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Case Study on Koramangala and Challaghatta (KC) Valley Wastewater Treatment Plant

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Abstract:- Water involves various range of activity and well being of society, in Kolar district Karnataka, observed as a result of the development of societies concerns the water sector, which results in the increasing requirements for water supply and wastewater treatment. The Koramangala and Challaghatta (KC) valley plant consist of three STPs of capacity 440 MLD will filter the sewage (secondary treatment) the water will flow into the drain networks that connects 134 lakes in Kolar distract, recharging the groundwater aquifers. 124kms lengths the water travels to reach 134 lakes in Kolar districts. After having a look at the results of the above said, a trial or say an attempt has been conducted to appraise the performance of waste water treatment plant (WWTP) near the Kolar district KC valley capacity of 440 MLD, it consists of units (Screening & Grit chamber, Aeration tanks, Secondary Clarifier, Storage Tank) for treatment. Specifications studied and examined for the appraisal of the performance of WWTP are Total Solids, Oil &Grease, Chlorides, Sulfates, Nitrates, Nitrites, COD, and BOD5@ 20° C. Certain tests were conducted which found pollutants in the Treatment plant. The studies done in the recent times states that removal efficiency of COD at a WWTP was around 88.07% and efficiency of BOD5 at a WWTP came around a big 95.67%. As the excess of sludge is produced in these wastewater treatment plant, they are further used as a fertilizer.

Keywords:- *Analysis, Screening, Performance, Chemical Oxygen Demand, Biological Oxygen Demand, Areation Tank.*

I. INTRODUCTION

With an increase in population and water requirement in Kolar district, Karnataka observed as a result of the development of the modern societies increases the concerns in the water sector, which results in the increasing requirements for water supply and wastewater treatment. The Koramangala and Challaghatta (KC) valley plant benefit 134 lakes from the project as per plan 440 million liters amount of water to be expected to be treated by plant and 6 pump house to send water to KC valley. The Koramangala and Challaghatta (KC) valley project is first of its kind considering its nature and scale. Three STPs of 440 MLD capacity will filter the sewage from Banglore. The treated water is pumped to the lake and then water will flow into drain networks that connect 134 lakes in Kolar District recharging groundwater aquifers.

II. LITERATURE REVIEW

The IJWWT (ISSN 2381-5299 tell us about various information, features and difficulties on how to manage wastewater and there are many and many articles on the issue of managing waste water that has become a global issue. The journal is a step forward to providing a stimulation and discussions on how to handle, prevent, monitor and characterize residue and reuse of the disposal of solid wastes. It introduces the articles from various countries whether it be from developing or industrial countries. Different categories of wastes such as agricultural and municipal are presented in detail. The residential, institutional, industrial and commercial wastewater are a part of the wastes extracted from municipal whereas other special categories may include sludge from sewages, household waste that may be hazardous and hospital waste.

- It tells about miscellaneous topics on treatment of waste water like monitoring of waste water, purification of waste water, etc.
- It give a fortune to study on the factors such as environment, politics and practical problems of wastewater treatment.
- The articles presented here gives a complete information about the present situation and difficulties faced due to waste water treatment.

III. AREAS TO BE COVERED UNDER THIS PROJECT

- Bellandur lake
- Vartur lake
- Hoskote lake
- Malur
- Bangarpet
- Kolar
- KGF
- Chintamani
- Mulbagal
- Srinivasapura

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IV. FLOW DIAGRAM OF WWTP

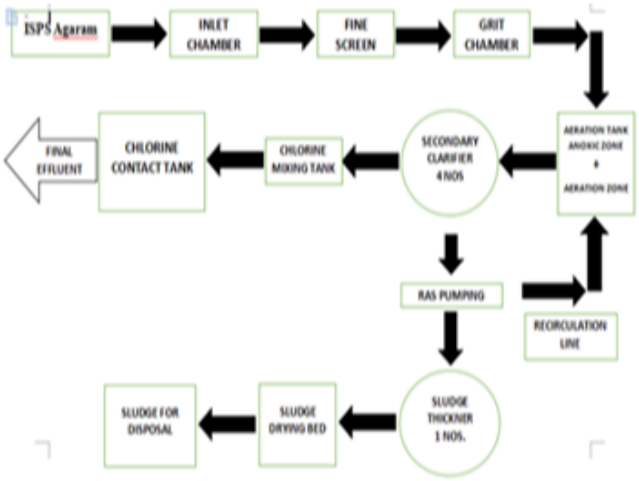

Fig 1

A. Experimental Processes of a Sewage Treatment Plant:

The treatment procedure may be found out by comparing the inlet to the necessary outlet characteristics of waste water after the treatment intention and regulations that can be applied are removed.

V. V. CLASSIFICATION OF METHODS FOR SEWAGE W.W. TREATMENT

A. Preliminary W.W. Treatment:

This consists of the treatment where the removal of wastewater elements is important because they can be a problem to the maintenance or operational issues in the process and ancillary systems of treatment. It consists of unit mainly, separating the floating materials (like dead bodies of animals, tree leaves, wood chips, and pieces of paper or any rag etc.) and the inorganic substances that can easily settle down in a minute or so. Oils and grease can also be removed from the sewage by this method. The BOD is removed by about 15 to 30%. Some example of this treatment method are given below:

- Providing an installation of screens to remove the debris from rags and others.
- Removal of Coarse suspended substance that may cause clogging by Grit method.
- Oil and Grease by skimming or floating method.

B. Primary W.W treatment:

In primary treatment,it is mainly carried out by physical operation such as sedimentation in settling basins that is removal of organic matter and suspended solids. The effluent of primary treatment, sometimes preliminary, as well as primary contains a large amount of suspended organic materials and which is high BOD. The organic solids, which are separated in the sedimentation tanks (in primary treatment), are often energized by anaerobic decomposition in a digestion tank or are incinerated. The main purpose of the primary treatment is to act as a predecessor to secondary treatment.

C. Secondary W.W. Treatment:

The effluent from the primary treatment chamber comes to the secondary treatment chamber which involves the next treatment and is sent for the removal of suspended solids and biodegradable organics through the biological decomposition of organic matter, either under aerobic or anaerobic conditions. In these biological units, bacteria will decompose the fine organic matter, to produce clean effluent. Aerobic biological units in which organic matter is decomposed by aerobic bacteria, and may consist of:

• Trickling filters as well as intermittent sand filters,
• Feed of recycled activated sludge and Aeration tanks,
• Aerated lagoons and oxidation ponds

Therefore all these aerobic units, generally make use of primary settled sewage; they are classified as secondary unit consists of;

• Inhofe and Septic tanks, Anaerobic lagoons, etc.

From all these units, the anaerobic lagoons are the one who works with the primary sewage which is settled down, and later it is stated as secondary biological units. Inhofe and Septic tanks which use sewage as raw sewage left are not classified as same as that of anaerobic lagoons. The amount of BOD infused in effluent of the secondary treatment chamber is about (5 to 10% of the former), and may have several mg/L of dissolved oxygen. The remaining sludge kept in the primary and in the secondary settling tanks are disposed by stabilizing under anaerobic conditions in a Sludge digestion tank.

D. Advanced W.W. treatment:

Tertiary treatment also known as advanced w.w. treatment is termed as that stage of treatment where the next conventional secondary treatment for removal of constituents of concern including nutrients, toxic compounds, and increased amount of suspended solids and organic material and to kill the pathogenic bacteria is required. In addition to the nutrient removal processes, unit operations or processes frequently employed in advanced wastewater treatment are chemical flocculation, coagulation, and sedimentation followed by filtration and chlorination**.** Also, as populations grows the quantity of wastewater output increase rapidly and the quality of this huge amount of wastewater output exceeded the self-purification capacity of the streams and river bodies. Therefore, certain methods of treatment were proposed to accelerate the force**s** of nature under controlled conditions in treatment facilities of a comparatively smaller size.

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VI. METHODOLOGY

A. Performance analysis of W.W. treatment plant:

The methodology developed to study the performance of the wastewater treatment plant is divided into the following steps:

- Identification and characterization of flows associated to the operation of the wastewater treatment plant, namely;
- Pollutants – Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), Chlorides, Oil & Grease, Nitrates, Sulfates, Phosphorus, Nitrites;

Identification of the specific amount indicator and specific production for each identified parameter, by dividing the annual flow of a given parameter by the effluent flow rate, thus comparison between treatment plants of different unit sizes.

The classification of the pollutant loads present in the wastewater entering and leaving the wastewater treatment plant was carried out monthly, consider the monthly average flow rate and the monthly average concentration of each pollutant, being the annual value given by the sum of all monthly values.

w.w. treatment method was framed to control the adverse condition caused by the discharge of wastewater to the environment by society and the concern for public health. Further, as cities or socirty became larger in size, the area of land available for wastewater treatment and disposal became less, principally by irrigation and intermittent filtration. Also, increase in population caused new problems that is, the quantity of wastewater coming out of society increased rapidly and the quality of this large amount of wastewater exceeded the self-purification capacity. we have to adapt other treatment methods so we developed other treatment methods to controll the conditions of water in treatment facilities comparatively smaller size. In general, the problems faced since the start of 20^{th} century can be such,

(I) The floating material is removed from w.w.
(ii) Biodegradable organics such as BOD is removed.
(iii) Disease causing pathogens are also removed.

B. Screening:

It is the first operation unit used at wastewater treatment plants (WWTPs). The removal of objects such as plastic, paper, rags and metals for prevention of clogging and damage of downstream equipment, piping, and appurtenances is operation of screening. It consists of both course screen and fine screen, both coarse screens and fine screens are in modern wastewater treatment plants.

C. Aeration tank:

The aeration tanks is used to hold the wastewater while oxygen is getting mixed, and are made of reinforced concrete and are left open to the atmosphere at the top. There is a source of oxygen to supply and an agitator which will cause the mixing of water so that oxygen gets thoroughly dispersed throughout the entire volume of water.

D. Clarifier:

The further step is to send the output on aeration tank into the primary clarifying or settling tank. As the debris containing, fluid flows into the clarifying or sedimentation tanks, where it slowly settles down and remaining debris will be seperated out from wastewater.

E. Experimental processes in sewage treatment:

The quality of treatment can be determined by comparing the results of the input or influent to required output or effluent characteristic after seeing the treatment objectives and applicable regulations. The above results are shown within the limits

(ii) The rest which is untreated contains large amount of organic matter, if it is discharged into a river/stream, it will consume the dissolved oxygen from river or stream and also satisfying the biochemical oxygen demand (BOD) of wastewater from river or stream which will results in lack of dissolved oxygen the stream; thereby, causing fish death and other unwanted effects.

(iii) Causing eutrophication of the lakes and streams that is due to wastewater containing nutrients, which leads to stimulation of aquatic plants and algal blooms.

(iv) Pathogenic, or Disease-causing microorganisms and toxic compounds are present in Left Untreated wastewater

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VII. ANALYSIS

We did random sampling for each and every unit input & output of wastewater in peak hours in quality & quantity. Parameters studied for appraisal of the proficiency of w.w. treatment plant are Total Solids, Oil & Grease, Chlorides, Sulfates, Nitrates, Nitrites, COD, BOD5 @ 20°.

SN.	Name of the test	Inlet Wastewater(mg/l)	Outlet wastewater(mg/l)	STANDARDS IS 2296:1992 LAND FOR IRRIGATION WATER (mg/L)	Overall Removal Efficiency (%)
1.	BOD	185	8	100	95.67
2.	COD	545	65	250	88.07
3.	TSS	220	11	200	95
4.	TDS	200	0	-	100
5.	CHLORIDES	99.99	89	-	10.09
6.	PHOSPHOROUS	15.6	3.52	5	77.43
7.	NITRATES	70	36	2	48.57
8.	NITRITES	3.0	.22	0	92.66
9.	SULPHATES	1.24	0	0	100

Table 1:- Data of sewage water treated:

Sl No.	PARAMETERS		UNITS	WASTEWATER TREATMENT UNITS			
				SCREENING CHAMBER	PRIMARY CLARIFIER	AREATION TANK	SECONDARY TANK
1.	pH	INFLUENT		7.2	7.11	7.44	7.48
		EFFLUENT		7.11	7.44	7.48	7.48
		Removal efficiency	%	1.25	-.04	-.53	0.0
2.	BOD	INFLUENT	mg/l	279.7	129.7	127.42	125
		EFFLUENT	mg/l	129.7	127.42	125	10.71
		Removal efficiency	%	53.7	1.75	1.89	91.43
3.	COD	INFLUENT	mg/l	679.3	224.8	218	202.66
		EFFLUENT	mg/l	224.8	218	202.66	160
		Removal efficiency	%	66.90	3.02	7.375	21.05
4.	TSS	INFLUENT	mg/l	395.2	132.7	127.42	135
		EFFLUENT	mg/l	132.7	127.42	135	20.32
		Removal efficiency	%	66.42	3.97	-5.64	84.94

Table 2:- Unit wise removal efficiency of w.w. treatment plant:

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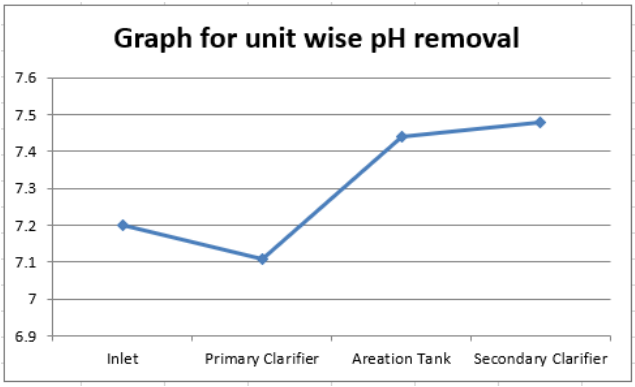

Fig 2:- Graph of unit wish Ph removal

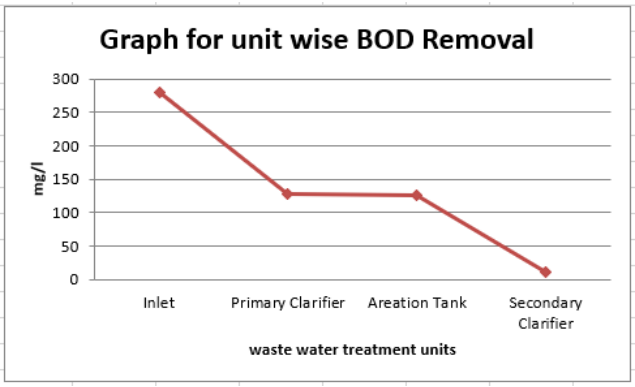

Fig 3:- Graph of unit wise BOD removal

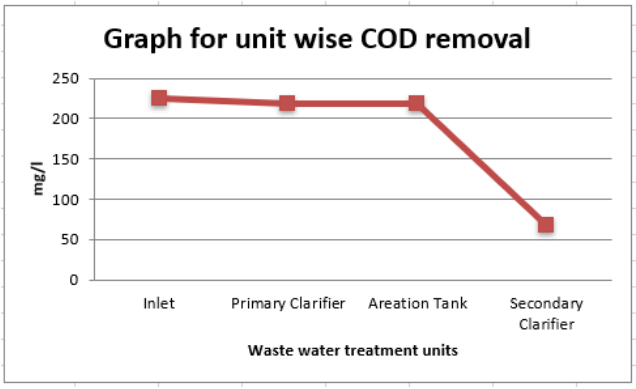

Fig 4:- Graph of unit wise COD removal

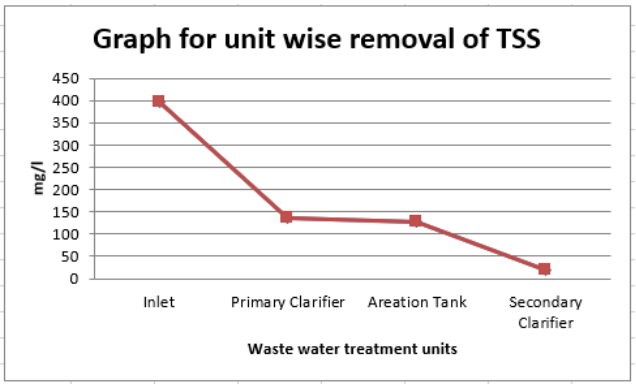

Fig 5:- Graph of unit wise TSS removal

VIII. CONCLUSION

According to the study conducted conclusion cab be taken as

- Removal efficiency of BOD5, an inorganic substance turned out to be 95.67%.
- The COD removal efficiency of wastewater treatment plant was found to be 88.07%.
- The Total solid removal efficiency of wastewater treatment plant was found to be 95%.
- The current results suggest that the treated effluent meets the standards and can be used for irrigation.

The treated wastewater is found to meet the effluent discharge standards. The above study recommended to following plan for the resource recovery to make it sustainable.

Based on the results, we can decide that the Treated Wastewater can be used for various purposes.

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