Examining the Current Water Treatment Facility and Planning for Increased Capacity at MIDC, Waluj, Chhatrapati Sambhajinagar

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ABSTRACT

Now a day's water shortage is the consuming issue. As it is very clear that there is everyday expansion in populace, the interest for water likewise increments to fulfill the requirements of the local area there comes a need to upgrade the current treatment plants, or plan the new treatment plants. Overhaul or configuration incorporates pressure driven plan and cycle of treatment of water in the plant. By and large water can be treated in treatment plants for eliminating destructive substances present in it. The treatment interaction incorporates pretreatment, air circulation, coagulation, flocculation, sedimentation, filtration, fluoridation, molding and sanitization.

Aim of study was to design the water treatment plant for MIDC, Waluj, Chhatrapati Sambhajinagar. The source of water is Jayakwadi Dam. The properties of water changes in light of its surface source. In this manner there is a ton of significance to plan treatment plant to Waluj, Chhatrapati Sambhajinagar. Tests performed are physical, chemical and biological test to check the nature of water provided by the water treatment plant.

This Project incorporates the detail of the treatment units present in the current water treatment plant at MIDC, which are 9 altogether, and anticipating the rising interest of water. This venture includes all the plan estimations for the new treatment plant and furthermore the plan rules on which these have been planned.

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The venture includes the new proposed site called as Raver which is situated in encompassing area of MIDC Waluj, Chhatrapati Sambhajinagar. The proposed development is conceivable and can be handily finished. Generally speaking the fundamental reason for this task is to help and propose another plan to the MIDC so the future necessities of the rising ventures can be met, and every one of the enterprises can successfully utilize this water.

I. INTRODUCTION

MIDC (Maharashtra Industrial Development Corporation) is a significant task of legislature of MIDC of Maharashtra state, India, and is a main organization of Maharashtra. It furnish business with foundation, for example, lands, street, water supply waste office and streetlamp. MIDC Waluj, Chhatrapati Sambhajinagar has a modern area of 1298 heactor of land has come into ownership of MIDC. It give all the essential framework, for example, streets, streetlamps, water supply, pipelines around here. The current water treatment plant of MIDC satisfies its need of water from Jayakwadi Dam. The plant was built in the year 1980, when the individual from ventures was 160. The limit of the plant in present today is 5.5 MLD. As the quantity of businesses is expanding step by step it has turned into an unquestionable necessity to build its ability for satisfying the need in not so distant future. MIDC, Chhatrapati Sambhajinagar has chosen to take the encompassing region known as "Raver" into ownership to satisfy what's in store needs. According to the interest the main thing here is to plan as per the ongoing 650 number of businesses. In this way, here the venture manages idea of upgrading of the treatment units bit by bit which the most fundamental part up to 20 MLD, likewise the expense of the new treatment plant is to be determined.

II. METHODOLOGY

a. BASIC INFORMATION OF EXISTING WATER TRATMENT PLANT:

First step of the project was collect basic data which is required for the project. We collected data from the existing water treatment plant located in MIDC Waluj. Data was about the basic information about the existing units present at water treatment plant. The total number of unit is 9 which are as follows,

- Intake Well
- Jack Well

- Cascade Aerator
- Flash Mixer
- Sedimentation cum Flocculation Tank
- Rapid Sand Filter
- Disinfection Unit
- Sump and Pump House
- Elevated Storage Reservoir

b. BASIC INFORMATION ABOUT TESTS:

Water quality determines the goodness of water for particular purposes. Water quality tests will give information about the health of the waterway. By testing water over a period of time, the changes in the quality of the water can be seen. Tests are as follows,

- Colour
- Odour
- Turbidity
- pH Value
- Chlorides (as Cl)
- Total Hardness (as $CaCO_3$)
- Alkalinity (as $CaCO_3$)
- Total Dissolve Solid
- E. coli

c. DESIGN CONSIDERATION

- DESIGN CRITERIA FOR INTAKE WELL:-

- Areas of bay openings are worked out by considering the speed of stream between 0.1 to 0.25 m/s.
- Bay opening ought to be 1 to 1.5m underneath water level.
- Breadth of Intake well is around 3 to 5 m.
- Lower part of Intake well ought to be somewhere around 3m underneath least water level. 05. Crude water gravity principal is planned by utilizing Hazen William equation, with speed of water through the fundamental going between 0.9 to 1.5 m/s.

- DESIGN CRITERIA FOR CASCADE AERATOR:-

An easiest outpouring comprises of a progression of 3 to 4 stages.

- Water is permitted to fall through a level of 1 to 3 meters.
- Distance across of focal shaft is viewed as 1.2 m.

- DESIGN CRITERIA FOR FLASH MIXER:-

- Confinement Time = 1 to 3 minutes.
- Square or roundabout bowls are utilized for blending profundity = 1 to 11.5 m.
- Speed inclination = 700 to 1000 s-1.

- DESIGN CRITERIA FOR SEDIMENTATION TANK:-

- Flood rate =15-30m3/d/m.
- Least side water profundity =2.5m.
- Detainment period for coagulated water 2-4hrs.
- Weir stacking = 300m3/d/m.
- Side slants for non-mechanical cleaning =10% from sides towards longitudinal focal line.
- Longitudinal slant = 1% if there should arise an occurrence of rectangular tank.
- Proportion of length and width = 3:1 to 5:1.
- Settling speed = To guarantee evacuation of least size of molecule of
- 0.02mm. 09. Detainment time to flocculation chamber = 20-30min.
- Skimming weir = to really take a look at the foam on the outer layer of outlet to decrease load on the channel. 11. Even stream speed = 0.15-0.9 m/s.

- DESIGN CRITERIA FOR CLARIFLOCCULATOR:-

- Profundity of bowl = 3m to 4.5m.
- Detainment time = 20 to 60 min.

- For rectangular kind = length/width = 2 to 3.
- All out paddle region = 15 to 20 % of vertical cross segment bowl. 05.
- Distance between paddle edge and base or side of bowl = 15 to 30 cm.
- The fringe speed of oar = 0.2 to 0.6 m/s.
- Level speed of stream = 1.5 to 2 cm/s.
- Speed distinction between oar of water = 75% of oar speed. 09. G = speed slope = 10 to 75/sec.
- Power utilization = 18 to 36 KW/MLD.
- Coefficient of drag = 1.8 for level oar with level plate.
- Item G× T ought to be between 104 to 105.

- DESIGN CRITERIA FOR RAPID GRAVITY FILTER:-

- Pace of filtration = 3000 to 6000 lit/hr/m2.
- Number of channel units N=√ (Q) 14.69 (Q in m3/hr).
- Channel bed size = L: B proportion = 1.25 to 1.33.
- Profundity of channel sand media = 60 to 90 cm.
- Profundity of base material (rock) = 30 to 60 cm (all around reviewed). 06. Sand particular = most extreme size = 1mm.
- Least size = 0.45mm.
- Viable size = 0.35 to 0.6 mm.
- Profundity of water region sand = 1 to 2 m.
- Measure of wash water = 2 to 4 % water separated.

a. DESIGN CRITERIA FOR UNDER DRAIN

Framework:-

- Proportion of length of horizontal to its width = 60.
- Breadth of holes in laterals = 5 to 12 mm.
- Separating of holes along the parallel = 8 cm for 5mm openings.

  20 cm for 12mm openings.
- Proportion of all out area of hole to the absolute cross sectional area of laterals = 0.25 for 5 mm.
- Dividing of laterals = 30 cm.
- The proportion of complete area of hole in the under seepage framework to the whole channel region might be between0.002 to 0.003.
- Cross sectional area of complex = 1.5 to twice the complete cross-sectional area of laterals.

b. DESIGN CRITERIA FOR WASH WATER TROUGH:-

- Flat travel of filthy water over the outer layer of channel will not be more than 0.5 to 1.0 m prior to arriving at box.
- Lower part of box ought to get the top free from extended sand by 50 mm or more.
- Upper edge of box ought to be set to the extent that over the outer layer of the undistributed sand surface as the wash water ascends in 1m.

III. RESULT AND DISCUSSION

a. ANALYSIS OF WATER SAMPLE FOR EXISTING WATER TREATMENT PLANT:

Water quality determines the goodness of water for particular purposes. Water quality tests will give information about the health of the waterway. By testing water over a period of time, the changes in the quality of the water can be seen. The results of test are as follows,

Sr No	**Parameter**	**Unit**	**Results**	**Std as per IS**
1	pH	Intake Well	8	6.5 to 7.5
		Cascade Aerator	9	
		Flash Mixer	9	
		Clariflocculator	6	
		Rapid sand Filter	5	
		Disinfection Unit	5	
		Final Outlet	7	
2	Turbidity	Intake Well	3.8 NTU	1.0 to 5.0 NTU
		Cascade Aerator	2.5 NTU	
		Flash Mixer	2.7 NTU	
		Clariflocculator	1.1 NTU	
		Rapid sand Filter	1.0 NTU	
		Disinfection Unit	1.0 NTU	
		Final Outlet	1.0 NTU	
3	CHLORIDE (as Cl2)	Intake Well	105 mg/l	100-1000 mg/l
		Cascade Aerator	120 mg/l	
		Flash Mixer	145mg/l	
		Clariflocculator	150 mg/l	
		Rapid sand Filter	125 mg/l	
		Disinfection Unit	135 mg/l	
		Final Outlet	135 mg/l	
4	Total Hardness	Intake Well	340 mg/l	200-600 mg/l
		Cascade Aerator	360 mg/l	
		Flash Mixer	390 mg/l	
		Clariflocculator	310 mg/l	

		Rapid sand Filter	360 mg/l	
		Disinfection Unit	430 mg/l	
		Final Outlet	430 mg/l	
5	Alkalinity (as CaCO3)	Intake Well	10 Mg/l as CaCO3	20 Mg/l as CaCO3
		Cascade Aerator	10 Mg/l as CaCO3	
		Flash Mixer	10 Mg/l as CaCO3	
		Clariflocculator	10Mg/l as CaCO3	
		Rapid sand Filter	10Mg/l as CaCO3	
		Disinfection Unit	10Mg/l as CaCO3	
		Final Outlet	10 Mg/l as CaCO3	
6	Total Dissolve Solid	Intake Well	77 mg/l	50-150 mg/l
		Cascade Aerator	79mg/l	
		Flash Mixer	91 mg/l	
		Clariflocculator	71 mg/l	
		Rapid sand Filter	80 mg/l	
		Disinfection Unit	90 mg/l	
		Final Outlet	70 mg/l	
7	E. coli	Intake Well	8 MPN /ml	1–10 MPN/100 ml
		Cascade Aerator	7 MPN /ml	
		Flash Mixer	7 MPN /ml	
		Clariflocculator	6 MPN /ml	
		Rapid sand Filter	6 MPN /ml	
		Disinfection Unit	1 MPN/ml	

		Final Outlet	0.76/ml	

b. The final result shows the comparison between the existing and proposed water treatment plant and the dimensions of both the treatment units. There are total 9 units in all which have been designed.

SR NO.	TREATMENT UNITS	EXISTING WTP(5.5 MLD)	PROPOSED WTP(18 MLD)
1	**INTAKE WELL**	**-**	3.5 m Φ
	Coarse Screen	-	Length - 2.4 m Height – 1.05 m
	Bell Mouth Entry	**-**	1.0 m Φ
	Intake Conduit	**-**	0.45 m Φ
2	**Raw Water Rising Main**		
	Diameter	350 mm	700 mm
	Distance	1.23 km	50 km
3	**Cascade Aerator**		
	Area	**-**	28.27 m^2
	Diameter	**-**	6.00 m

4	**Flash Mixer**		
	Size	1.0 m X 1.0 m X 2.75 m	4.85 m X 4.85 m X 1.5 m

IV. CONCLUSION

- Based on the review, it suggests using recycled water going forward. The enterprises growth from around 1980 to the near future has resulted in enormous water requirements.
- The aforementioned research illustrates how the design of a 20 MLD water treatment plant takes into account important variables including supply, region of interest, and contemporary development.
- A progressive strategy for WTP units is presented on a regular basis. Procedures, point by point estimations, and drawings are delineated.
- Based on comparison with the existing treatment facility, the project's cost is manageably achievable. The task's outcome is the affordability of the newly planned water treatment facility.

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