_1-P_2A_2=f'PLV^2 F=P∗A

$A(P_1 - P_2) = f'PLV^2 P/A=\pi d * 4/\pi d^2 = 4/d$

P_1-P_2=f'PLV^2/A

P_1-P_2 = f' PLV²/d “(2),”

Equation 1 and 2 put equal then:

δghf = f' 4LV²/d

hf=f' 4LV²/d∗δg

Finally HL on single pipe line: on the place of 4L can put λ

hf = f' 4LV²/2gd

hf = f' λV²/2gd

After mathematical equation to show the demand pattern and curve editor.

3.3.2. Demand Pattern:

Water demand pattern to show multiplier have different demand of water each day and how’s water need a individual person. As consumption of water is dynamic, so water demand also varies.

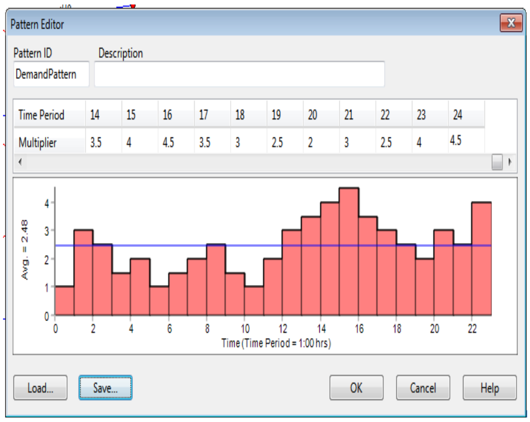

Figure5: Demand Pattern

In figure 5. Show the pattern ID for 1:00 hours per time period for multiplier and average of water is 2.48. Pattern editor to work for 24 hours and in this time demand of every person to be changed. Average of water is 2.40. In the day water demand increased and in night water demand decreased. All the data collected according to simulation.

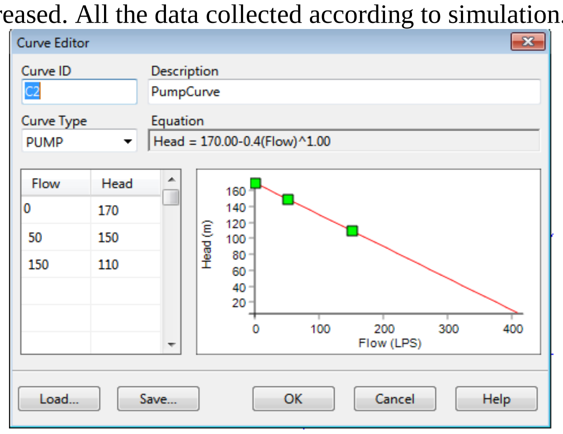

Figure6: Curve Editor

Curve editor to show the flow and head curve type. In this curve editor to use the pump curve type which have flow and head. Flow to be show in the litter per second.

Table 1: Network table of Links

Pipe Links	Unit HL *valves*	Status
Valve1	19.98	Active
Valve2	53.50	Active
Valve3	5.50	Active
Valve4	15.50	Active
Leak valve1	1.02	Open
Leak valve2	0.00	closed
Leak valve3	0.00	closed
Leak valve4	0.00	closed
Leak valve5	0.00	closed
Leak valve6	0.00	closed
Leakvalve1	Leakage	Active

In table 1 all the valve in active status and leakage find at the leakvalve1.

Table 2: Network table of nodes

Node ID	Head	Pressure
Leaknode1	299.98	299.98
Leaknode2	280.00	280.00
Leaknode3	280.03	280.03
Leaknode4	230.00	8.03
Leaknode5	225.00	10.00
Leaknode6	225.00	14.44
JuncN2	299.98	44.98
JuncN3	280.00	25.00
JuncN6	230.00	5.00
JuncN9	225.00	10.00
N6	HL	Pressure drop

In table2 more than pressure drop at N6. Pressure to be optimize at all the nodes. Leaknodes to be established with leakage valves.

Table 3: Network table at pipes

Network Table - Links at 0:00 Hrs

Link ID	Unit Headloss	Status
Pipe Pipe5	63.89	Open
Pipe Pipe6	63.89	Open
Pipe Pi22	927.65	Open
Pipe Pipe1	0.22	Open
Pipe Pipe2	0.22	Open
Pipe Pi26	0.84	Open
Pipe Pipe8	0.53	Open
Pipe Pi4	0.00	Open
Valve Valve2	48.77	Active
Valve Valve3	6.28	Active
Valve value4	5.00	Active
Valve Valve1	19.78	Active
Valve LeakV2	0.00	Closed
Valve LeakV3	0.00	Closed
Valve LeakV1	0.00	Open
Valve LeakV4	0.00	Closed
Valve Leakvalve5	0.00	Closed
Valve LeakValve6	0.00	Closed

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IV. EPANET IMPLEMENTATION

After design the network to simulate the data. In EPANET, normal valve randomly set and leak valves also used in algorithm to use for water distribution network. In this firstly calculate the HL for 24 hours at DW equation. This formula repeat for over all network set up.

Algorithm 1: **EPANET**

Input: set the control setting valves and leak valve set at open and close status

Output: Calculate the pressure drop or HL at the different nodes or junction

Step1: set time=0 to initiate leak detection systems

Step2: Apply Darcy Weishbachequation to compute the HL ratio or pressure drop

$hf= 4fLV^2/2gd$ or h1-h2

$$hf= 4fLV^2/2gd$$

$hf= f\lambda V^2/2gd$

Step3: Calculate major loss

Step4: Compute pressure drop(P1-P2) or HL(h1-h2) at all nodes and valves

Step5: if t=0, not found pressure drop then go to at time=t+1, repeat until can't found the significant results.

V. RESULTS

EPANET, find the HL on the nodes, valves and pipes. In this control valves setting at different positions and leak valves set at open and close status.

5.1. Simulation Environment:

Find out Head Loss in the different conditions: Head Loss on the normal Valve V1, V2, V3, V4

Graphs: Valve1= 5 to 25(setting) .Valve v1 vary at 5 to 25 and V2=V3=V4= 10(setting). LV1, LV2 in open status and LV3, LV4, LV5, LV6 in close status. In the fig 7.to find out the head loss on the valve V1, V2, V3, V4

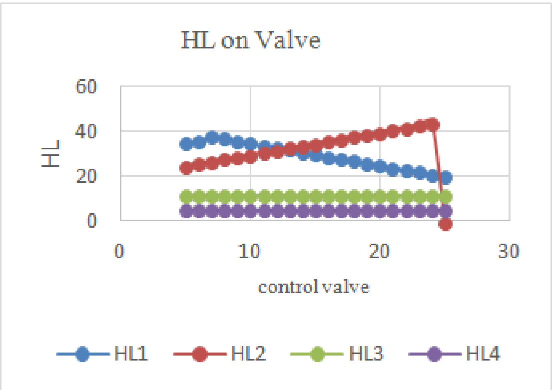

Figure7: HL on valve

In the figure 7. Pressure drop at HL1 and HL2 it means leak create between 10 and 20.

When vary v1, v2,v3,v4 and all the leak valve to be set any condition then HL on the nodes, HL on the pipes and pressure on the nodes will be same on the normal valve at the given conditions

1) v1=5-25,v2,v3,v4=10
2) v2=5-25,v1=25,v3,v4=10
3) V3=5-25,v1=25,v2,v4=10
4) V4=5-25,v1=25,v3,v4=10

Valve v1 vary at 5 to 25 and V2=V3=V4= 10(setting). LV1, LV2 in open status and LV3, LV4,LV5, LV6 in close status then find out the head loss on the nodes which are near the normal valve v1 to v4.

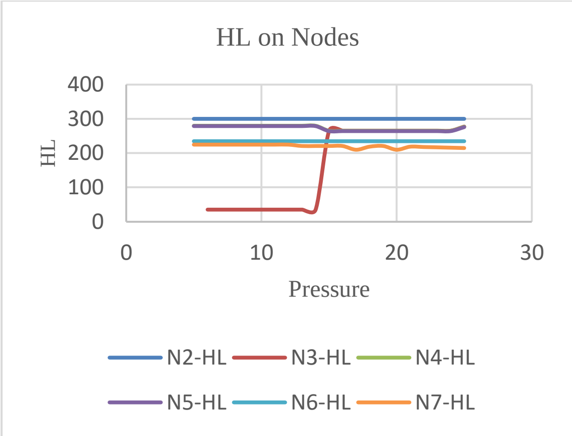

Figure8: HL on nodes

Valve v1 vary at 5 to 25 and V2,V3,V4 set at 10 and LV1,LV2 in open status and other LV3,LV4,LV5,LV6 in close status then find out the head loss on the Pipes.

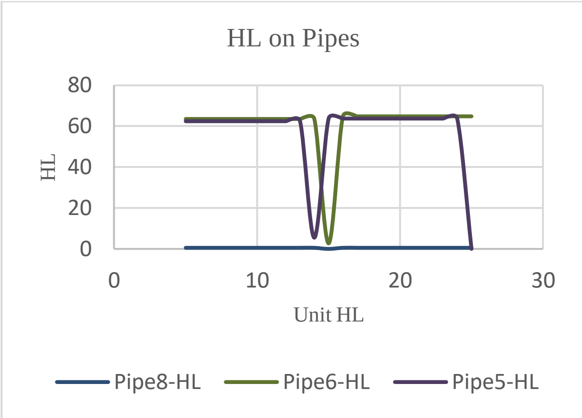

Figure9: HL on Pipes

Valve v1 vary at 5 to 25 and V2,V3,V4 set at 10 and LV1,LV2 in open status and other LV3,LV4,LV5,LV6 in close status then find out the pressure on the Nodes

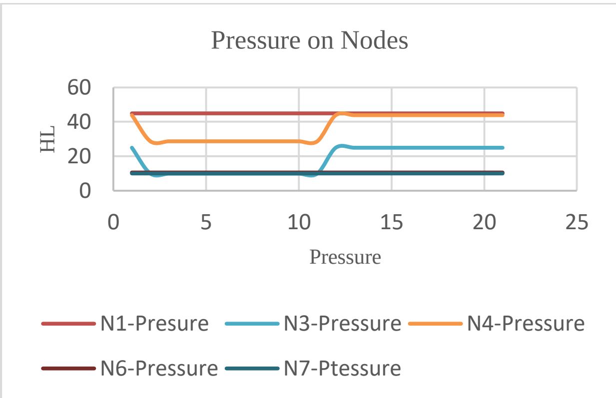

Figure10: HL on Nodes

Valve v1 vary at 5 to 25 and V2=V3=V4= 10(setting). LV1, LV5, LV6 in Close status and LV2, LV3, LV4 in open status. In the fig 11.to find out the head loss on the valve V1, V2, V3, V4

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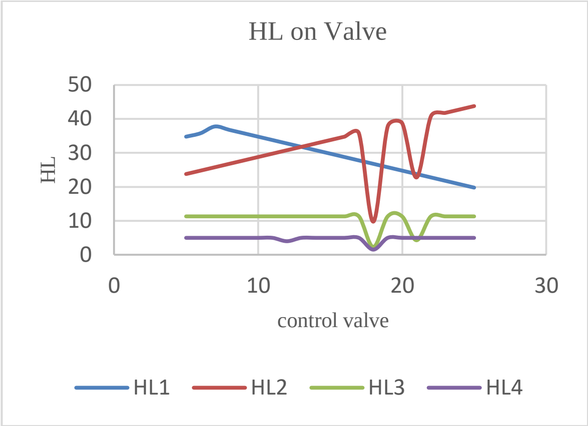

Figure11: HL on valves

Valve2= 5 to 25(setting)Valve v2 vary at 5 to 25 and V1=25, V3=V4= 10(setting). LV1, LV2 in open status and LV3,LV4, LV5, LV6 in close status. In the fig12.find out the head loss on the valve V1,V2,V3,V4

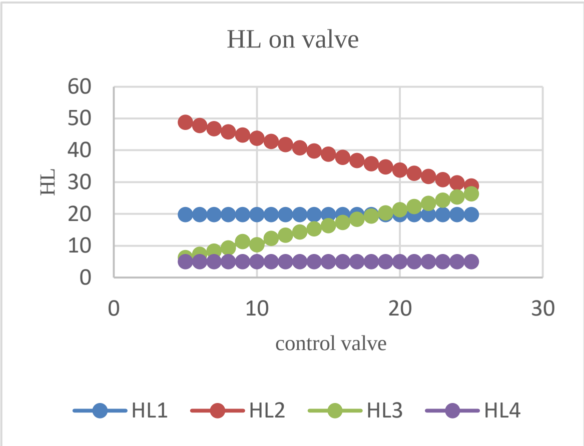

Figure12: HL on valve

valve v2 vary at 5 to 25 and V1=25,V3,V4 set at 10 and LV1,LV2 in open status and other LV3,LV4,LV5,LV6 in close status then find out the pressure on the Nodes.

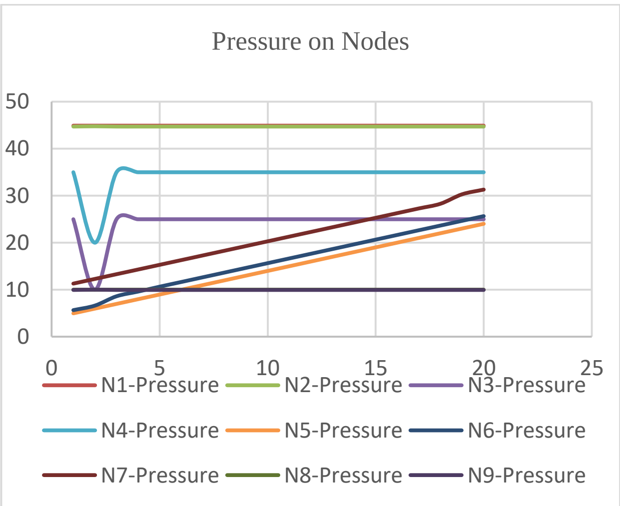

Figure13: Pressure on Nodes

When Valve v2 vary at 5 to 25 and V1=25, V3=V4= 10(setting). LV1, LV2 in open status and other LV3, LV4, LV5, LV6 in close status then find out the head loss on the nodes which are near the normal valve v1 to v4.

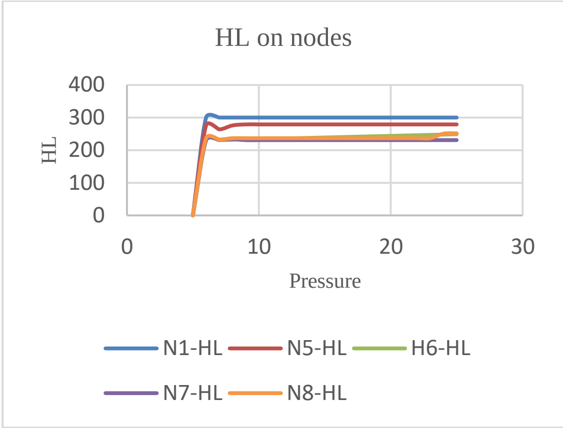

Figure14: HL on nodes

Valve v2 vary at 5 to 25 and V1=25, V3=V4= 10(setting). LV1, LV5, LV6 in Close status and LV2, LV3, LV4 in open status. In the fig 15 to find out the head loss on the valve V1, V2 ,V3, V4.

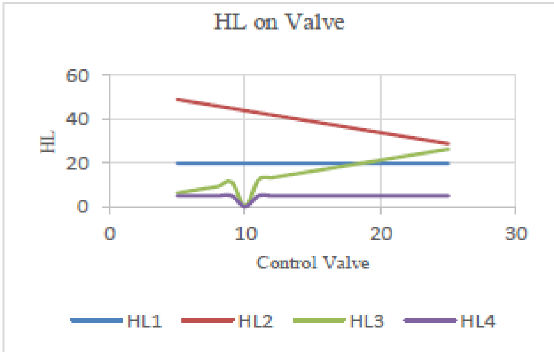

Figure15: HL on valve

Valve v2 vary at 5 to 25 and V1=25, V3=V4= 10(setting). LV1, LV6 in open status and other LV2, LV3, LV4, in close status.In the fig 16.find out the head loss on the valve V1,V2,V3,V4

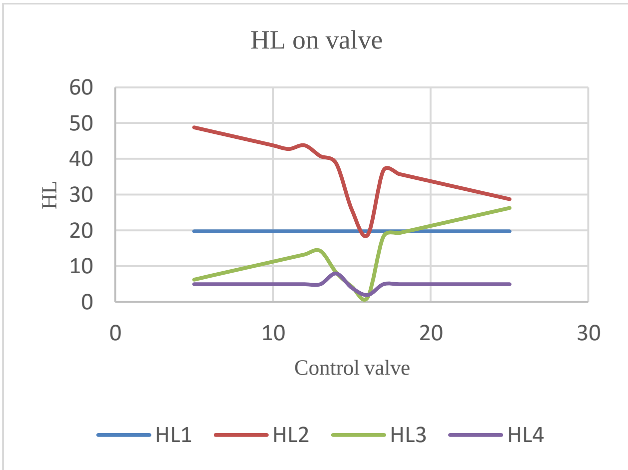

Figure16: HL on valve

Valve3= 5 to 25(setting) Valve v3 vary at 5 to 25 and V1=25,V2=V4= 10(setting). LV1, LV2 in open status and other LV3, LV4, LV5, LV6 in close status. In the fig 17. to find out the head loss on the valve V1,V2,V3,V4

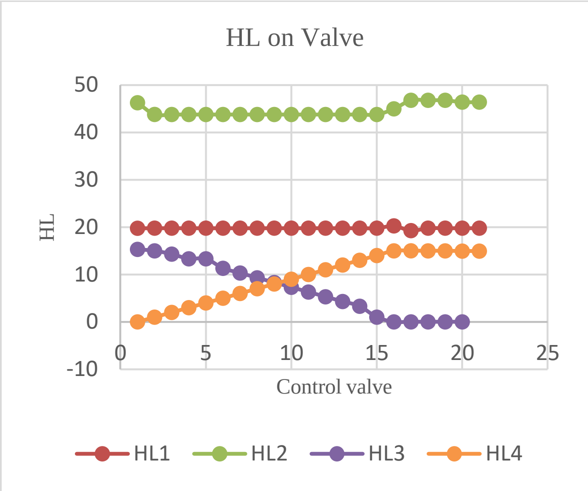

Figure17: HL on valve

Valve v3 vary at 5 to 25 and V1=25, V2=V4= 10(setting). LV1, LV2 in open status and other LV3, LV4, LV5, LV6 in close status then find out the head loss on the nodes which are near the normal valve v1 to v4

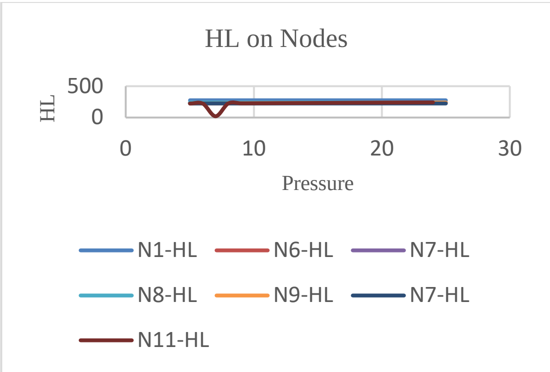

Figure18: HL on nodes

Valve v3 vary at 5 to 25 and V1=25,V2,V4 set at 10 and LV1,LV2 in open status and other LV3,LV4,LV5,LV6 in close status then find out the head loss on the Pipes.

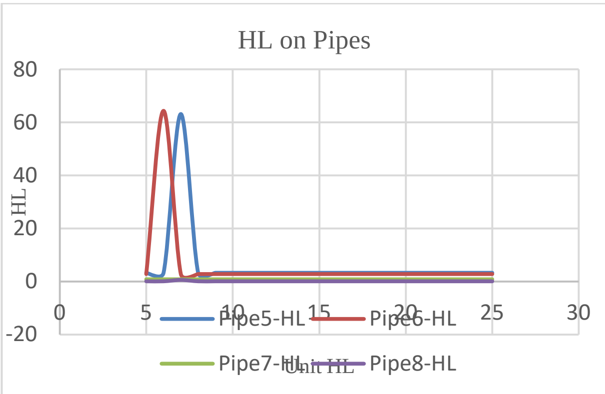

Figure19: HL on Pipes

Valve v3 vary at 5 to 25 and V1=25, V2=V4= 10(setting). LV1, LV5, LV6 in Close status and other LV2 , LV3, LV4 in open status. In the fig 20. to find out the head loss on the valve V1,V2,V3,V4

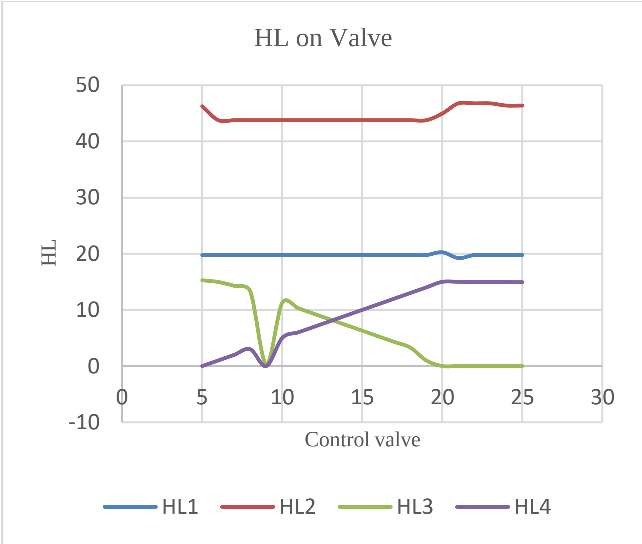

Figure20: HL on valve

Valve v3 vary at 5 to 25 and V1=25, V2=V4= 10(setting). LV1, LV6 in open status and other LV2, LV3, LV4,LV5 in close status. In the fig 21. to find out the head loss on the valve V1,V2,V3,V4

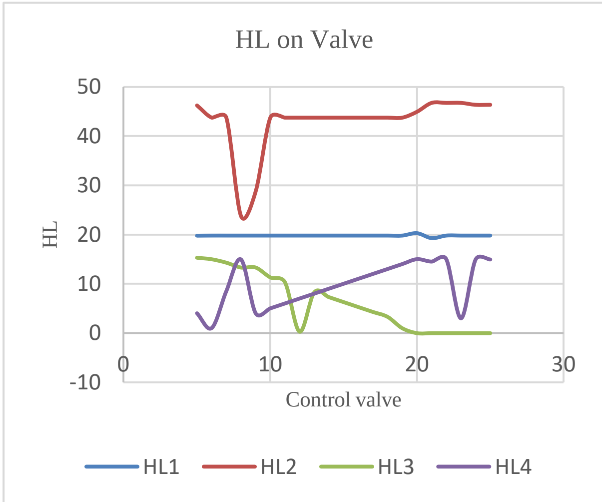

Figure21: HL on valve

Valve4= 5 to 25(setting) Valve V4 vary at 5 to 25 and V1=25, V2=V3= 10(setting). LV1, LV2 in open status and other LV3, LV4, LV5, LV6 in close status. In the fig 22.to find out the head loss on the valve V1,V2,V3,V4

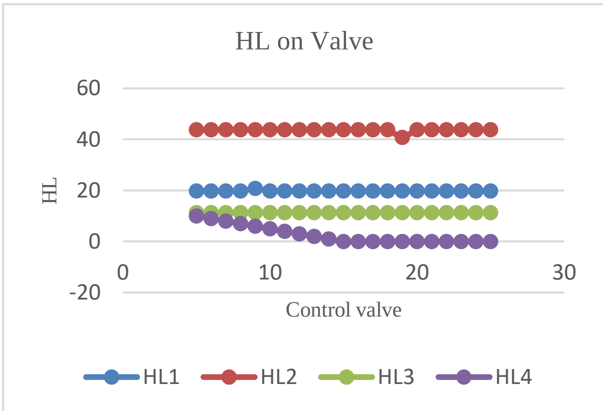

Figure22: HL on valve

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Valve v4 vary at 5 to 25 and V1=25,V2=V3= 10(setting). LV1, LV2 in open status and other LV3, LV4, LV5, LV6 in close status then find out the head loss on the nodes which are near the normal valve v1 to v4

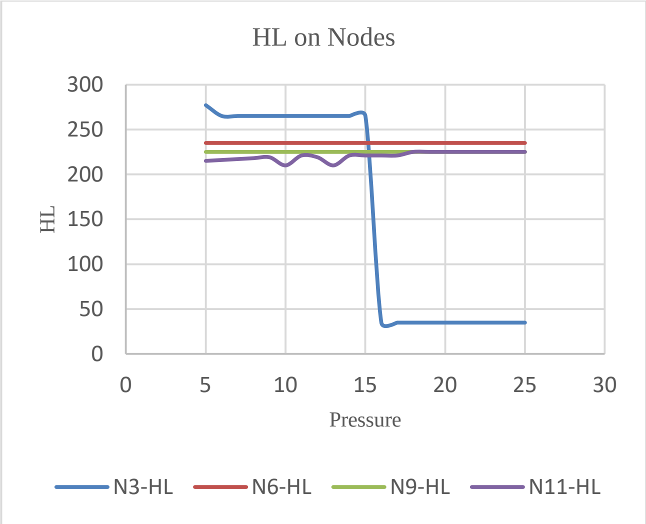

Figure23: HL on Nodes

All the graphs show the HL in the different flow on the nodes, pipes and valves.

VI. CONCLUSIONS

This paper described easily detect the leakage through valves. We keep it up valve in active status and leak valve1 in open and other in closed status then to determine HL at valves, pipes and nodes. We can repeat this for leakage time to time. Also include pump for increase the pressure but our main motive is detect a leak when pressure is low it means leakage at node. In thisoptimize the head loss or pressure drop through EPANET tool to using Darcy weisbach equation method.EPANET water distribution network create at real map scenario.Many tools available for water supply network. We can easily implement architecture on this distribution network and practical to find out the headloss on the nodes and valves. In future, I have established a practical network in campus and optimize head loss.

REFERENCES

1. K. Gupta, K. Kishore and S. C. Jain, "Modeling and simulation of CEERI's water distribution network to detect leakage using HLR approach," 2017 6th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO), Noida, 2017, pp. 289-294. doi: 10.1109/ICRITO.2017.8342440
2. Kemba, Joseph & Gideon, Kenneth &Nyirenda, Clement. (2017). Leakage Detection in Tsumeb East Water Distribution Network Using EPANET and Support Vector Regression. 10.23919/ISTAFRICA.2017.8102401.
3. A. Georgescu, S. Perju, R. A. Madularea and S. Georgescu, "Energy consumption due to pipe background leakage in a district water distribution system in Bucharest," 2017 International Conference on ENERGY and ENVIRONMENT (CIEM), Bucharest, 2017, pp. 251-254.doi: 10.1109/CIEM.2017.8120785
4. Djebedjian, Berge &Yaseen, Ashraf &Abou- Rayan, Rayan. (2006). Optimization of Large Water Distribution Network Design using Genetic Algorithms.
5.]S. Porwal, S. A. Akbar and S. C. Jain, "Leakage detection and prediction of location in a smart water grid using SVM classification," 2017 International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS), Chennai, 2017, pp. 3288-3292. doi: 10.1109/ICECDS.2017.8390067
6. J. Lin, S. Sedigh and A. Miller, "Towards Integrated Simulation of Cyber-Physical Systems: A Case Study on Intelligent Water Distribution," 2009 Eighth IEEE International Conference on Dependable, Autonomic and Secure Computing, Chengdu, 2009, pp. 690-695. doi: 10.1109/DASC.2009.140
7. G. Ibarra-Berastegi and R. García-Arriba, "Using open source software in engineering studies to teach water operation & management," 2017 IEEE Global Engineering Education Conference (EDUCON), Athens, 2017, pp. 1397-1404. doi: 10.1109/EDUCON.2017.7943030
8. L. K. Letting, Y. Hamam and A. M. Abu-Mahfouz, "An interface for coupling optimization algorithms with EPANET in discrete event simulation platforms," 2017 IEEE 15th International Conference on Industrial Informatics (INDIN), Emden, 2017, pp. 1235-1240.doi: 10.1109/INDIN.2017.8104951
9. G. Nguyen, M. Bobák and L. Hluchý, "Geospatial preprocessing for situational assessment through hydraulic simulations," 2017 13th International Conference on Natural Computation, Fuzzy Systems and Knowledge Discovery (ICNC-FSKD), Guilin, 2017, pp. 2429-2435.doi: 10.1109/FSKD.2017.8393154
10. Wu S., Hu G., Gu B., Ding N., Yu G. Variational mode decomposition (VMD) based method of leakage locating in water delivery lines Sensor Letters, Volume 14, 2016
11. Huang P., Zhu N., Hou D., Chen J., Xiao Y., Yu J., Zhang G., Zhang H. Real-time burst detection in District Metering Areas in water distribution system based on patterns of water demand with supervised learning Water (Switzerland), Volume 10, 2018
12.]Vijai P., Sivakumar P.B. Design of IoT Systems and Analytics in the Context of Smart City Initiatives in India Procedia Computer Science, Volume 92, 2016
13. Shingo Adachi, Shinsuke Takahashi, Xiaoming Zhang, Minoru Umeki, Hideyuki Tadokoro Estimation of Area Leakage in Water Distribution Networks: A Real Case Study Procedia Engineering, Volume 119, 2015, pp. 4-12
14. Barranquilla's Water Distribution System: A First Detailed Description Procedia Engineering, Volume 186, 2017, pp. 12-19
15. Luis Londoño, Johana Segrera, Margarita Jaramillo Water Distribution System of Santa Marta city, Colombia Procedia Engineering, Volume 186, 2017, pp. 20-27
16. Sela L., Salomons E., Housh M. Plugin prototyping for the EPANET software Environmental Modelling and Software, Volume 119, 2019Optimal design of pipe diameter in water distribution system by multi-objective differential evolution algorithm: A case study of small town in Chiang Mai Lecture Notes in Electrical Engineering, Volume 513, 2019
17. Riahinia S., Abbaspour A., Farzin H., Khalili S. A dynamic programing-based framework for distribution system restoration considering load uncertainties International Transactions on Electrical Energy Systems, Volume 27, 2017
18. Agboka, Komi Mensah &Mayabi, Alfred &Cheruiyot, Charles. (2019). Pressure Performance Assessment of Juja water Distribution Network using EPANET model. International Journal of Recent Technology and Engineering. 8. 10.35940/ijrte.C5571.098319.
19. VenkataRamana, Gedela&Sudheer, Ch.V.S.S. &Bellapu, Rajasekhar. (2015). Network Analysis of Water Distribution System in Rural Areas using EPANET. Procedia Engineering. 119. 496-505. 10.1016/j.proeng.2015.08.875.
20. Kumar, Arjun & Kumar, Kankesh& B, Bharanidharan&Matial, Neha&Dey, Eshita& Singh, Mahan & Thakur, Vivek& Sharma, Sarit& Malhotra, Neeraj. (2015). DESIGN OF WATER DISTRIBUTION SYSTEM USING EPANET. International Journal of Advanced Research. 3. 789-812.

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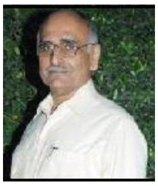

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