A comparative Study of the Existing and Proposed Sewage Treatment Plant in Kudalwadi Basin of PCMC, Pune in View of Pragmatic Feasibility, Cost Efficiency and Sustainability

Yogesh S Alhat[1], Dr. Ashok B More[2], Dr. Saswati Datta[3]

[1]P.G. Student, D.Y. Patil College of Engineering Akurdi.
[2]Head of Department of Civil Engineering, D.Y. Patil College of Engineering Akurdi.
[3]Professer, Department of Civil Engineering, D.Y. Patil College of Engineering Akurdi.

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Abstract - *Water and waste water systems represents major infrastructure for sustainable growth of any city. The potential negative impacts of improper waste water systems on the surrounding environment range from negligible to significant. It is observed that collection and conveyance system often gets less attention compared to treatment plant. Existing STP at Chikhali, for Kudalwadi basin, is located at a higher altitude and a distance of 2840 m from the river Indrayani to which treated waste water flows through the channels. During this journey it carries a lot of e-waste dumped by the local people as well as waste water directly mixed with it at places due to leakages in drainage pipe.*

Proposed STP and ESR for Kudalwadi basin planned at the Indrayani riverbank which is at a lower altitude in the catchment area. Therefore, this project will provide valuable land available for public purpose by shifting STP to riverbank and eliminating pumping stations as well as reduce the cost of operation and maintenance of pumping stations. If constructed it will be a better alternative to the existing STP since treated effluent can be discharged directly to nearby river. It will help achieving zero liquid discharge from municipal waste water as well as no scope for leakage of polluted water. It is expected to reduce the cost and energy to retreat the channel water as well. The proposed STP will also help maintaining the various parameters of channel and river water required for natural growth of flora and fauna of aquatic life in river Indrayani, reduce the water and environmental pollution in the catchment area of Kudalwadi basin and increase the hygienic life of residents. So the proposed STP is a better alternative to the existing STP from in view of pragmatic feasibility, cost efficiency and sustainability.

*Key Words***:** STP, Chikhali, Kudalwadi basin, river Indrayani, cost of operation

1. INTRODUCTION

Water and waste water systems represents essential infrastructure for sustainable growth of any city. These systems affect basic public health of the citizens and are often taken for granted. The importance of this system is not recognized until disruption in service occurs. The study of waste water system comprises of collection, conveyance, pumping, treatment and discharge of raw sewage from sump well to sewage treatment plant (STP) with high pressure pump. Sewage treatment plant involves physicochemical and biological processes to remove contamination and produce treated waste water that is safe for environment and further disposal in water bodies or storage for other application. It is observed that collection and conveyance system often gets less attention compared to treatment plant. The underground pipe network that collects waste water from sources to treatment plants is an invaluable asset. The aim of waste water treatment at treatment plant and distribution of treated water can't be achieved satisfactorily without a full proof collection and conveyance system. The main aim of this study is to achieve zero liquid discharge from municipal waste water and leakage of polluted water from Kudalwadi basin and make channels and Indrayani river (Figure 1) free from water pollution for safe survival of aquatic flora and fauna.
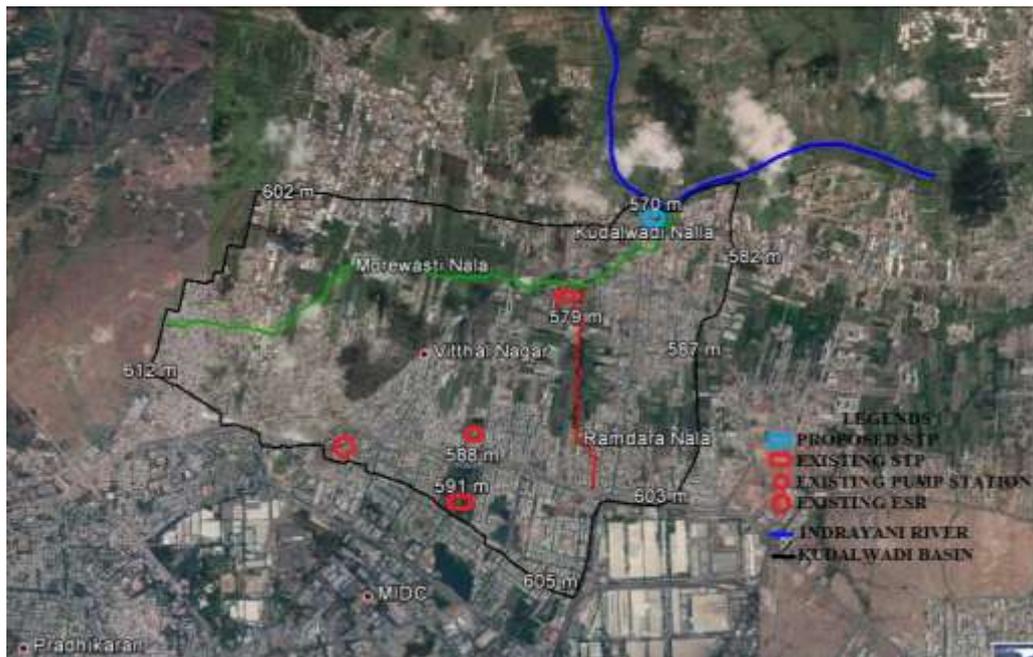
Figure 1. Topographical details of the Kudalwadi basin of PCMC, Pune

1.1. Motivation

In recent times, all urban local bodies and government sectors having arrangement to treat waste water and then discharge it into nearby water bodies. Conventional treatment methods such as Activated Sludge Process (ASP) and Sequential Batch Reactor (SBR) have some limitations (Arnold et al., 2000). These methods could not achieve complete level of treatment and due to that treated water may not be fit for aquatic flora and fauna. As per CPHEEO manual (2013) and recent research it is very important and essential to treat waste water up to a level which can be fit for potable use of human; at least it should not be harmful for aquatic flora and fauna (The Environment (Protection) Rule, 1986). Recent site visit at river Indrayani, Maharashtra also reveals that attention is not given to channels and river water pollution.

Many a times, it is observed that water after consumption for any of the purposes - domestic or industrial is not collected, treated and discharged in safe manner which leads to water pollution in channel, river and ocean. Channels flowing with this waste water and low laying areas filled with stagnant water become colony areas for breeding of mosquitoes and insects. To avoid such type of problem it is highly and precisely needed to add industrial waste water, after treatment, into sewage line and more importantly to design the collection, conveyance, treatment and disposal of sewage sustainably; which was not observed in the catchment area of Kudalwadi basin of PCMC, Pune. This study focuses on the paucity of pragmatic feasibility, cost efficiency and sustainability of the existing STP at Kudalwadi basin. Additionally, in the present paper, a new alternative STP is proposed which is expected to solve the problem of water and environmental pollution of that area.

1.2. Problems involed with existing stp

Kudalwadi basin is an industrial area of PCMC, Pune. Presently, waste water of Kudalwadi basin consists of sewage as well as industrial effluent is collected at two pumping stations namely Newalewasti (popularly known as 930) and Spine road (popularly known as 1253) which are located at lower level of the existing STP at Chikhali (Figure 1). After treatment, treated waste water released to the channels flowing to Indrayani river. Approximate altitude and distances of Indrayani river bank and existing two pumping stations from existing STP are as given in Table 1. From the site investigation it is observed that Newalewasti pumping station has pumping head of 12 m and that of Spine road 3m. It is also found that Newalewasti pumping station is 1630m away from existing STP and Spine road pumping station is just near to STP, but due to great difference in altitude it is not possible to collect waste water by gravity at existing STP and large amount of cost required for pumping water to a higher level. Additionally, disposal of post treatment waste water pollutes water in the catchment area of Kudalwadi basin

as well as of Indrayani river. Channels carrying treated waste water to Indrayani river gets polluted due to the disposal of e-waste directly to the channels by the local people. Local farmers break drainage chambers to use water for irrigation. At some locations waste water gets mixed directly to the channel water due to leakages of drainage pipe. As per Maharashtra Pollution Control Board (MPCB), Kudalwadi channel located to north region of PCMC and meeting Indrayani river is the most polluted channel in this region. It carries high level of suspended solids and dry garbage at Moi bridge, Chikhali just before reaching to river Indrayani. So, further a question of cost and energy requirement to retreat the channel water arises.

Table 1 Distance of Indrayani river bank and existing two pumping stations from existing STP

Node point	Altitude (m)	Distance from existing STP
Indrayani River bank	570	2840
Newalewasti Pumping Station	579	1630
Spine Road Pumping Station	588	200
Chikhali STP	591	0

2. Pragmatic feasibility, efficiency and sustainability of proposed stp

Proposed STP planned on the Indrayani riverbank covers approximately 9.11 sqkm of area (having 14.23 km of perimeter). This STP if constructed would reduce the need for pump-houses, since the treatment plants will be at a relatively lower altitude and sewage would flow by gravity to the extent possible. Therefore, this project will provide valuable land available for public purpose by shifting STP to riverbank and eliminating pumping stations as well as reduce the cost of operation and maintenance of pumping stations. This will also provide justifiable location of Elevated Static Reservoir (ESR) near Proposed STP at lower altitude for better conveyance of water supply by taking advantage of hydraulic gradient. Besides, since treated waste water would be disposed directly to Indrayani river, proposed STP would reduce water pollution and hence have positive impacts on public health and ecosystems.

Existing Chikhali STP currently treats about 32 MLD of waste water (Final Report of PCMC, 2000). Considering future population forecasted for next 30 years, this capacity is expected to be increased to about 50 MLD. From recent survey it is observed that leakage of waste water into channel and river is about 5 MLD and this may increase up to 10 MLD in next 30 years. Hence to avoid the leakages and meet treating capacity of 50 MLD during coming 30 years proposed location of STP near river Indrayani is justifiable.

3. CONCLUSIONS

From the site investigation and data collected in this study following inferences can be drawn,

(1) Proposed STP will provide valuable land, (2) It will reduce the cost of operation and maintenance of pumping stations, (3) It is capable of treating the waste water of Kudalwadi basin, (4) Better conveyance of water supply to ESR, (5) It will reduce conveyance losses of sewage water in the pipe network the water and environmental pollution of the catchment area.

Therefore, the proposed STP is a better alternative to the existing STP from in view of pragmatic feasibility, cost efficiency and sustainability.

REFERENCES

1. Arnold, E., Bohm, B. and Wilderer, P.A. (2000). Application of activated sludge and biofilm sequencing batch reactor technology to treat reject water sludge dewatering systems: a comparison. *Water Sci. Technol.*, *41*, 115–122.

2. CPHEEO (2013) CPHEEO Manual on Sewerage and Sewage Treatment Systems.

3. PCMC (2000). *Development Plan - 2021 For Newly Merged Areas In Pimpri-Chinchwad Municipal.* Department of Environmental Engineering, Pimpri Chinchwad Municipal Corporation.

4. The Environment (Protection) Rule (1986). http://jkforest.gov.in/act/Environment_Protection_Rules.pdf