A COMPARATIVE STUDY BETWEEN ACTIVATED CARBON TREATED WASTE WATER AND CONVENTIONAL TREATED WASTE WATER

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ABSTRACT

Water scarcity has become a major issue in today's world. There are lot of advanced technologies developed in purifying and recycling wastewater produced. Activated carbon is commonly used in water treatment to remove water contaminants from tap water and well water. The main aim of the project is to determine effect of various water quality parameters from waste water using activated carbon. In the present study Activated carbon was prepared from seed shells of Jatropha curcas, carbonized in LPG furnace and impregnated with dil.HCL and kept in a hot air oven for 2hours at 250^{o}c. The tests were conducted on various water quality parameters of waste water using activated carbon in order to compare it with conventional treated water. The test was conducted on: pH test, Turbidity, Chlorides, Nitrates, phosphates, COD, total solids and total dissolved solids, Alkalinity, Acidity. The Jatropha seeds which are economical and easily available in any biodiesel plant in large quantity can be converted to activated charcoal in order to treat the waste water.

Keywords-: *Alkalinity, PH, Acidity, Turbidity, COD, Chlorides, Nitrates, Phosphates, TSS, TDS:*

General

Water scarcity is the lack of fresh water resources to meet water demand. It affects every continent and was listed in 2019 by the World Economic Forum as one of the largest global risks in terms of potential impact over the next decade. It is manifested by partial or no satisfaction of expressed demand, economic competition for water quantity or quality, disputes between users, irreversible depletion of groundwater, and negative impacts on the environment. One-third of the global population (2 billion people) live under conditions of severe water scarcity at least 1 month of the year. Half a billion people in the world face severe water scarcity all year round. Half of the world's largest cities experience water scarcity. A mere 0.014% of all water on Earth is both fresh and easily accessible. Of the remaining water, 97% is saline and a little less than 3% is hard to access. Technically, there is a sufficient amount of fresh water on a global scale. However, due to unequal distribution (exacerbated by climate change) resulting in some very wet and some very dry geographic locations, plus a

sharp rise in global freshwater demand in recent decades driven by industry, humanity is facing a water crisis. Demand is expected to outstrip supply by 40% in 2030, if current trends continue.

The essence of global water scarcity is the geographic and temporal mismatch between freshwater demand and availability. The increasing world population, improving living standards, changing consumption patterns, and expansion of irrigated agriculture are the main driving forces for the rising global demand for water. Climate change, such as alteredweatherpatterns(including droughts or floods), deforestation,increased pollution, green house gases, and wasteful use of water can cause insufficient supply. At the global level and on an annual basis, enough freshwater is available to meet such demand, but spatial and temporal variations of water demand and availability are large, leading to (physical) water scarcity in several parts of the world during specific times of the year. All causes of water scarcity are related to human interference with the water cycle. Scarcity varies over time as a result of natural hydrological variability, but varies even more so as a function of prevailing economic policy, planning and management approaches. Scarcity can be expected to intensify with most forms of economic development, but, if correctly identified, many of its causes can be predicted, avoided or mitigated.

Some countries have already proven that decoupling water use from economic growth is possible. For example, in Australia, water consumption declined by 40% between 2001 and 2009 while the economy grew by more than 30%. The International Resource Panel of the states that governments have tended to invest heavily in largely inefficient solutions: mega-projects like dams, canals, aqueducts, pipelines and water reservoirs, which are generally neither environmentally sustainable nor economically viable. The most cost-effective way of decoupling water use from economic growth, according to the scientific panel, is for governments to create holistic water management plans that take into account the entire water cycle: from source to distribution, economic use, treatment, recycling, reuse and return to the environment

II. OBJECTIVES

- The main objective of the study is to check the potential of low-cost natural adsorbents (activated charcoal of jatropha seed from biofuel industry) for the removal of different water quality parameters by adsorption technique.
- To characterize the raw sewage water for its physical-chemical properties
- To determine the effect of adsorbent dosage and contact time on adsorption process.
- Experiments to optimize the adsorbent dosage, pH and contact time of identified adsorbents.

III. METHODOLOGY

The present study, deals with the preparation of activated charcoal from Jatropha seed. Our study deals with jatropha seeds because it is economical and it is available in excess in any biodiesel plant. To conduct our study, we obtained jatropha seeds at a quantity of 8kgs from Phytotron Agro Products Pvt Ltd (Bangalore).Jatropha seeds of known quantity was taken in a stainlesssteel plate. For the purpose of obtaining charcoal the jatropha seeds were burnt in LPG furnace for 2-3 minutes at the temperature of 250^{o}C to obtain coarse granular charcoal material. The charcoal obtained was kept aside to cool down.

Method Analysis

Using grab sampling sewage was collected from Alva's PU College Vidyagiri. To understand the physical and chemical properties of the collected sewage, above mentioned tests were conducted and then the sewage was characterized and the results were calculated. It can be noticed that the COD, turbidity, hardness, dissolved solids a measure of organic strength of wastewater, is quite high and the effluent needs treatment before being discharged

IV. RESULTS and DISCUSSION A. Test Results On sewage sample

Table 4.1 Test results

SL NO	DISCRIPTION	PH	TURBIDITY (NTU)	ALKALINITY	ACIDITY	CHLORIDES (mg/l)	COD (mg/l)
1	Sewage sample	6.61	25.2	Absent	Absent	89.5	5500
2	Treated sewage sample	7.09	4.5	Absent	Absent	64.73	4300
3	Activated charcoal 1gram	7.46	15.2	Absent	Absent	89.2	5000

4	Activated charcoal 2gram	7.23	12.2	Absent	Absent	84.5	4750
5	Activated charcoal 3gram	7.10	13.3	Absent	Absent	71.2	4350
6	Activated charcoal 4gram	7.08	15.3	Absent	Absent	85.6	4250
7	Activated charcoal 5gram	7.03	16.1	Absent	Absent	79.8	4000

Table 4.2 Test results

SL NO	DISCRIPTION	TSS (mg/l)	TDS (mg/l)	NITRATES (mg/l)	PHOSPHATES (mg/l)
1	Sewage sample	2500	1600	0.026	18
2	Treated sewage sample	400	200	0.017	1
3	Activated charcoal 1gram	2000	1300	0.021	8
4	Activated charcoal 2gram	1600	1200	0.019	7
5	Activated charcoal 3gram	1300	1000	0.0255	5.8

6	Activated charcoal 4gram	800	500	0.0225	2
7	Activated charcoal 5gram	1000	800	0.0251	2.8

DISCUSSION

The following observation can be concluded from the result analysis with respect to the physical and bio chemical of untreated and treated waste water using activated carbon; -

Hydrogen ion (pH)
Comparing the result obtained from Table 4.1 it can be observed that the pH at all hours is within the refinery designed basis of 6 – 8.5.

Turbidity
The turbidity was reduced from 25.2 NTU to 12.2 NTU. Experimental results from Table 4.1 showed that the turbidity was relatively removed.

Chemical Oxygen Demand (COD)
From the experimental result in Table 4.1, with respect to COD in waste water before and after treatment, it can be observed that the COD was reduced from 5500 mg/l to 5000 mg/l for the 1gram activated carbon and 4750 mg/l for the 2 gram and 4350 mg/l for the 3gram and 4250 mg/l for the 4gram and 4000 mg/l for the 5gram. for the sewage treated sample COD is 4300 mg/l.

Chlorides

Chloride content in the treated water is 71.2mg/l, as it has not reduced drastically it is still under the permissible limit for usage. We can still use the treated water even when the chloride content has increased

Total Dissolved solid (TDS)
The results obtained showed that there was are markable decrease in the amount of total dissolved solid after treatment. It was reduced from 2500 mg/l to 1300 mg/l for the optimum dosage.

Nitrogen and Phosphorus

Nitrate content and phosphates have been reduced drastically from 0.026 mg/l to 0.01 mg/l 7 in nitrates in the treated water and phosphates from 18 mg/l to 2 mg/l. Such changes observed makes the water used for many other purposes

V. CONCLUSION

- This project work has revealed some latent facts about the usefulness and effectiveness of granular activated carbon produced from jatropha seeds
- From the experimental information gathered, it has been shown in this study that granular
activated carbon from jatropha seeds can effectively remove organic pollutants from sewage before reusing the water for any other purpose
- Activated carbon can be used in water filtering systems due to its excellent adsorption capacity as found out in this experimental study.
- The activated charcoal with dosage of 4g and contact period of 40 minutes is proved to be effective.
- This method can also be further extended to provide irrigation facility to plants near hostel by drip irrigation.
- The water treated using activated charcoal of Jathropha seeds can be used for cleaning and flushing purpose is an additional advantage.

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