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"WATER DEMAND FORECASTING AND DESIGN OF WATER DISTRIBUTION SYSTEM/NETWORK AT POHALE TURF BORGAON USING EPANET"

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Abstract - *This study presents the use of EPANET software in the design of water distribution network for Pohale Turf Borgaon. EPANET is a computer program that performs extended period simulation of hydraulic and water quality geste within pressurized pipe networks. The Components of network includes pipes, nodes, pumps, valves and reservoirs or a Tank., EPANET tracks the inflow of water in each pipe, the pressure at Nodes, the height of water in each tank, and the attention of a chemical species throughout the network, EPANET is designed to be a exploration tool for perfecting our understanding of the movement and fate of drinking water ingredients within distribution systems. It can be used for numerous different kinds of operations in distribution systems analysis. In this paper it's used for carrying out the hydraulic analysis of the distribution network in the study area. The results attained vindicated that the pressures at all junctions and the overflows with their rapidity at all pipes are doable enough to give acceptable water to the network of the study area.*

Key Words: Epanet Software, Google Earth Pro, AutoCAD, Water Demand, Base Flow, Population Forecasting.

1. INTRODUCTION

Water is the fundamental human need. Each person on earth requires at least 20-50 liters of clean, safe water a day for drinking, cooking etc. To obtain the basic water requirement a good water Distribution system must be carry out. Water distribution systems consist of pipeline networks and associated components, most of which is underground and mechanical stress from the surrounding soil, surface, and internal water pressure. Water distribution network design is based on the proposed street plan and topography. According to the report the water is wasted due to leakage and thief inspection, control and planned maintenance and rehabilitation programs are necessary to properly operate existing water distribution system. In our project for resolving the major issues faced in Water Distribution System a new system of Water Distribution with visualized Pipe Network is introduced for Pohale Turf Borgoan using Epanet Software as our key Software for building the Pipe Network, Google Earth Pro, Google Earth and AutoCAD for the other works.

1.1 Problem Statement

The population forecasting and design of water distribution system help in maintaining water quality, reduce wastage of water, efficiency of water, by forecasting the population of village/city we can pre-calculate the water demand and deliver water to all customers of the system in sufficient quantity for drinking water at the appropriate pressure with minimal loss of safe and acceptable quality as economically as possible.

1.2 OBJECTIVE

The objective of the distribution system is to supply water to each and every house, industrial plants and public places. Each house must be supplied with sufficient quantity of water at the desired pressure. Therefore the water has to be taken to the roads and streets in the city and finally to the individual houses. This function of carrying the water from the treatment plant to the individual homes is accomplished through a well-planned distribution system. A distribution system therefore consists of pipe lines of various sizes for carrying water to the streets; valves for controlling the flow, service connections to the individual homes, distribution reservoirs for storing the water to be fed into the distribution pipes. The water may either be pumped directly into the distribution pipes, or it may be first stored in a distribution reservoir and then fed into the distribution pipes. The main purpose of the distribution systems is to develop adequate water pressure at various points i.e., at the consumer's tap and the choice of the distribution and its elevation with respect to the location of the water treatment plants.

- To analyze and forecast population for 3 decades.
- To determine the water demand for the village; current and future demands.
- To study and find out the problem exist in water distribution system.

- To prepare hydraulic network using E-panet software.
- To design Water Distribution system in less amount of time and economically using Epanet Software.
- To estimate the amount of water used by the village.

2. LITERATURE STUDY

The study of water supply distribution network has always been of keen interest to researchers, scholars, and students. In a research presented as "Analysis and Design of Water Distribution Network Using EPANET for Chirala Municipality in Prakasam District of Andhra Pradesh", [G. Anisha et al. 2016], a network is laid according to old day's requirement and is not suitable to the future (2041) needs and demands. The network was proposed according to the master plan keeping in view the ease and accessibility of the network with roadside and straight as it will help the laying out easy and less complicated. In the sudy, the modelling and analysis were carried out and to incorporate the future needs of the city new location, bearing minimum cost and effort, was proposed based on EPANET software simulation result. A Study on the shortage of water in some specific regions of water in Al-Diwaniya city,[Mohammad Ali et al. 2012], was based on looking into the reality of supply water in the city through the distribution network. The methodology consisted of two primary steps. First was to obtain the discharge of water in the supply network along with the direction of flow in the pipe network. This analysis and simulation were performed in 1998 version of program 'Pipe++'. This step also gave the head available in each network node. Next step included the practical on-site measurement of the flow and pressure head at different ones of the network. A combined analysis showed the area suffering from shortages of water and the possible reason behind it. Another study which is relevant is the one in which EPANET software was used to design and analyze the multi-village supply system with reference to technical sustainability, [K. Shital et al. 2016]. The study presents the hydraulic analysis of pipeline network of Punagam area near Surat city using EPANET 2.0. This study brings out the simulation of existing network in Punagam area near Surat city. The network is divided into two zones and spans in an area of 600.83 Ha and comprises 109 junctions and 144 pipes. The study aimed at analyzing the behavior of the distribution network and the pattern of flow and pressure head at various junctions and with different pipe flow. In the mentioned study it was reported that the water was taken from the source and was stored in the Ground Service Reservoir. Depending on the need it was pumped up to the Elevated Storage Reservoir and from there the water was supplied to the houses via gravity system which is in close connection with this study. The mentioned study took into account the future needs of the city and concluded that the pressure at each junction and flow through each pipe are sufficient with the demand of the city. The simulation was also checked and verified the pressure on-field. The model was checked for negative pressure generation. In all the literature reviewed above the objective of analysis by performing the simulation of the water supply distribution network using EPANET as a hydraulic simulation tool is carried out and the network is optimized and any improvement is suggested. This study covers all the aspect and goes further beyond to optimize and then calculate the efficiency thereby verifying the need and utility of Optimized network.

3. METHODOLOGY

Initially the map of study area was extracted by using Google Earth pro software. The obtained map was then opened in Auto CAD software and the network lines along the roads are drawn. After the CAD file was imported into EPANET and converted into NETWORK file. The network file is opened in EPANET software. Elevation, pipe diameter and length of the pipe had to be given to each node and to the pipe for hydraulic analysis. As per design criteria, after rectifying all the Warnings and errors, it is run successfully. Finally all the Resultant reports are taken in a tabular column. The error reports are generated and if the pressure, demand and supply are not sufficient to the consumer, then we increase the pipe diameters.

The study region is extracted from the Google earth and wants to convert it into the bmp. File and it can be used as backdrop for the designing of water network. If the backdrop is ready, then start designing the network. Initially locate the nodes. Then, connect the nodes with pipes. If the network plan is ready for whole campus, then start giving the length, diameter, roughness coefficient of the pipes. If the model is ready, the next step is to assign water demand and elevation for nodes in the plan. And also give the properties of the main overhead tank.

3.1 Data Collection

The following data should be carried out for the simulation:

1. Collection of data from local authorities;
2. Calculation of future population by Arithmetic and Geometrical Increase method;
3. Calculation of water demand by Village;
4. Study and survey on the existing water distribution system and analyzation of problems;
5. Capturing the area of the village by Google Earth Pro;
6. Taking out all important data from Google Earth Pro Application;
7. Input all the basic data on Epanet and draw a hydraulic network;

The factors such as elevation, base demand, diameter, roughness is given at each node.

A primary data are collected from Local and Municipal Authorities.

The Secondary data are collected from Google Earth Pro, Google Map, previous literature, articles, v-logs, research paper and books.

3.2 Population Forecasting Method

Population forecasting is a method to predict/forecast the future population of an area. Usually, the populations at the design period of water supply system to find the water demand at that time, as the system are required to fulfill their purposes till the end of the design period. Methods which are used for the population projection are as given below

Table -1: Population Forecasting Methods

S.no	Mathematical method
1	Arithmetical Method
2	Geometrical Increase Method
3	Incremental Increase Method

The above Methods are used to forecasting the population of pohale village for the years of 2032, 2042, 2052.

4. EXPERIMENTAL RESULTS

The below tables are introduced for calculating/projecting the population for the year 2032, 2042 & 2052.

Since they are the assumed population we took the average out of the three results and use them particularly for this project, in order to get the most accurate results.

Table -3: Detailed Project Report for Population Projections

	Existing Population				Projected Population		
s.no	**1991**	**2001**	**2011**	**2021**	**2032**	**2042**	**2052**
	1852	2082	2182	2750			
1	GEOMETRIC PROGRESSION METHOD Pn=P(1+IG/100)n				3104	3464	3867
2	ARITHMETIC PROGRESSION METHOD Pn=P+n.C				3080	3380	3680
3	INCREMENTAL INCREASE METHOD Pn=P+n.X+{n(n+1)/2}.Y				3275	3930	4754
4	GRAPHICAL METHOD				3153	3591	4100
5	DECADAL GROWTH METHOD 60%				2939	3121	3314
	AVG				3110	3497	3943
	ADOPTED METHOD				3110	3497	3943
					AVERAGE		
						191.6	575.1

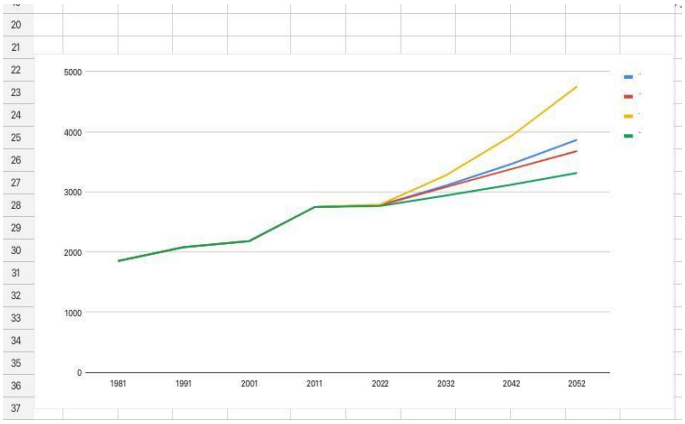

Chart -1: **Projection Graph**

Blue color indicate Geometric Progression, the Yellow color indicate Incremental increase method, Red color indicate Arithmetic Progression and Green color indicate Decadal growth method.

Table -3: Projected Water Demand

YEAR	PROJECTED POPULATION	LPCD	DEMAND
2032	3110	x 70	217700
2042	2042	x 70	244790
2052	3943	x 70	276010

The above table is the estimated population and water demands for the village of Pohale, the water required for each person at the village/town area is 70 LPCD (Liter per capita per day). In order to calculate the water demand, we multiply the projected population with 70 LPCD and we get the projected water demand for the projected population for the years of 2032, 2042, 2052. Projected population x 70 (LPCD) = Projected water demand.

E.g 3110 x 70 = 217700(the water demand for the year of 2032).

4.1 Network Drawing

The study area (Pohale Turf Borgaon) was extracted by using Google Earth pro software. To obtained the network line along the road. By using Google earth application we get elevation at node as well as position of houses is visible. Which help us to calculate number of houses at each node and also helped us to draw the network diagram more easy, The obtained map was transferred in to Auto cad by using XREF command. XREF command is used for importing image with a specific x, y, z coordinates and we align the XREF Google capture image with the correct lines and coordinate then opened in Auto CAD software and the network lines along the roads are drawn using Polyline.

Fig -1: Captured Google Earth Image of Pohale

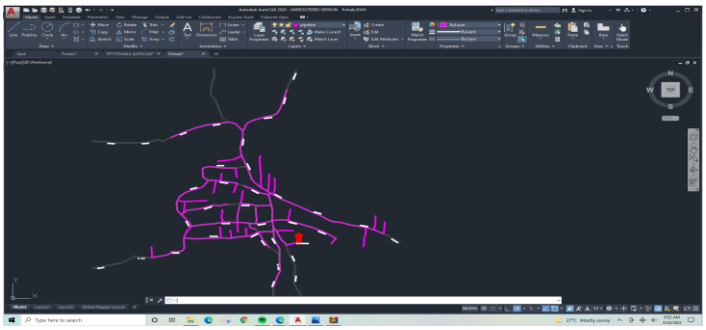

Fig -2: Plan of Water Distribution Network

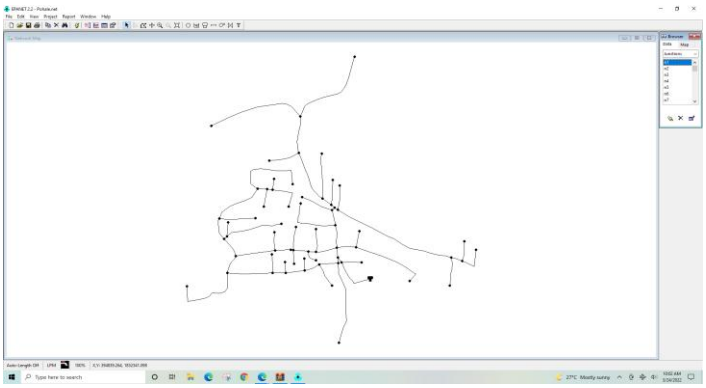

Fig -3: Network Image

Initially after the CAD file was converted into NETWORK file using Polylines. The network file is opened in EPANET software. Elevation, pipe diameter and length of the pipe had to be given to each node and to the pipe for hydraulic analysis. As per design criteria, after rectifying all the Warnings and errors, it is run successfully.

5. NODE RESULTS

EPANET
Hydraulic and Water Quality
Analysis for Pipe Networks
Version 2.0

Input File: Pohale.net

prueba

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
p1	n1	n2	244.9	56.6
p2	n3	n4	89.14	56.6
p3	n5	n6	231.3	56.6
p4	n7	n8	17.22	126.3
p5	n9	n10	203.8	56.6
p6	n11	n12	84.09	56.6
p7	n11	n13	56.76	56.6
p8	n14	n15	10.21	67.4
p9	n16	n17	45	56.6
p10	n18	n5	51.42	99.3
p11	n19	n20	37.69	56.6
p12	n18	n21	68.9	56.6
p14	n24	n25	34.06	56.6
p15	n26	n27	31.31	56.6
p16	n28	n29	38.06	56.6
p17	n30	n31	157.6	56.6
p18	n14	n32	39.1	56.6
p19	n33	n34	98.54	56.6
p20	n16	n35	51.63	56.6
p21	n36	n37	64.61	56.6
p22	n38	n39	50.2	56.6
p23	n40	n41	31.57	56.6
p24	n42	n43	70.39	56.6
p25	n44	n45	68.62	56.6
p26	n46	n47	127.6	56.6
p27	n48	n49	84.25	56.6
p28	n50	n51	206.3	56.6
p29	n8	n52	54.35	56.6
p30	n9	n53	46.85	56.6
p31	2	n8	113.6	126.3
p32	n55	n56	79.89	56.6
p33	n57	n58	209.2	56.6
p34	n59	n40	94.1	56.6
p35	n40	n38	15.66	67.4
p36	n38	n57	24.97	67.4
p37	n57	n33	140.5	67.4
p38	n33	n15	62.44	81.1
p39	n15	n60	59.33	81.1
p40	n60	n50	53.16	99.3
p41	n61	n28	66.18	56.6
p42	n50	n23	123.4	99.3
p43	n23	n27	35.32	99.3
p44	n27	n24	51.51	99.3
p45	n24	n18	43.49	99.3
p46	n60	n16	97.39	67.4
p48	n62	n14	154.8	56.6
p49	n63	n2	266.5	56.6
p50	n2	n48	104.2	67.4
p51	n48	n46	146.5	67.4
p52	n46	n42	29.59	67.4
p53	n42	n64	12.27	67.4
p54	n64	n44	10.37	67.4
p55	n44	n56	338.3	67.4
p56	n56	n11	31.74	67.4
p57	n28	n19	40.75	67.4
p58	n19	n36	21.12	67.4
p59	n36	n65	57.35	67.4
p60	n65	n9	53.26	67.4
p61	n3	n31	43.84	81.1
p62	n31	n65	63.82	81.1
p63	n65	n7	27.44	99.3
p64	n7	n5	16.41	99.3
p65	n64	n3	9.839	67.4
1	n22	n23	62.23	56.6

Fig -4: Node Table

The above figure give us that the node table, It determines the different nodes naming and pipe numbers which include the properties of the network pipe, start node, end node, length and diameter.

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality
n1	5.11	615.64	28.64	0.00
n2	19.17	615.65	42.65	0.00
n3	5.11	616.10	31.10	0.00
n4	7.67	616.09	32.09	0.00
n5	5.11	616.42	25.42	0.00
n6	2.56	616.42	38.42	0.00
n7	7.65	616.49	26.49	0.00
n8	10.23	616.57	25.57	0.00
n9	11.49	616.37	25.37	0.00
n10	14.04	616.32	19.32	0.00
n11	1.28	616.03	33.03	0.00
n12	2.55	616.03	33.03	0.00
n13	1.28	616.03	35.03	0.00
n14	3.83	615.00	46.00	0.00
n15	5.11	615.01	47.01	0.00
n16	8.95	615.22	36.22	0.00
n17	15.33	615.20	34.20	0.00
n18	5.11	616.22	32.22	0.00
n19	5.11	616.27	33.27	0.00
n20	10.22	616.27	33.27	0.00
n21	5.11	616.22	35.22	0.00
n23	6.39	615.76	36.76	0.00
n24	3.81	616.06	36.06	0.00
n25	6.39	616.05	33.05	0.00
n26	6.39	615.87	33.87	0.00
n27	3.81	615.88	34.88	0.00
n28	8.94	616.26	34.26	0.00
n29	6.39	616.26	34.26	0.00
n30	7.65	616.19	33.19	0.00
n31	8.94	616.21	31.21	0.00
n32	20.43	614.98	46.98	0.00
n33	11.49	614.86	48.86	0.00
n34	23.01	614.79	38.79	0.00
n35	8.95	615.21	37.21	0.00
n36	15.33	616.29	32.29	0.00
n37	10.23	616.28	31.28	0.00
n38	10.23	614.35	38.35	0.00
n39	6.39	614.35	38.35	0.00
n40	10.23	614.33	37.33	0.00
n41	23.01	614.31	37.31	0.00
n42	5.11	616.01	31.01	0.00
n43	2.55	616.01	33.01	0.00
n44	1.28	616.05	32.05	0.00
n45	5.11	616.05	32.05	0.00
n46	6.39	615.92	30.92	0.00
n47	19.17	615.86	32.86	0.00
n48	19.17	615.69	37.69	0.00
n49	11.49	615.68	42.68	0.00
n50	7.65	615.41	46.41	0.00
n51	1.28	615.41	54.41	0.00
n52	12.78	616.56	19.56	0.00
n53	7.65	616.37	32.37	0.00
n55	2.55	616.03	30.03	0.00
n56	2.55	616.03	32.03	0.00
n57	8.94	614.40	39.40	0.00
n58	12.78	614.36	35.36	0.00
n59	16.62	614.30	34.30	0.00
n60	16.62	615.27	44.27	0.00
n61	10.22	616.25	34.25	0.00
n62	16.62	614.95	35.95	0.00
n63	3.83	615.65	48.65	0.00
n64	1.28	616.05	31.05	0.00
n65	8.95	616.40	28.40	0.00
n22	8.94	615.76	36.76	0.00

Fig -4: **Node Result**

The above figure shows that the final result of node, which we obtained from inputting the data i.e. length, elevation, diameter & head loss

Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
p1	-5.11	0.03	0.04	Open
p2	7.67	0.05	0.08	Open
p3	2.56	0.02	0.01	Open
p4	-536.56	0.71	4.33	Open
p5	14.04	0.09	0.25	Open
p6	2.55	0.02	0.01	Open
p7	1.28	0.01	0.00	Open
p8	-40.88	0.19	0.78	Open
p9	15.33	0.10	0.30	Open
p10	-273.42	0.59	4.01	Open
p11	10.22	0.07	0.14	Open
p12	5.11	0.03	0.04	Open
p14	6.39	0.04	0.06	Open
p15	-6.39	0.04	0.06	Open
p16	6.39	0.04	0.06	Open
p17	-7.65	0.05	0.08	Open
p18	20.43	0.14	0.51	Open
p19	23.01	0.15	0.63	Open
p20	8.95	0.06	0.11	Open
p21	10.23	0.07	0.14	Open
p22	6.39	0.04	0.06	Open
p23	23.01	0.15	0.63	Open
p24	2.55	0.02	0.01	Open
p25	5.11	0.03	0.04	Open
p26	19.17	0.13	0.45	Open
p27	11.49	0.08	0.17	Open
p28	1.28	0.01	0.00	Open
p29	12.78	0.08	0.21	Open
p30	7.65	0.05	0.08	Open
p31	559.57	0.74	4.68	Open
p32	-2.55	0.02	0.01	Open
p33	12.78	0.08	0.21	Open
p34	-16.62	0.11	0.35	Open
p35	-49.86	0.23	1.13	Open
p36	-66.48	0.31	1.93	Open
p37	-88.20	0.41	3.26	Open
p38	-122.70	0.40	2.44	Open
p39	-168.70	0.54	4.40	Open
p40	-218.54	0.47	2.65	Open
p41	-10.22	0.07	0.14	Open
p42	-227.47	0.49	2.85	Open
p43	-242.80	0.52	3.22	Open
p44	-253.00	0.54	3.47	Open
p45	-263.20	0.57	3.74	Open
p46	33.22	0.16	0.53	Open
p48	-16.62	0.11	0.35	Open
p49	-3.83	0.03	0.02	Open
p50	-28.12	0.13	0.39	Open
p51	-58.78	0.27	1.54	Open
p52	-84.34	0.39	3.00	Open
p53	-92.00	0.43	3.52	Open
p54	16.60	0.08	0.15	Open
p55	10.21	0.05	0.06	Open
p56	5.11	0.02	0.02	Open
p57	-25.55	0.12	0.33	Open
p58	-40.89	0.19	0.79	Open
p59	-66.45	0.31	1.93	Open
p60	33.18	0.15	0.53	Open
p61	-122.65	0.40	2.44	Open
p62	-139.24	0.45	3.08	Open
p63	-247.82	0.53	3.34	Open
p64	281.09	0.60	4.22	Open
p65	-109.87	0.51	4.89	Open

Fig -5: **Link Result**

Figure 5 gives us the link result of Flow in LPM, Velocity in m/s, head loss in m/km and status of the pipe.

Junction ID	Elevation	No of Houses	No of person in house	Per Capita Water Demand (LPCD	Base Demand (LPM)
1	587	4	6	55	1.704
2	573	15	6	55	6.39
3	585	4	6	55	1.704
4	584	6	6	55	2.556
5	591	4	6	55	1.704
6	578	2	6	55	0.852
7	590	6	6	55	2.55
8	591	8	6	55	3.41
9	591	9	6	55	3.83
10	597	11	6	55	4.68
11	583	1	6	55	0.426
12	583	2	6	55	0.85
13	581	1	6	55	0.426
14	569	3	6	55	1.278
15	568	4	6	55	1.704
16	579	7	6	55	2.982
17	581	12	6	55	5.11
18	584	4	6	55	1.704
19	583	4	6	55	1.704
20	583	8	6	55	3.408
21	581	4	6	55	1.704
22	579	7	6	55	2.98
23	579	5	6	55	2.13
24	580	3	6	55	1.27
25	583	5	6	55	2.13
26	582	5	6	55	2.13
27	581	3	6	55	1.27
28	582	7	6	55	2.98
29	582	5	6	55	2.13
30	583	6	6	55	2.55
31	585	7	6	55	2.98
32	568	16	6	55	6.81
33	566	9	6	55	3.83
34	576	18	6	55	7.67
35	578	7	6	55	2.982
36	584	12	6	55	5.11
37	585	8	6	55	3.41
38	576	8	6	55	3.41
39	576	5	6	55	2.13
40	577	8	6	55	3.41
41	577	18	6	55	7.67
42	585	4	6	55	1.704
43	583	2	6	55	0.85
44	584	1	6	55	0.426
45	584	4	6	55	1.704
46	585	5	6	55	2.13
47	583	15	6	55	6.39
48	578	15	6	55	6.39
49	573	9	6	55	3.83
50	569	6	6	55	2.55
51	561	1	6	55	0.426
52	597	10	6	55	4.26
53	584	6	6	55	2.55
54	584	10	6	55	4.26
55	586	2	6	55	0.85
56	584	2	6	55	0.85
57	575	7	6	55	2.98
58	579	10	6	55	4.26
59	580	13	6	55	5.54
60	571	13	6	55	5.54
61	582	8	6	55	3.408
62	579	13	6	55	5.54
63	567	3	6	55	1.278
64	585	1	6	55	0.426
65	588	7	6	55	2.982

Fig -5: Base Demand Calculation

The Network Properties

1. Node; A node is a point of intersection/connection within a data communication network. In an environment where all devices are accessible through the network, these devices are all considered nodes. The purpose of the node is to transmit data to communicate with other nodes in the network.

2. Demand (LPM); LPM stands for liters per minute (L/min) demand planning water is supply chain management process of forecasting or predicting the demand for water to ensure they can be delivered and satisfy consumer.

3. Head; Assume that you have a pump that you can disconnect the discharge pipe or tube and are able to extend it vertically. Head is the height of which a pump can rise water up.

4. Pressure; The pressure is that occur inside liquid and its exerted by weight of liquid itself. The S.I unit of pressure is Pascal. A pascal can be defined as a force of one Newton applied over a surface area of one meter square.

5. Pipe velocity; Pipe velocity is an area averaged property which is dependent of the pipes cross-sectional flow distribution and whether the flow. For example along the central axis fluid may be travelling at twice the calculated pipe velocity. V=1.274 x q/d^2 V is the pipe velocity (ms) q is the volume flow (m3/s) d is the pipe inside diameter (m)

6. Head loss; Within a pipe frictional contact with the wall means that fluid flow is highest on the pipe axis and effectively zero at the pipe wall. In head loss results of the friction between walls of a pipe and the fluid, the friction between fluid particles as they move relatively to one another and the turbulence that is causes whenever the fluid flow is redirected or obstructed in any way by components such as piping entrance and exist, pump, valves and fitting.

3. CONCLUSIONS

In this work, the water distribution system has been analysis with the help of EPANET in which use number of nodes, elevation, number of pipes and demands of different area. First we surveyed the area and take information about the population and per capita demand of the people. And according to that we analyzed the distribution system for the same. Here during the day time hours that is peak hours during morning time the demand of water is more as compared to the other time so the maximum supply is given for 8 hours a day. And concluded the graph which is obtained from EPANET shows that the demand is more during the peak hours. The different nodes show different variation of pressures and demand. The method of distribution used here is combined gravity and pumping system as firstly the water is pumped with the help of pumps from underground water source i.e. from aquifers and then they are lifted up to the overhead water tanks and through there with the help of gravity system is transferred to the main rising pipe. The distribution layout used here is tree system, loop system or dead-end system which is according to the layout of the different places. Selected source is capable of meeting water requirement of the system for the design period with due consideration to climate change & anticipated activities in & around. Yield of open well is 164000L/d and required water is 95900L/d hence available source are sufficient to fulfill the daily demand of village for next 30 years

In steady state analysis, network run for next 15 and 30 years to check whether designed network will sustain or not. pressure value decrease as population increase for the year

of 15 and 30 years. And pressure head increase with decrease in pressure value.

Rehabilitation has done to eliminate pressure drop in pipe. In Pohale village 90% houses is of single storey as per CPHEEO manual single storey building required minimum 7m pressure. By replacing existing pipe P56 from diameter 67.4 to 100mm,and pressure value changed from 6.94 to7.05m which is fall under required range.

We obtain the different results by imputing basic data in EPanet Software and got the required results i.e. the water demand, nodal flow, base demand, pressure, etc. The network is designed for the year 2052.

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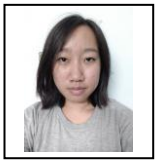
BIOGRAPHIES



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