Reutilization of Wastewater for Irrigation.

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ABSTRACT : India is the biggest and the oldest irrigating country in the world and most of the provinces depend mainly on agriculture. Water is essential. Day by day population is increasing at alarming rate; there would be very heavy demand for water supply for domestic, irrigation, and industrial needs. Water pollution is one of the important aspects of environmental studies, which needs a greater emphasis because of its wide spread nature. People are attracted towards cash crops like sugarcane, tomato, and vegetables. Increase in population causes increase in unemployment. There will be more land demand for cash crops, which increases requirement of water. Wastewater is discharged in water bodies like natural stream, nalla, river, lake, pond or marine coastal areas with treatment or without treatment.

The volume of wastewater generated by domestic, industrial and commercial sources has increased with population, urbanization, improved living conditions, and economic development. The productive use of wastewater has also increased, as millions of small-scale farmers in urban and peri-urban areas of developing countries depend on wastewater or wastewater polluted water sources to irrigate high-value edible crops for urban markets, often as they have no alternative sources of irrigation water.There will be more land demand for cash crop, which increases requirement of water. On the contrary, increased population will utilize water 100 Lpcd in urban area and 50 Lpcd in rural area. Out of that 80% water will be converted into sewage.

Regarding with this , I have undertaken this paper, " Reutilization of Treated Wastewater of Shrigonda City for Irrigation. " for this purpose, I have selected the Saraswati river in Shrigonda City from its Origin for analysis purpose and I have collected and analysed the physical and chemical characteristics of water samples along the Saraswati river at six selected stations. This data represents quality of water from of Saraswati River all along the length. From this I have concluded that the quality of water is degrading at all respective stations for the whole length.

In this paper I have discussed about the waste water of Saraswati River in Shrigonda City can be reutilized for irrigation purpose with a little treatment instead of direct use to avoid any harmful effects at the farmers end. Benefits obtain by using waste water for agriculture. Thus Saraswati river water will be an alternative source of water for irrigation, with a little treatment considerations, along the length of river in the irrigation period.

Keywords: **reutilization, wastewater, crop production, cash crop, benefits.**

I. INTRODUCTION

Water is essential for life, without water human beings cannot survive. Now a day there is very heavy demand of water supply for domestic, irrigation, and for industrial needs. It can be said that no water is pure or clean owing to the presence of some quantities of gases, minerals and life. However pure water is considered to be that which has low dissolved and suspended solids and obnoxious gases as well as low in biological life. The unique property of water is to make its universal solvent and a renewable resource. Water can be regarded polluted when it changes its quantity or composition either naturally or as a result of human activities thus becoming less suitable for drinking, domestic, agriculture, industrial, recreational, wild life and for other uses. A polluted water is define as physical, chemical or biological factor causing aesthetic or detrimental effects on aquatic life and on those who consume the water. Toxic substances are those, which causes acute or chronic health impacts on human, animal and which affect the growth of the plants. The nutrients in sewage like nitrogen, phosphorus and potassium, along with organic matter present, could be advantageously employed for sewage farming to add to the fertility and to improve the drainage characteristics of the soil, along with the irrigation potential of the water content. However, use of raw sewage or night soil or sludge is brought with public health dangers. Though sewage after primary treatment can be applied to the farms, the temptation of providing only primary treatment and eliminating secondary treatment merely on cost considerations should be resisted. Waste water should be provided with hygienic safety of the staff which can protect them against the infection by pathogenic organisms and helminthes. India the second most populous country in the world has water enough to meet its people's needs. Exponential growth of population, rapid industrialization and urbanization, higher cultivation intensities, and poor water management practices over the past century has made freshwater availability a limiting factor in agricultural development. In addition, the options for increasing supply have become expensive and often environmentally damaging.

The United Nations World Water Development Report-2 clearly states that: "the insufficiency of water is primarily driven by an inefficient supply of services rather than by water shortages. Lack of basic services is often due to mismanagement, corruption, lack of appropriate institutions, bureaucratic inertia and a shortage of new investments in building human capacity, as well as physical infrastructure" The report further states that water crisis rest on how we as individuals, and as part of collective society, govern water resources and their benefits. Therefore, we need to manage the available freshwater resources effectively and use water based on fitness-for-purpose criteria. Further, our actions to counter water scarcity challenges should be sustainable, without depleting the natural resources or harming the environment. For these reasons, water managers and policy makers around the world are forced to continually look for alternatives to supplement limited and depleting freshwater resources. In such situations, 'source substitution ' appears to be the solution as it allows higher quality water to be reserved for domestic supply and poor quality water may satisfy less critical uses .

Consequently, urban wastewater (treated) is now considered as a reliable alternative water source without compromising public health and wastewater management is prominent in the water management agenda of many countries.

II. MATERIALS AND METHOD

2.1 General Steps for Evaluation of Wastewater

Waste water samples were collected from six different stations on Saraswati River where the direct effluent of waste water meets the main stream. The samples were collected in between the month of Jan. 2011 to June 2011. Following are the details of the six stations from where the samples were collected. The samples collection stations have been selected throughout the stretch of river. First samples station was selected at origin.

2.2 Selection of sampling station

General criteria for the selection of the sampling station for wastewater analysis is as follows,

1) The site of sampling should be easily approachable without any obstruction.
2) The site should be located very close to the city or village, which is situated along the riverbank so as to account the effect of various local activities on the river water.
3) The site should be such that sufficient of water should be available for long period through the year.
4) The site should be so selected such that the place where water of river is more and more turbid.
5) The site should be all the length of various characteristics of indifferent stretches of Saraswati River.
6) The site should have sufficient depth of water, at midstream.

2.3 Locations of stations

Following are the distances between of each sampling stations are as under.

Sr.No	Station Name	Distance
1	Origin Lendi Nala	0
2	Panchawati Nala	2.5
3	Bhanali Nala	5.5
4	Dari Nala	6.50
5	Ambil Nala	7.05
6	Babhali Nala	10

2.4 Collections and preservation of samples

The objective of sampling is to collect a portion of material small enough in volume to be conveniently transported to and handled in the laboratory while still accurately representing the material being sampled. This implies, first, that the relative proportions or concentrations of all pertinent components must be the same in the sample as in the material being sampled, and second, that the sample must be handled in such a way that no significant changes in composition occur before the tests are performed.

2.4. General precautions

Take care to obtain a sample that is truly representative of existing conditions and to handle it in such a way that it does not deteriorate or become contaminated before it reaches the laboratory. Before filling, rinse the sample bottle out two or three times with the water being collected. Representative samples of some sources can be obtained only by making composites of samples that have been collected over a period of time or at many different sampling points. Make a record of every sample collected, and identify every bottle, preferably by attaching an appropriately inscribed tag or label. The record should contain sufficient information to provide positive identification of the sample at a later date, as well as, the name of the sample collector, the date, hour, and exact location, the water temperature, and any data that may be needed for correlation, such as weather conditions, water level, stream flow, or the like. Fix sampling points by detailed description, by maps, or with the aid of stakes, buoys, or landmarks in a manner that will permit their identification by other persons without reliance on memory or personal guidance.

2.5 Types of samples

Integrated samples for certain purpose, the information needed is provided best by analysis of mixtures of grab sample collected from different points simultaneously, or as nearly so as possible. The need for integrated samples also may exist if combined treatment is proposed for several separate wastewater streams, the interaction of which may have a significant effect on treat ability or even the composition of the mixture. Quantity sample should suffice for most physical and chemical analyses. For certain special determinations, larger samples may be necessary.

2.6 Time interval between collection and analysis:-

In general, the shorter the time that elapse between collection of a sample and its analysis, the more reliable will be the analytical results. For certain constituents and physical values, immediate analysis in the field is required to obtain dependable results because the sample compositions may change before it arrives at the laboratory. It is impossible to state exactly how much time may be allowed to elapse between collection of a sample and its analysis; this depends on the character of the sample, the particular analyses to be made, and the conditions of storage. Changes caused by the growth of organisms are greatly retarded by keeping the sample in the dark and at a low temperature until analysis. Where the interval between sample collection and analysis is long enough to produce changes in either the concentration or the physical state of the constituent to be measured. Record the time elapsed between sampling and analysis, and which preservative if any, was added.

2.7 Preservation Method

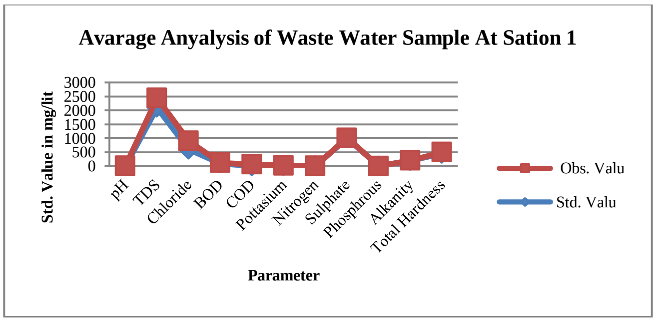
Preservation of samples is difficult because almost all preservatives interfere with some of the tests. Immediate analysis is idea. Storage at low temperature (4 C) is perhaps the best way to preserve most samples until the next day. Use chemical preservatives only they are shown not to interfere with the examination being made. When they are used, add them to the sample bottle initially so that all portions of the samples are preserved as soon as collected. No single method of preservation is entirely satisfactory; choose the preservative with due regard to the determinations to be made, All methods of preservation may be inadequate when applied to suspended matter. Formaldehyde affects so many of the determinations that its use is not recommended. Methods of preservation are relatively limited and are intended generally to retard biological action, retard hydrolysis of chemical compounds and complexes, and reduce volatility of constituents. Preservation methods are generally limited to pH control, chemical addition, refrigeration, and freezing. The various tests are performed which are listed below with appropriate reforms.

3.25 Waste Water Quality Analysis

Determine ph, alkalinity, BOD, COD, Total hardness, TDS, Chloride,Nitrogen,Pottasium,Phosphrous, by standard method in laboratory.

III. RESULT & DISCUSSION.

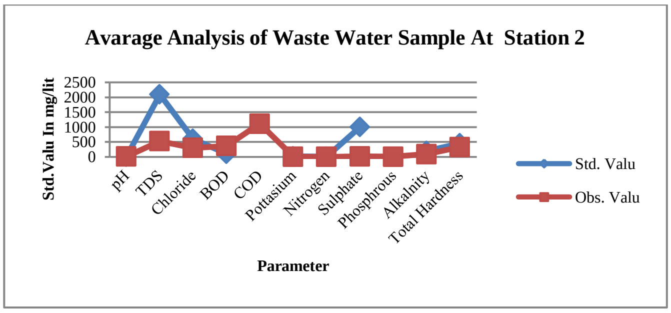
1. Lendi Nala:-



Graph. No.1

From Graph 1 it is concluded that all parameter i.e., TDS, Chloride COD, Potassium, Nitrogen, Sulphate, Phosphorus, Alkalinity, Total Hardness values ranges between acceptable limit. Only BOD value higher than acceptable limits 100 mg/lit. Treatment is necessary before application for irrigation.

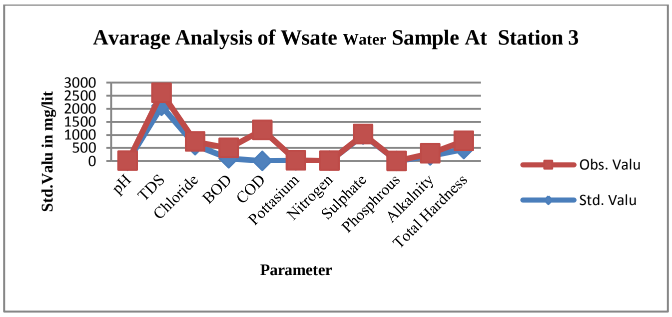
2. Panchawati Nala:-



Graph No. 2

From Graph 2 it is concluded that all parameter i.e.pH,TDS,Chloride,COD,Pottasium,Nirogen,Sulphate,Phosphrous,Alkalnity,Total Hardness values ranges between acceptable limit. Only BOD value higher than acceptable limits 100 mg/lit. Treatment is necessary before application for irrigation.

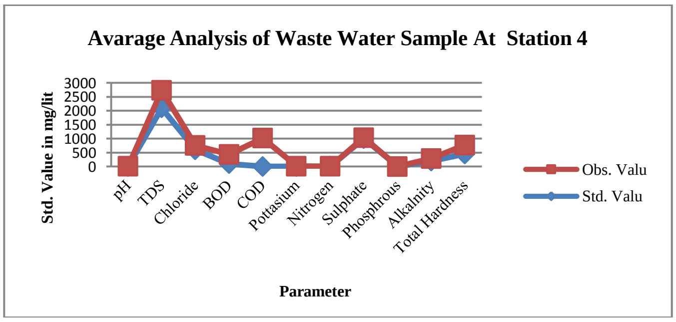
3. Bhanali Nala:-



Graph No.3

From Graph 3 it is concluded that all parameter i.e., TDS, Chloride COD, Potassium, Nitrogen, Sulphate, Phosphorous, Alkalinity, Total Hardness values ranges between acceptable limit. Only BOD value higher than acceptable limits 100 mg/lit. Treatment is necessary before application for irrigation.

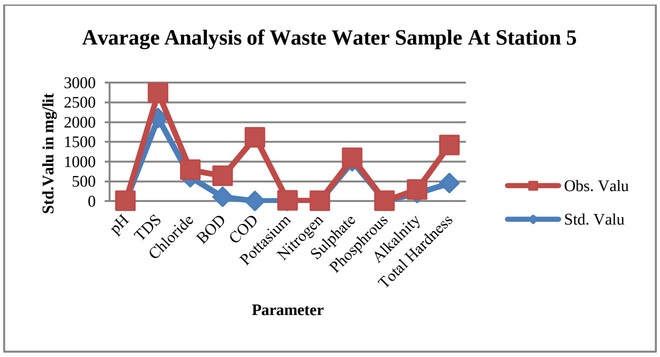
4. Dari Nala:-



Graph No.4

From Graph 4 it is concluded that all parameter i.e., TDS, Chloride COD, Potassium, Nitrogen, Sulphate, Phosphorous, Alkalinity, Total Hardness values ranges between acceptable limit. Only BOD value higher than acceptable limits 100 mg/lit. Treatment is necessary before application for irrigation.

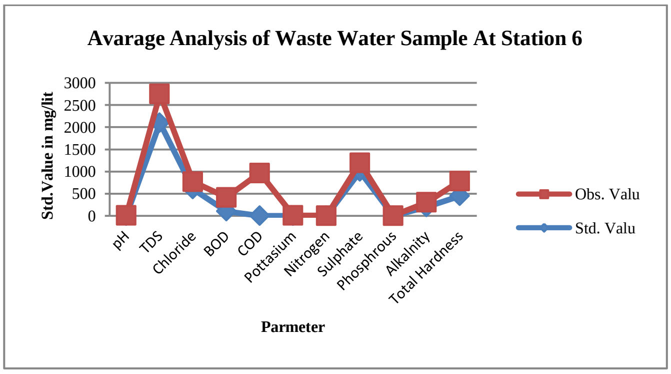
5. Ambil Nala:-



Graph No.5

From Graph 5 it is concluded that all parameter i.e., TDS, Chloride COD, Potassium, Nitrogen, Sulphate, Phosphorous, Alkalinity, Total Hardness values ranges between acceptable limit. Only BOD value higher than acceptable limits 100 mg/lit. Treatment is necessary before application for irrigation.

6. Babhali Nala:-



Graph No.6

From Graph 6 it is concluded that all parameter i.e., TDS, Chloride COD, Potassium, Nitrogen, Sulphate, Phosphorous, Alkalinity, Total Hardness values ranges between acceptable limit. Only BOD value higher than acceptable limits 100 mg/lit. Treatment is necessary before application for irrigation.

IV.CONCLUSION

The paper Reutilization of Waste Water of Shrigonda City for Irrigation has been undertaken with an aim to utilize the polluted waste water of Saraswati River in Shrigonda city for irrigation purpose, with necessary treatment. The Shrigonda city wastewater will be an alternative source of water for irrigation, reducing the dependability on rain water and ground water for the farmers around Shrigonda city. The paper is helpful and guideline to the farmers and the peoples of the surrounding areas of Shrigonda city provides the knowledge and information of increasing the fertility of soil, productivity of crops, aqua culture practices to be adopted for revenue generation in addition to irrigation and also the multipurpose utilization of waste water with its ill effects.

On analysis and evaluation of physical and chemical parameters of the polluted water of Saraswati River, it is concluded that the effluent can be utilized for irrigation purpose if its strength is reduced. PH, TDS, COD, Total hardness, chloride,,Potassium,Nitrogen,Sulphate,Phosphorus values are within limits or nearer to the limits or irrigation standards.

However the treated effluent can be applied to grow the various crops. The nutrients like nitrogen, phosphorus, potassium and organic matter present in sewage can be utilized by waster irrigation.

The paper is much help full and beneficial to the farmer and the society, as the polluted water will be utilized for irrigation purpose around the year. The crop production will definitely increase, and has reducing fertilizer requirement.

This water resource project is a need of society and the farmers in view to make the available waste water suitable for the irrigation with additional revenue generation. The paper has an advanced technical innovative idea in Water Resources Engineering with respect to Environmental Engineering aspects, to face any water crisis and challenges in future in the field of Irrigation Engineering System.

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Appendix

1. Avarage Analysis of Waste Water at Lendi Nala

Parameter	Std. Value	Obs. Value
pH	6.5-8.4	7.78
TDS	2100	344
Chloride	600	303.69
BOD	100	20
COD		65
Pottasium	14.23	12
Nitrogen	5	0.784
Sulphate	1000	11.1
Phosphrous		0.572
Alkalinity	200	2.3
Total Hardness	450	54.4

2. Avarage Analysis of Waste Water at Panchawati Nala

Parameter	Std. Value	Obs. Value
pH	6.5-8.4	7.81
TDS	2100	526
Chloride	600	300.88
BOD	100	367
COD		1114
Pottasium	14.23	6.8
Nitrogen	5	0.465
Sulphate	1000	14.3
Phosphrous		2.37
Alkalinity	200	89.6
Total Hardness	450	328

3. Average Analysis of Waste Water at Bhanali Nala

Parameter	Std. Value	Obs. Value
pH	6.5-8.4	7.85
TDS	2100	510
Chloride	600	140.6
BOD	100	398
COD		1188
Pottasium	14.23	7.64
Nitrogen	5	0.518
Sulphate	1000	20.4
Phosphrous		2.2
Alkalinity	200	91.2
Total Hardness	450	320

4. Average Analysis of Waste Water at Dari Nala

Parameter	Std. Value	Obs. Value
pH	6.5-8.4	7.83
TDS	2100	632
Chloride	600	154.66
BOD	100	340
COD		1021
Pottasium	14-23	14
Nitrogen	5	0.226
Sulphate	1000	38.5
Phosphrous		3.4
Alkalinity	200	91.2
Total Hardness	450	320

5. Average Analysis of Waste Water at Ambil Nala

Parameter	Std. Value	Obs. Value
pH	6.5-8.4	7.65
TDS	2100	641
Chloride	600	191.22
BOD	100	538
COD		1615
Pottasium	14-23	10.4
Nitrogen	5	0.691
Sulphate	1000	89.4
Phosphrous		4.02
Alkalinity	200	92.8
Total Hardness	450	968

6. Average Analysis of Waste Water at Babhali Nala

Parameter	Std. Value	Obs. Value
pH	6.5-8.4	7.97
TDS	2100	651
Chloride	600	165.9
BOD	100	318
COD		965
Pottasium	14-23	8.12
Nitrogen	5	0.452
Sulphate	1000	197
Phosphrous		2.01
Alkalinity	200	105.6
Total Hardness	450	336