# "DESIGN OF WTP FOR NASHIRABAD MUNICIPAL COUNCIL"

**Prajwal B. Satpute[1], Adil J. Shaikh[2], Pankaj K. Jadhav[3], Rushikesh K. Bharad[4], Roshansha Husensha[5], Prof. Vilas T. Patil[6]**

*[1, 2, 3, 4,5]Student-Tech Civil Engineering, Government College of Engineering Jalgaon-425001(MS), India.*
*[6]Assistant Professor, Dept. of Civil Engineering, Government College of Engineering Jalgaon-425001(MS), India.*

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**Abstract** - *Nashirabad, town in the district of Jalgaon; today dealing with the problems like water scarcity and untreated water. The population of that is around 26,131(census 2011) but not getting fresh drinking water, the town also facing low frequent water supply and there also irregularity in supply of water always. Due to those women and child facing more problems. There are sufficient sources available for collecting raw water such as Waghur river, Waghur dam and infiltration wells near town. In 2020 the project of WTP was proposed and ignoring above sources raw water is being collected by Tapti River but it fails only just in 6 months due to wrong design and poor maintenances. And due to unawareness about water borne diseases and lack of provision of funds for proposing water treatment units; there is not a good scheme for water supply even today. Population density of town is 571.02 persons/ sq.km and we can't ignore such a huge population and design of WTP is must there.*

***Key words:*** **Nashirabad, water supply scheme, WTP, Wagur river, Tapi river .**

## 1. INTRODUCTION

Even in countries with adequate water resources, water scarcity is not uncommon. As a result of collapsed infrastructure and distribution systems, contamination, conflict, or poor management of water resources, children are increasingly denied the right to safe water and sanitation due to climate change, as well as human factors. Water scarcity limits access to safe water for drinking and for practicing basic hygiene at home, in schools and in health-care facilities. When water is scarce, sewage systems can fail and the threat of contracting diseases like cholera surges. Scarce water also becomes more expensive. Water scarcity takes a greater toll on women and children because they are often the ones responsible for collecting it. When water is further away, it requires more time to collect, which often means less time at school. Particularly for girls, a shortage of water in schools impacts student enrolment, attendance, and performance. Carrying water long distances is also an enormous physical burden and can expose children to safety risks and exploitation.

India gives reason for 2.45% of land field and 4% of water possessions of the realm but represents 16% of the globe people. With the study of human population-rate (1.9 per insignificant value done yearly), the population proper to cross the 1.5 billion marks by 2050. The Planning Commission, Government of India has supposed the water demand increase from 710 BCM (Billion Cubic Meters) in 2010 to nearly 1180 BCM in 2050 accompanying household and industrialized water consumption wonted to increase nearly 2.5 occasions. The style of urbanization in India is striving stress on community authorities to specify fundamental necessity to a degree secure quaffing water, sanitation and foundation. The hasty progress of populace has applied the convenient water demand, which demands investigation of inexperienced water beginnings, expanding situation and distribution orders.

### 1.1 Aim

The goal is to provide water treatment plant to Nashirabad municipal council.

### 1.2 Objective

1) The decreasing availability of freshwater has generated the need for purification of wastewater on earth. Water treatment is important to earth because the availability of fresh water is limited in the earth and the demand is high.

2) It is important to protect the health the harmful chemicals, metal and other contaminants present in water are dangerous for the health of humans and other organisms living on this planet. These harmful substances and toxins lead to various health problems like asthma, cholera, diarrhoea, asthma, cancer, skin disorders and even death. Hence, this will reduce the annual death rate of people caused by drinking contaminated water.

3) It helps to ensure that water is not wasted – The wastewater treatment plants use water discharged from households and industries which is purified and discharged back to the community and natural environment. Thus it reduces the wastage of water.

4) It helps to restore the water with this process; water is reintroduced back to the cycle of nature.

5) To protect the environment– Water treatment is very much helpful for the environment. It helps to balance

the water cycle by maintaining groundwater and surface water.

6) The water purified at the treatment plants can be used for various purposes like drinking, households use, industrial application, agriculture, and irrigation purposes, etc. This will solve the problem of water shortage and countries with limited access to safe water will be benefited.

7) Water purification plants are also important as they fulfil the increasing demand for water.

8) Desalination is another way of water purification. It is important as it converts the saline water (which is of no use and is available in abundance on the earth) to potable water. This can help in solving the problem of water scarcity in the world.

## 2. LITERATURE REVIEW

1. A International Journal of Innovative Research in Science, Engineering and Technology presented a research paper Study of Water Treatment of Jalgaon City on "Performance of Drinking water treatment Plant" and concluded that, The water treatment plant of Jalgaon needs some changes in their working process for providing better and safe water treatment for Jalgaon city.

a) The current workers and officers working in water treatment plant are quite less and should be increase to required level.

b) The Security Systems of the plant should be updated.

c) The SCADA (Supervisory Control & Data Acquisition) System should be implemented in plant.

d) The need of water will be 175.4 MLD in 2030 therefore certain measures should be taken to increase the capacity of plant or it should come with one more secondary plant.

e) The pipeline in area of Bali ram peth and Shanipeth should be repaired and uniform diameter pipes should be placed to avoid head loss.

f) Currently the operation of manhole is done manually at plant. This should be operated by a definite system automatically.

g) The maintenance of components at water treatment plant should be updated.

h) The basic objective of the water treatment plant is to supply safe and adequate amount of water to the human society in economical form. To attend this it is very important to have installation of safe guard instruments as well as safe guard monitoring system for plant operations. The water treatment plant of Jalgaon is operated by Municipal Corporation of Jalgaon.

The plant has the capacity to treat 132MLD water per day and supplies water to Jalgaon city with a population of.6 laths (approx.) the intake source of water treatment plant is from Waghur dam located 6 km away from the plant. The objective of this paper is to have a brief study of the working efficiency of water treatment plant. The main focus of the study is to survey the brief specifications of the equipment's used in the water treatment plant. The paper will also contribute to identify the solutions for better efficiency of water treatment plant.

2. Research paper on KRISHNA WATER DISTRIBUTION TAILS The main object is the supplying of Krishna treated water to Hyderabad from Kodandapur water treatment plant by the help of mechanically pumping and by gravity. To drawing raw water from AMRP canal through MS pipe line from the canal intake to the three WTP's (water treatment plant's) (phase-I of stage I & stage-II of 45 MGD+45 MGD and phase –II OF 90 MGD) total 180 mgd of water for Krishna drinking water supply project.To pump out the clear water after filtration by the pumps from the pump house of Kodandapur to Nasarlapally a distance of 34 km with 157 m through 8 pumps. The pumping of clear water from pump house at Nasarlapally to Godakondla with a distance of 24 kms and head of 163 m.To pump the clear water from Godakondla to Gungal with distance of 20 Kms and head of 148 m.To pump the clear water from the Gungal to Sahebnagar reservoir by gravity. The current demand for water supply in the city is 460 MGD, but the Water Board is supplying only 340 MGD, a major shortfall, that deprives the surrounding municipal areas, many of which get water once in three days, some only once in seven days. Godavari water will come to the city a few months before the Assembly elections in 2014.Alwal would be the first GHMC circle to get Godavari water, which would traverse 186 Kms from

Yellampally (Karimnagar) barrage. Subsequently, Qutubullapur, Rajendranagar, Kukatpally, Serilingampally, Kapra and Malkajgiri circles and the Secunderabad cantonment would get Godavari water treated at the Ghanpur mega balancing reservoir.

3. International Journal of Innovative Research in Science, Engineering and Technology presented a review paper on "Review on Optimization of Conventional Drinking Water Treatment Plant", and concluded that, Water treatment is a process which consists of several sub process which works on the motto of converting the non-drinkable form of water in to drinkable form. Conventional drinking water treatment plant consists of coagulation,

flocculation, sedimentation, filtration and disinfection units. Depending on water quality influent, each unit can be optimized to achieve the desired water quality effluent, both in design and operation stages. A typical water treatment plant has the combination of processes needed to treat the contaminants in the source water treated by the facility. The presence of unbeatable organic or mineral substances causes some problems in obtaining drinking water.

Understanding these phenomena requires considering the physical and chemical natures of the water to be treated. Optimization of conventional drinking water treatment plant means "to attain the most efficient or effective use" of your water treatment plant regarding some principles, there are: achievement of consistently high-quality finished water on a continuous basis and the importance to focus on overall plant performance, instead of focusing too much on individual processes. The paper presents a review on optimization of conventional drinking water treatment plant that eventually proposing a method to maximize process efficiency with less risk. Overall optimization was carried out by dynamic programming to meet drinking water quality standard.

## 3. METHODOLOGY

The methodology consists of three phases, as below:

### 3.1. Questionnaire survey:

1) Name of the City: Nashirabad.

2) Population:

   a. As per Year 1991: 17,532

   b. As per Year 2001: 22,212

   c. As per Year 2011: 26,131

3) Year of establishment of WTP: 2020

4) Treatment Plant Installed Capacity: MLD Quantity of water treated: 4.5 MLD

5) Whether water treatment plant is adequate to meet present demand: No

6) Source of Water Supply: River: Waghur, Tapti. Dam: Waghur Dam Ground water: Wells (5 Nos)

7) Type of Treatment: No Disinfections only by bleaching power and sedimentation with coagulation by alum.

8) Plans for additional water treatment plant: water treatment plant should be redesign by considering high demand of water.

9) Distribution System: Distribution systems available today do not meet the requirement of population and discontinuity in the water supply. There is only three Elevated surface reservoirs.

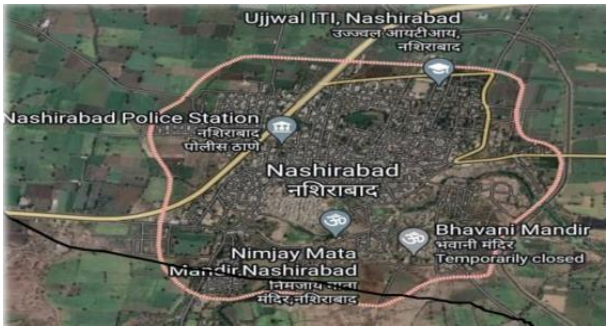


**Fig-1. Service Area of Nashirabad (4576.21 hectares)**

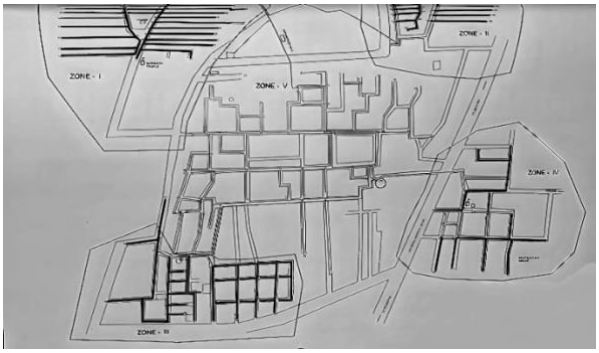

**Fig-2. Distribution System**

### 3.2. Design of WTP units.

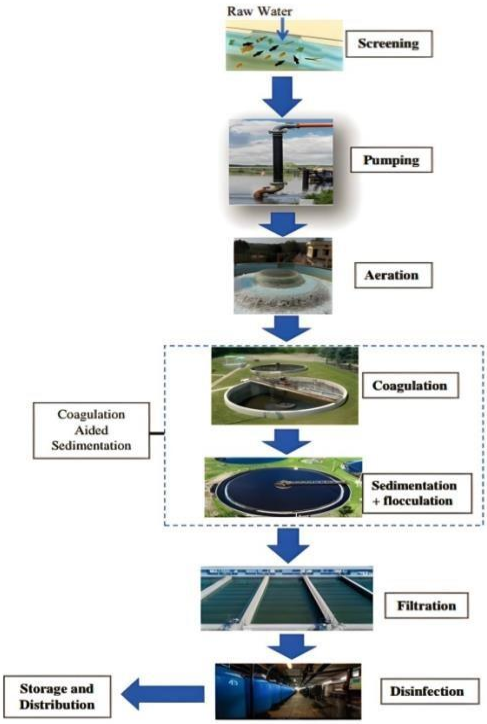


**Fig-3. WTP Units**

**NASHIRABAD WATER SUPPLY SCHEME**

**TAL- JALGAON, DIST- JALGAON**

**A) Main Features of the Scheme:**

1) Name of the Scheme: Nashirabad Water Supply Scheme
2) Town: NASHIRABAD
3) District: JALGAON
4) Source of Supply: Jack well in Waghur Dam
5) Population in person as per 2011 Census: 26131 Souls
6) Population in persons designed Stage (2055 year): 48060 Souls
7) Rate of Water Supply: 135 LPCD
8) Daily Water Supply at designed Stage (Net): 7.461 MLD
9) Daily gross demand with losses: 8.720 MLD Existing water supply is not adequate to satisfy the needs of water during dry weather. In summer people do not get at: 0.000 MLD Required Daily Demand: 8.720 MLD
10) Rate of pumping (Immediate Stage 2039): 85136 Litres/Hr
11) Daily pumping (Pure Water): 20 Hrs
12) Cost of the scheme as per DSR 2022-23: a) Net Cost Rs. 420956105.20 b) Gross Cost Rs. 496728204.20 13)Per Capital cost of designed stage (2054): Rs. 8759.00

14)Cost of Water 1000 Litres.Rs.5.51 15. Water tax per house per year: 1) Special water connection tax house connection/year.: Rs. 1600.00 **B) Design data of water supply scheme:**

1) Name of Municipal Council

Taluka: JALGAON
District: JALGAON

2) Population

2011: 26131 Souls

2040: 38753 Souls

2055: 48060 Souls

3) Rate of Water Supply: 135 LPCD

4) Daily requirement of water with losses etc.: 8.72

5) Source of Supply: Jack well in Waghur Dam 6) Hours of Pumping: 20Hours.

Rate of Pumping Raw Water (Immediate 7) Stage)319636 Litres/Hr

8) Details of Sub work

a) Head works (Ultimate Stage 2054): Jack well in Waghur Dam

Intake Well-3 m Dia,

Connecting Main- 350 mm dia

Jack well Well- 23.59m

Depth with pump house 8 m Dia,

Approach Bridge- 30m

b) Raw Water Pumping Machinery (Immediate Stage year 2039)Rate of Pumping: 393750.00 Litres/Hr. Total Head: 60.00m

BHP: 140 BHP Submersible pumps 1 Working +1 Standby

c) Raw Water Rising Main (Ultimate Stage: 2054)

Pipe: DI Pipe Dia: 350.00mm Length: 1730.00m K-9 Class

d) Treatment Plant with automation

Capacity: 4.00 MLD

Type: conventional

Working Hours: 20 Hrs.

Av. G.L. at site: 226.600 M.

Lip of aeration fountain: 232.10 M.

e) At WTP

Hours of Pumping: 20 Hours

Rate of Pumping: 369166.67 Litres/Hr.

Total Head: 35.00 M

BHP: 80.00 BHP - 2 No

: One in use & other stand by

Type of Pump: Submersible Pump

f) Pure Water Rising Main (Ultimate Stage 2054) At WTP

Pipe: DI Dia: 350.00 mm Length: 50.00 M.

i) MBR Proposed

Capacity: 6.70 Lakh Lit.

Av G.L.: 226.600 M

Staging Height: 25.000 M

LWL: 251.600 M

FSL: 255.600 M

ESR Proposed

Location: Bhuvaneshwar Nagar

ESR Capacity: 1.06 Lakh Lit.

Av G.L.: 218.580 M

Staging Height: 15.000 M

LWL: 233.580 M

FSL: 236.580 M

j) ESR Proposed

Location: NP OFFICE

ESR Capacity: 5.14 Lac Litters

Av G.L.: 217.750 M

Staging Height: 18.000 M

LWL: 235.750 M

FSL: 239.750 M

MBR @ WTP Pure Water Pumping Machinery (Intermediate Stage year 2039)

k) ESR Proposed

Capacity: 227000.00 Lac Litters

Av G.L.: 214.000 M

Staging Height: 20.000 M

LWL: 234.000 M

FSL: 238.000 M

ESR Proposed

Capacity: 751000.00 Lac litters

Av G.L.: 217.000 M

Staging Height: 15.000 M

LWL: 232.000 M

FSL: 236.000 M

l) Distribution System (Proposed) 1110 mm dia. Total Length of Distribution System 50293.00 m 100% connection

m) Substation & Express Feeder - proposed

n) Road reinstating provision is made in this scheme

o) Miscellaneous work electrical connection at head works and WTP & ESR Compound Wall

Aqualon Solution Municipal Engineer Chief Officer NashikNashirabadNagarpanchayat, NashirabadGaothan ESR Staff Quarter, charges for road crossing, Forest Permission provision is made in this scheme.

**C) Cost of Scheme**

1) Working Survey: Rs. 488983.00
2) Intake Channel (Length 30 M): Rs. 1979511.00 3)Intakes Well (3 M Dia): Rs. 2585397.00 4)Inspections Well (2.50 M Dia) (1 Nos): Rs. 1544607.00
5) Intake Pipe (Length 30 M &Dia 600 Di K-7): Rs. 5259196.00
6) Jack well With Pump House (8 M Din): Rs. 20662824.00
7) Approach Bridge (Length 30 M): Rs. 3190001.00
8) Raw Water Pumping Machinery- 20 Hp (1W +1 Standby): Rs. 18831418.00
9) Raw Water Rising Main 350 Mm Dia Di K-9, L1730M (Jackwell To Bpt) Bpt Of Capacity 131000 Lits- 15 M St Ht: Rs. 15438035.00
10) Bpt Of Capacity 131000 Lits- 15 M St Ht: 3649824.00
11) Gravity Main (Dik-7 Pipe 400 To 450 Mm Dia L16200M): Rs. 133660156.00
12) Water Treatment Plant Of Capacity 4 Mld: Rs. 21347920.00
13) Pure Water Rising Main 250 Mm Dia Di K-9, L-50 M (Sump To Mbr): Rs. 755663.00
14) Pure Water Pumping Machinery 15 Hp (1 W+1 S) (From WTP To MBR) 15 Mbr @Wtp Of Capacity 670000 Lits-25 M St Ht : Rs. 9490355.20 15)Mbr @ Wtp Of Capacity 670000 Lits- 25 M St Ht : Rs. 10707754.00
16) Feeder Main (Dik-7 Pipe 150 To 350 Mm Dia L3220M): Rs. 14078996.00
17) Np Office Esr Of Capacity 514000 Lits 18 M St. Ht 18 Bhuvaneshwar Nagar Esr Of Capacity 210000 Lits- 15M St Ht: Rs. 7102735.00
18) Bhuvaneshwar Nagar Esr Of Capacity 210000 Lits- 15M St Ht: Rs. 4598694
19) Swami Samarth Nagar Esr Of Capacity 227000 Lits
18 M St. Ht: Rs. 3140059.00
20) GaothanEsr Of Capacity 751000 Lits- 15M St Ht
21) Distribution Systems (110 To 250 Mm DiaHdpe& D.I Pipe L- 50.29 Km): Rs. 70411017, 00
22) Road Reinstating-45.23 Km 23 Solar Power Plant 180 KWP Capacity: Rs. 4581997.00
23) Solar Power Plant 180 KWPCapacity:Rs. 6911592.00
24) Staff Quarter - 1 Nos: Rs. 996733.00
25) Miscellaneous Work (Road Crossing, Irrigation Permission Etc): Rs. 4000000

A. **COST : RS 420956105:20**
B. **ADD 18% GST CHARGES: RS 75772099.00**
C. **NET PROJECT COST : RS 496728204.20**
D. **TOTAL GROSS COST: RS 496728204.20**

Financial Forecasts

a) Gross Cost Rs. 496728204.20

b) Design Population 2024 Souls 31386

c) Per Capita Cost on net cost Rs. 15826.00

Annual Burdens: Rs 379.00

Taxation Proposal: Thus the Scheme is self-supporting.

Cost of Water per 1000 litters

a) Annual requirement of Water 2079.00 MLD For population of (2024)
b) Quantity actually used 85 % of Above 1767.15 MLD Annual burden = Design Population Average Establishment, electrical energy charges and sundries ( as per statement)
c) Cost of water/1000 litres :Rs. 6.72 /1000 Ltr

## 4. CONCLUSIONS

1) Population forecasting has been done for 3 decades by using Incremental Increase Method. From calculated data, the population is as follows: 2031:- 38199

   2041:- 45771

   2051:- 54844

2) From calculated population data, for 2051 population forecasting, design of water supply scheme was designed.
3) From the designed data, estimation has been workout. The total cost of this project is Rs.496728204.20/-
4) From present population point of view the cost of the project per capita will be Rs. 15826.00

## 5. REFERENCES

1.https://www.google.com/url?sa=t&source=web&rct=j&url=http://www.ijirset.com/upload/2018/april/128_Study.pdf&ved=2ahUKEwiA4rbtoP37AhUZ1GEKHTktBioQFnoECCUQAQ&usg=AOvVaw2oKbTdAeNkG0rJ8KXxhnSs

2. Mudassir M Inamdar1, Salman sheikh2. “Performance of Drinking water treatment Plant”, International Journal of Innovative Research in Science, Engineering & Technology, Vol 7 Issue 3, March 2018.

3. EndahAngreni. “Review on Optimization of Conventional Drinking Water Treatment Plant”, International Digital Organization for Scientific Information (IDOSI), 2009 Publications.

4. Fifth edition of “Water Treatment Plant Design” – Published by American water works association.

5. Water Treatment Plant of Jalgaon Records by Jalgaon Municipal Corporation. 5. Environment Engineering 1 – Nirali Publication Book by authors Dr. Ravi. K, Dr. Edition published by Ministry of Urban Development. 7. www.gaurankpatil.blogspot.in –Post “Visit Experience at Water Treatment Plant.

6. omelia, c (1998). "Coagulation and sedimentation in lakes, reservoirs and water treatment plants". Water science and technology.

7. 129. [2] Bholea.g., bogawatn.g. (1978) significance of sludge re circulation in the process of flocaulation, jour. Indian wat. Wks. Asscn., x, 1, jan/march, 119- 125.

8. Chaudhuri m., engelbrechtr.s. (1970) removal of viruses from water by chemical coagulation and floaoulation,3our.aww'a, sept., 563-566.

9. Manwaringj.f., chaudhuri m. ,engelbrechtr.s., (1971) removal of viruses by coagulation and floaoulation, jour.awwa, march, 298-300.

10. Shelton s.p., drewryw.a. (1973) tests of coagulants for the reduction of viruses, turbidity and chemical oxygen demand, jour.awwa, oct., 627-635.

11. Qasemy, nawid. "rapid sand filtration". Authorstream.com. Nawid11. Retrieved 27 january 2015.

12. http://outsidethesink.rtu.lv/documents/principles%2 0of%20water%20treatment.pdf http://www.lenntech.com/history-watertreatment.htm

13. www.epa.gov/safewater

14. https://en.wikipedia.org/wiki/water_treatment

15. G.S.Birde and J.S.Birde (1980) Water Supply and Sanitary Engineering. Dhanpat Raj Publishing Company Delhi.

16. Garg, S.K. (2004) Water Supply Engineering. 18th Edition, Khanna Publishers, Delhi.