Scientific Journal of Impact Factor (SJIF): 4.72

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 4, Issue 11, November -2017

UPGRADATION OF EXISTING WATER SUPPLY SYSTEM OF VISNAGAR CITY

Vankar Jitendrakumar Pravinbhai

Assistant Professor, ITM Universe Vadodara

Abstract —*At present there is a wide gap in infrastructure facility available in Urban, Suburban and rural areas of our country. Majority of the population of our country still stays in rural and suburban areas, where infrastructure facility is not available as per the standards. Our proposed project is on UPGRADATION OF EXISTING WATER SUPPLY SYSTEM OF VISNAGAR CITY. We calculated Proposed population for 2041 as 133750. Our aim is to upgrade the facilities of water supply in Visnagar city for proposed need of 25.56 MLD . We have estimated population of 2041 and worked out water requirement. We have verified capacity of existing ELEVATED STORAGE RESERVOIR (ESR) and find out whether there is any deficiency in capacity of ESR or not. Also checked Capacity of sump; studied Total water requirement of city and availability of sources. Hydraulics of water distribution of Main pipelines and its Sub mains (Branch lines) has been checked thoroughly and Upgradation of pumping hours is suggested at different head works.*

Keywords- *Water Distribution system,Incremental Increase method*

I. INTRODUCTION

Visnagar town is a head quarter of Visnagar Taluka of Mehsana district in Gujarat. There is a railway station on Mehsana-Taranga hill railway line, about 19 km. in the North-East direction of Mehsana. The population of this town as per 2011 census is 76,753 persons. Visnagar Municipality (Nagarpalika) one of the oldest one in the area, was established in the year 1875 AD, It was then 'B' class municipality up to the year 1930 AD. At present there are Eleven ESRs and 13 tube wells, out of which only 5 tube wells are being utilized for pumping water, At many tube wells and pumping machinery is to be installed and put into commission in due course, these tube wells will augment the water demand of town. Dharoi water is also available at some head works since the year 2004 which is being distributed up to consumer end through existing system. Further looking to the present demand more water is required to supply.At present 19.36 MLD water is required to distribute satisfactorily in Visnagar city, which will cover both Town zone and Highway zone. Further in 2041 water demand will raise to 25.56 MLD. Nearest source for above supply is Dharoi Dam. So provision of water should be made available for future demand.

II. NECESSITY AND DATA COLLECTION

NECESSITY

Water supply scheme based on open well and ESR was executed during 1931. Open well of 6 m.dia and about 30m deep was dugged and ESR of 3.0 lakh ltr. Capacity and 14m. Height was constructed at Lal Darwaja head works and distribution pipeline as per requirement was also laid and water supply was started. Drainage project is also commissioned during 1942.

At present 19.36 MLD water is required to distribute satisfactorily in Visnagar city, which will cover both Town zone and Highway zone. Further in 2041 water demand will raise to 25.56 MLD. Nearest source for above supply is Dharoi Dam. So provision of water should be made available for future demand.

DATA COLLECTION

RAINFALL DATA

Details	Visnagar
Average rainfall of 36 years	674mm
Maximum rainfall in the year	1975
Maximum rainfall	2004mm
Minimum rainfall in the year	1987
Minimum rainfall	**91mm**

DECADAL POPULATION

Sr. No	YEAR	Census Population(souls)
1	1901	17284
2	1911	14137
3	1921	13855
4	1931	12040
5	1941	17227
6	1951	21093
7	1961	25982
8	1971	34863
9	1981	41343
10	1991	57834
11	2001	65826
12	2011	76753

ANTICIPATED POPULATION

Sr. No	Method	2011	2021	2031	2041
1	Incremental increase	76753	87419	98084	108750
2	Add-increase in population due to Development of surrounding areas	15000	15000	20000	25000
3	Total	91753	102419	118084	133750

ANTICIPATED POPULATION & WATER DEMAND CONSIDERED FOR VISNAGAR TOWN FOR DHAROI WATER SUPPLY PROJECT EXISTING WATER SUPPLY & DRAINAGE ARRANGMENTS:

Year	1991	2001	2011	2021
Population	59497	75000	91753	102419
Water Demand(MLD)	8.32	10.50	17.07	19.36

Existing Water Supply:

Water supply scheme based on open well and ESR was executed during 1931. Open well of 6 m.dia and about 30m deep was dugged and ESR of 3.0 lakh ltr. Capacity and
14m. Height was constructed at Lal Darwaja head works and distribution pipeline as per requirement was also laid and water supply was started. Drainage project is also commissioned during 1942. At present there are Eleven ESRs and 13 tube wells, out of which only 5 tube wells are being utilized for pumping water, At many tube wells and pumping machinery is to be installed and put into commission in due course, these tube wells will augment the

water demand of town. Dharoi water is also available at some head works since the year 2004 which is being distributed up to consumer end through existing system. Further looking to the present demand more water is required to supply.

At present 19.36 MLD water is required to distribute satisfactorily in Visnagar city, which will cover both Town zone and Highway zone. Further in 2041 water demand will raise to 25.56 MLD. Nearest source for above supply is Dharoi Dam. So provision of water should be made available for future demand. Dharoi water collected in U/G sump of 50.0 lakh ltr. Capacity will be pumped Into ESR and than distributed through nine sub head works. Three tube Wells drilled surrounding main head works and ten tube wells drilled surrounding nine sub head works will be utilized to augment water supply of respective zones. 610 mm dia. MS line is tapped in between Gunja and Visnagar head works and connected with 400 mm dia. AC pipeline and water is made available at Kinara (BK) head works. Jawahar HW/ Parimal HW.AC pipeline is leaking heavily and work of replacement of pipeline is proposed under UIDSSMT project. 610 mm dia. MS line is tapped at survey no. 305 near main head works and connected with 300 /350 mm dia. AC line connected with Lal Darwaja head works and Dosabhai park head works and Dharoi water is made available.AC pipeline is leaking and replacement of line is approved under AmrutdharaYojana and work is being tapped up on head.New MS line is connecting FatehDarwaja head works, DipraDarwaja head works, KamanaChowkdi head works and Krishnanagar head works and Dharoi water is made available. After completion of AmrutdharaYojana, out of 9 sub head works, 7 sub head works will be connected with Dharoi water. After completion of UIDSSMT project, remaining two head works will be connected and Dharoi water will be made available on permanent basis. At present Dharoi water is being connected through AC line.

Water connections

AS ON 31/12/2014	
Ward No.	Connections
1	3023
2	1047
3	1185
4	1341
5	1395
6	3788
7	1701
8	1128
9	1323
10	1454
11	2738
12	1121
Total	21244

For details of ward wise connections on 31/12/2014 exact data were not available hence considering family size of 5 persons and on the basis of total population of ward on 31/12/2014 has been calculated.

Drainage works

The sewage project was commissioned in the year 1941. Total length of sewage line is 39.93 km. out of which 150 mm dia. and 250 mm dia. sewage line is 28.90 km. And remaining 11.03 km. having a dia. of 450 mm and 600 mm. the project was prepared for ultimate population of 65000 and total no. of house connections are 677 as per the record available with local body. VisnagarNagarpalika has provided sewerage pipeline network in some of the area on south side of railway (zone-1), the sewage from this area is collected and brought into existing sewage pumping station. From this sewage pumping station, sewage is pumped and is utilized by the farmers of the surrounding area. Nagarpalika has planned the sewerage system for the area on the north side of railway (zone-2). The sewage will be collected and brought to the waste stabilization pond near river Rupen in the west direction of town. The majority of pipelines collecting the sewage in this area have been already laid by Nagarpalika up to canal.

Necessity of Modification in WS Project:

Due to increase in population of town and outskirt area developed surrounding the town, water demand is increased. Work of remaining drainage in developed area is also been taken up in hand, hence entire project requires revision. Pipelines from main ESR at visnagar town up to Darbar road sump require modification. The design is rechecked and modifications / alteration suggested are as under.

Node No.	Length (m)	Existing diameter in mm
1-4	80	610 DI
2-4	240	610 DI
4-6	300	600 DI
6-7	652	273.1 MS
7-8	501.25	355.6 MS
8-9	440	323.9 MS
9-10	1282	273.1 MS
10-11	560	273.1 MS
11-12	400	250 DI
12-13	872.5	273.1 MS
13-14	300	250 DI
14-15	1110	300 DI
15-16	1059	250 DI
16-17	1270	200 DI

MODIFICATION SUGGESTED:

City is to be divided into zone namely Highway zone and town zone. Highway is further sub divided into sub zones and town is divided into seven sub zones.

19.36 MLD water is required to be allotted under Dharoi water supply project based on Dharoi dam, works up to Visnagar town are completed and water is made available 50lakh litre capacity sump of Visnagar town main head works. Possibility of direct ESR filling of 20 lakh litre capacity main head works directly by Dharoi water is checked and it is possible to collect water directly into ESR through pipelines from Vav to Visnagar town connecting three sub head works of Dharoi project.

Possibility of taping Dharoi main pipelines of near sump of 50 lakh litres capacity at main head works with MS line connecting main ESR to nine sump is also checked and it is possible to bypass main ESR and directly supply into nine sub head works along with main head works from Vav head works.

Existing storage capacity of main ESR and nine different ESRs is found in order, storage capacity underground sump at different sub head works requires modification. Details of existing storage capacity of ESR and sump along with increasing capacity of sump proposed at some head works is kept.

Entire distribution system is redesigned considering increasing population in old town area and developed area, city is divided into nine sub zones and work of additional distribution system is proposed as per requirement.

Capacity of existing pumping machinery installed on sumps is rechecked and new pumping machinery is suggested as per requirement.

ALLOTMENT OF FILTERED WATER FOR VISNAGAR TOWN

Water from Vav HW is reaching Visnagar town sump through 56372 m long MS pipe line through Kadarpur HW, Vadnagar HW and Gunja HW.

PRODUCTION OF WATER FROM LOCAL SOURCE

Total requirement of town is the year 2021 is 19.36 MLD. At present 19.81 MLD water is being collected from Dharoi RWSS, but in year 2041 when the total demand of water will increase to 25.56 MLD. Hence deficiency of 5.75 MLD will be created in year 2041. Further out of 13 tube wells only 5 tube wells are in working condition. Hence additional resources for supply of water is recommended to investigate and finalized
before 2041.

PROPOSED WATER SUPPLY PROJECT:

Dharoi dam about 48 km away from Visnagar town. Water from Dharoi dam is being collected in Filter Plant at Vav head work. Pumping machinery of required capacity and head is installed at Vav head work to pump water directly into Kadarpur head works, Vadnagar group head works and Gunja head works of Visnagar group and 610 mm dia. MS pipeline is extended up to 50.0 lakh ltr. Capacity sump at Visnagar town. MS pipeline from Vav head works connecting Kadarpur groups HW, Vadnagar group HW and Gunja group HW is also laid and put into commission. 19.36 MLD water is required to be allotted for Visnagar town against the ultimate demand 25.56 MLD. Hence it is required to utilize existing 13 tube wells out of which only 5 tube wells are to fulfill the water demand.

According to approved project 19.81 MLD water is to be collected sump constructed at Visnagar head works than pumped into ESR of 20.0 lakh ltr. Capacity and 25 m height andwater is to be distributed to the 9 sub head works. It is also planned to collect tube well water into respective sumps directly.

The possibility of connecting Dharoi line near Visnagar town sump with proposed gravity connecting 9 sumps is checked and it is foundthat it is possible to supply Dharoi water into 9 sub head works directly by passing main ESR and main ESR can be utilize for outskirt area. It is planned to pump water into respective ESR and than supplied to the consumers though revised network of distribution system.

Water is being pumped directly from vav head works into ESR at Kadarpur, Vadnagar, Gunja and sump at Visnagar. Design of existing pipeline from Vav HW up to Visnagar Town head work is rechecked and it is possible tofill ESR of Visnagar town directly from Vav HW along with Kadarpur, Vadnagar and Gunja head work ESR.

PROPOSED COMPONENTS

Name of HW	Ex. Sump (Lac. Ltr)	Proposed Sump (Lac. Ltr)	Ex. ESR (Lac. Ltr)
Main	50		20
Lal Darwaja	9		3
Dosabhai	9.5		3
FatehDarwaja	1		4
DipraDarwaja	7.5		3
KamanaChowkdi	6		4
Krisnanagar	1	2.5	4
Parimal		3.5	3
Kinara		5	4
Vivekanand	2	3.5	3
Panchshil		2	1
Total	3.1 MLD*	1.9 MLD*	5.4 MLD*

* Excluding capacity of main sump 50 lakh ltr. As a main storage.
Total storage sump -5.5 ML, total storage ESR-5.4ML=10.9ML against 25.56 MLD demand

CONCLUSION

Due to increase in population of town and out skirt area developed surrounding the town; water demand is increased and will also increase in future.

19.36 MLD water is required to be allotted for Visnagar City against the Ultimate demand of 25.56 MLD.

On the basis of Past records future population for year 2021; 2031; 2041 has been worked out and water demand has been calculated on the basis of future population.

Existing Storage Capacity of ESR and Underground Sumps are found in order.

Existing diameter of different main line and distribution line are found in order.

City is divided in two main zones (1) Highway zone (2) Town zone. Total water demand of highway zone is 6.65 MLD present and 8.84 MLD Ultimate; while in Town zone present demand is 12.72 MLD and Ultimate demand is 16.72 MLD. Population density in highway zone is low and pipe line distance is more while population density in town zone is high particularly in LAL DARWAJA HW; DOSABHAI GARDEN; DIPRA DARWAJA and KAMANA CHOWKDI; and Pipe line distance is low in comparison of Highway zone.

REFERENCES

1. Manual for Water Supply and Treatment(CPHEEO) By Ministry of Urban Development; Government of India.
2. Tables for Hydraulic Design of Circular Drains, Sewers and Pipe Lines by D. B. BHATT.
3. VisnagarNagarpalika - A General Report for Visnagar Town Water Supply Scheme Based on Dharoi Dam- Dharoi RWSS- Gunja HW.
4. Handbook on Water Supply by Office of the Principal Accountant General (Civil Audit), Chennai.
5. Unified Facilities Criteria(UFC), Water Storage, Distribution and Transmission Approved for Public Release Distribution Unlimited.
6. A Project Report on Design of Water Supply Pipe Network for the Societies near Polytechnic Campus by Government Polytechnic, Porbandar.

