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TREATABILITY STUDY OF BLACK WATER

Arpit Patel[1], Jayan Patel[2], Kuldeep Chauhan[3], Monika shah[4]

[1,2,3]Under Graduate Student, [4]Assistant Professor, Civil Engineering Department, Navrachana University, Vadodara (India)

ABSTRACT

Environment pollution is a major issue the world is facing at present. The pollution growth ,industrialization & technology development have lead to the degradation of water. So, the treatment of waste water is essential. The study of treatment of black water collected from the university waste which contained solid waste, laboratory waste and grey water. There is liquid waste(black water) generated during different academic activities that liquid water had to be treated before disposing them into the natural streams. The treatment of black water is carried out by checking various parameter and try to make them into the permissible limits of Government. The different physical and biological treatments are suggested to treat the waste water and try to make waste water up to the regular standards.

Keyword: Black water, Chemical oxidation demand

I. INTRODUCTION

Wastewater from our homes comes from many different sources. The wastewater that comes from showers, washing machines, and sinks is considered grey water because, while it has particles and contaminants, they re not deemed dangerous. The rest of the wastewater, from toilets, dishwashers, and garbage grinders, can contain food particles, feces, and other human body fluids and is considered hazardous. This is what makes up black water.

Black water is generally not recycled, mostly because it contains so much sewage that it is hard to clean adequately for use. Yet, science has come up with systems that will recycle black water, most systems filtering the water enough to be used outdoors in watering lawns and plants from underground. There are even systems that will make black water clean enough to be potable (drinkable), but those systems are very expensive, hard to maintain, and the people who drink that water have to get over the stigma of drinking toilet water.

II. LITERATURE REVIEW

2.1 Black Water Recycling System

The filtering system for removing usable water from black water is generally outside the Source. Water is piped to it, and then it goes through a process before being used to water the lawn or non-food gardens via underground pipe systems. Water recycled from black water should never be used as drinking water or on food crops because they could still contain harmful bacteria. There are five basic steps to black water treatments.

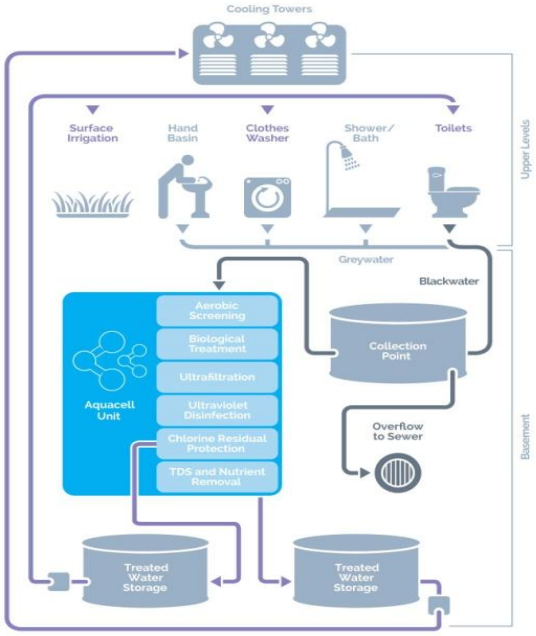


Figure 1. Treatments of Black water

- **Primary treatment tank -**The primary treatment tank is where black water goes when it runs away from the source via gravity and pipes. Here, the sewage sits for 24 hours while an established colony of bacteria works to break down the bigger particles. After the 24 hour period, the settled black water is pumped to the secondary treatment tank.
- **Secondary treatment plant-** When the settled black water is pumped away from the primary treatment tank, it goes into the secondary treatment tank. This tank is separated into three stages to help with the continuing process.

  Black water aeration stage -The first chamber in the secondary treatment tank begins the aeration stage. This means water and air are injected into the tank at timed intervals so that the tank contents are churned. Bacteria in the tank then settle so they can feed on the sludge in the tank. When that is finished, the water is moved to the sludge settling chamber.

  Sludge settling chamber –The water that is piped from the aeration chamber ends up in the sludge settling chamber. A bacteria biomass mechanism forces sludge downwards and the partially treated water upwards to be collected and sent on to the irrigation chamber stage.
- **Screening-** The first step efficiently reduces insoluble material to a negligible residue. This residue is either discharged to sewer or it is de-watered and compacted for disposal as solid waste.
- **TDS and nutrient removal** – Proprietary technologies are employed for applications such as a cooling tower reuse and discharge to sensitive environments.
- **Reuse -**When the water is piped out of the sludge settling chamber, it is eventually pushed into the irrigation chamber. Here, it is clarified and disinfected, which is the last step of the process. The water can then be piped into ground irrigation systems for use in gardens.

2.2 Benefits of Black water Recycling

The benefits of black water recycling are larger than a person might think. It isn't all about keeping your lawn watered, though that is an excellent use for the recycled water. The filtered black water is also good for the environment and other benefits which include:

- **Reduces stress on septic system** -A black water recycling system can reduce some of the stress off older septic systems which may be close to failing.
- **Water conservation** -Using recycled black water to water lawns and non-food crops/gardens conserves energy. There is a lot of fresh water wasted on watering lawns and those kinds of plants.
- **Habitat protection** -By recycling black water, there is less chance of wastewater seeping into natural habitats.
- **Plant growth** -The plants that are grown with recycled black water rarely need any fertilizer. There are enough nutrients left in the water after being treated that plants can easily feed off of them.

2.3 Problems with Black water Recycling

There are certainly several advantages to working with black water recycling. Unfortunately there are also disadvantages that might make people reconsider when deciding to put in a black water recycling system. Some of these drawbacks include:

- **Cost** -Black water recycling systems can be expensive - not only to install, but to maintain, and to fix if something happens to it.
- **Smell** -While many people say there isn't a discernable smell, there are others who claim that they can smell the system (which is mostly sewage) all the time. This can be from dying bacteria as well.
- **Maintenance** -The system usually requires maintenance every three months or so by the company that installed it. There is usually a charge each time they come out to check on the system.

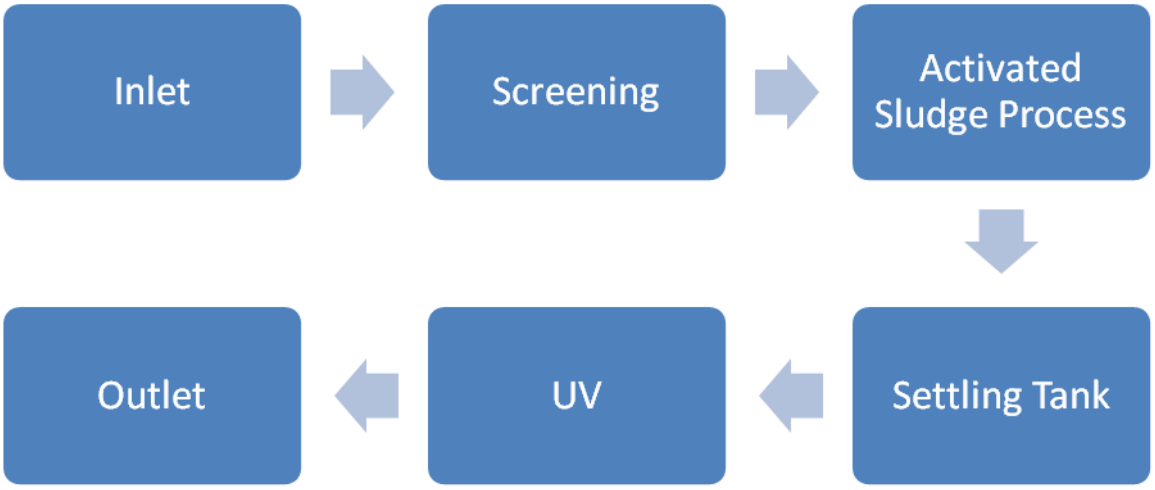
As treated wastewater of sewage gets more and more popular, many people are looking to not only recycle grey water, but black water as well. Extracting usable water from sewage means that there is hope for the future for water filtering and recycling. If the disadvantages of a black water recycling system can be overcome, then the advantages of such a system can move to the next level of re-filtering water.

- The study of previous treatments of black water indicates the matrix of black water is not ideal for biological treatment. For the reuse of black water we can purify by the any method other then biological process. To improve advanced black water treatment, the treatment process has to be enlarged by further processing units, e.g. by chemical oxidation, in order to reduce the COD.

2.4 Experimental work

The university under study has been located near the Vadodara city, Gujarat. The university having different schools like science engineering and management. Around more then 3000 students and faculties are working. The amount of waste generated by the students and from the different laboratories will make the waste water polluted. Such waste water treats with different physical, biological and disinfections methods to discharge them into the sewers.

The treatment applied to the waste water is as follows :



Average efficiency = 70.7%

Sample	1	2	3	4	5	6
Sample COD (mg/l)	12100	19000	26400	17300	19700	18800
Activated Sludge Process (mg/l)	6000	12600	8200	9000	13400	12000
Efficiency after Activated sludge process	48%	33%	68%	47.90%	31%	36.10%
UV (mg/l)	4800	5800	4000	5200	6200	5600
Efficiency after UV process	22.50%	53%	51.20%	42.20%	53%	53.30%
Total % efficiency	60.30	69.40	84.80	71	68.50	70.20

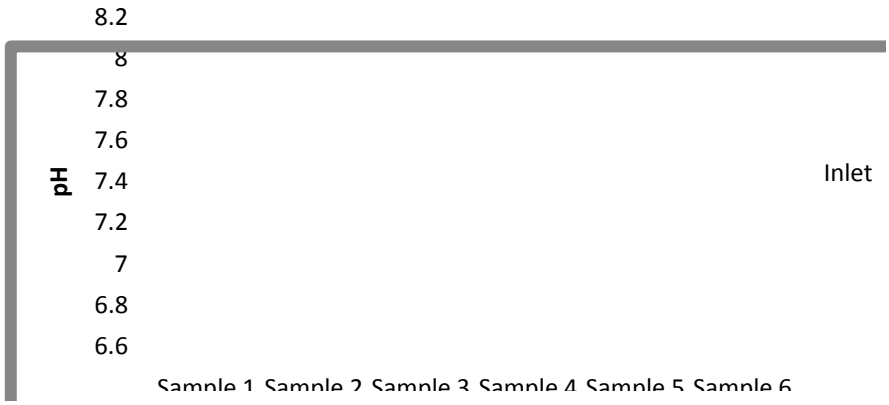


Figure 2. pH observations

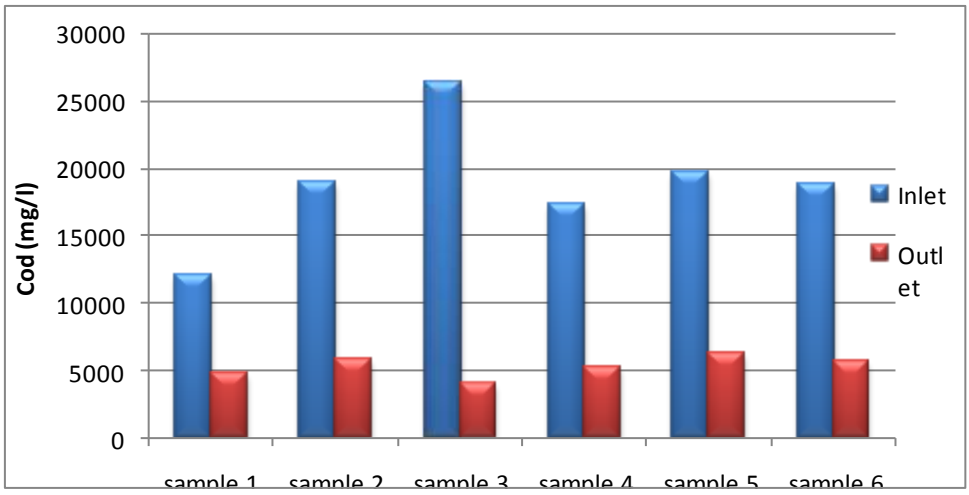


Figure 3. COD observations

- Also the observations of TSS and TDS for inlet is 80 and 3.2. And outlet for TSS 30 and TDS is 2.6.

III. CONCLUSION

We can say that biological treatment and disinfection treatments results shows that COD decrease about 70.7%. Still they are not up to the disposal standard. Some tertiary treatment can be applied to meet the regular standard**.**

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