Domestic Wastewater Treatment by using Rotary Biofilm Reactor

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Abstract— the effect of uncertainty in the system parameters on the reliability of domestic waste biofilm reactor analyzed. It is used to demonstrate the ability to handle biological wastewater rotary biofilm reactor. It is a beneficial microorganism plays an important role in wastewater treatment. Experimental model was developed representing the binding growth system. Rotary biofilm reactor is a technique that uses the adhesion and growth arrest system using the advantages of both systems. Suspended growth systems outside the unit show the inner unit attached growth system are shown. This was operated at different rotational speeds to optimize performance. Optimal performance showed the efficiency of the water to the 73%, 78% and 91% of the TS of the BOD of COD.

Key words: Attached Growth System, Suspended Growth System, Rotating Biofilm Reactor, Speed, and Different Media

I. INTRODUCTION

The purpose is to remove the clot and colloidal solids non-settle able, is to stabilize the organic material. Recently, two types of combinations of growth from a single system have been found to be advantageous for improving the efficiency and capacity of the existing treatment plant. Rotation Biofilm Reactor (RBR) for wastewater treatment is for effluent reuse and, in particular, has become one of the new technologies for both urban and industrial wastewater treatment now. The trickling filter and biological processes for wastewater treatment such as activated sludge plant has been used since the late 19 days 20 days early well -century is set [1]. Biological or biochemical degradation, some hazardous organic waste can be a practical method for the detoxification [2]. If the decomposition of organic waste materials by the action of microorganisms. When the biological treatment of the waste is expected, other components of the medical waste is required to render the residue was inadequate to confirm or no more biological decomposition [3].

The reactor of GI sheet was prepared to study the performance of model. Model was provided with the inlet and outlet. The model was operated at different operational speed conditions and different detention time [4]. The various parameters such as BOD, COD and TS were performed to study the performance of the reactor.

II. MATERIAL AND EXPERIMENTAL SETUP

Material used in the exercise was cellulose pad media was fully packed with inner rotary drum which works as attached growth system. Cellulose pad was a porous material which packed with layers with glue. The wastewater distributed evenly over the media so that it can flow in a thin film down through the media. It had a large surface area with large openings to allow the biological material to have good aeration. The drum was a rotary as well as it has perforations, provides a good aeration to the microbial activity. The large openings also enable the biological material to flow to the bottom of the filter after it falls off the media so that it can exit into the outer tank.

The laboratory scale Rotating Biofilm Rector (RBR) model was developed and fabricated with GI sheet 20 gauge factors. The reactor consisted of 60 liters of volume. It works on principle of combine growth system. Attached growth technologies work on the principle that organic matter is removed from wastewater by microorganisms attached on some inert media. These microorganisms are primarily aerobic, meaning they must have oxygen to live. The Model was coaxially fitted at bottom of outer drum. Inner drum worked on the principal of attached growth system. It is provided with perforation to increase micro-organisms growth. Outer drum worked on the principle of suspended growth. Inner Drum was filled with media to judge the performance of RDR in terms of BOD and COD. The inlet is provided from top. Outlet arrangement was provided at invert height from bottom. Arrangement was provided in such manner that rotating drum remains immersed. The shaft and inner drum was rotated with the help of machine. Machine was provided with provision of belt and pulley. Two machines were provided one was lower power machine for lower rpm. Other was higher power machine for higher rpm. Lower rpm machine reduces the rpm of higher machine. This led to inner drum to rotate at lowest speed of 4rpm to 8 rpm. The machines were mounted at the bottom. Which is fitted a side of model with belt and pulley to regulate the speed. The wastewater was provided to reactor through inlet fed tank of 60 liters of volume. The reactor was operated as continuous reactor with varying detention time, varying rotational speed and change in operating conditions. To judge the efficiency of RDR, the same unit was fed with Domestic wastewater. To judge the performance of reactor for change in detention time and rotational speed various trials were examined.

III. OBSERVATIONS

RBR after the start of a long-term stable performance was observed for 120 days. Wastewater parameter that is analyzed at two points. After comparison of the outlet and the council right from the entrance, COD and TS removal was completed. The model was analyzed for BOD, COD and TS at various operating conditions. At different detention time such as 12 hrs, 15 hrs, 18 hrs and 21 hrs at different rotational speed such as 4rpm, 6rpm 8rpm the model is optimizes at detention time of 24 hours of work in rotational speed of 4 rpm. With respect to the rotation rate of the rotation speed of the rotary biofilm reactor was varied to observe the change in quality of the outlet. Retention times to get an optimum time for optimal operation of the reactor RBR has changed.

IV. RESULTS

The rotary biofilm reactor operation of the test series that can analyze the parameters in the various operating conditions, such as BOD, COD and TS. The change in the rotational speed of the detention time results in a few weeks, and the results in order to find the optimal operating conditions of the reactor were tabulated. The accompanying combined and suspended growth systems will be a better choice for wastewater treatment. The purpose of this study was to analyze the overall performance of the RBR under various speed changes. Result has taken on Cellulose Pad media. Table that shows result is up to 24 hours in the detention time of a rotational speed with 4 rpm 79%, 73%, 90% of BOD, COD and TS provides a result. It was Minimum i.e.45%, at 8rpm at 18 hours, 39%at 8rpm at 12 hours,40% at 8rpm at 12 hours. And 6 rpm rotational speed gave optimal result. At 27 there was only 2% increase in results.

24HOURS									
SAMPLE NUMBER		**INFLUENT**			**EFFLUENT**			**% REMOVAL**	
	4RPM	6RPM	8RPM	4RPM	6RPM	8RPM	4RPM	6RPM	8RPM
1	214	241	197	62	72	79	71.02	70.12	59.89
2	178	219	231	50	68	87	71.91	68.94	62.33
3	208	238	257	44	62	80	78.84	73.94	68.87
4	234	215	212	59	73	95	74.78	66.04	55.18
5	188	227	195	47	64	74.1	75	71.80	62

Table.1: Performance of the model for BOD at 24 Hours Detention Time

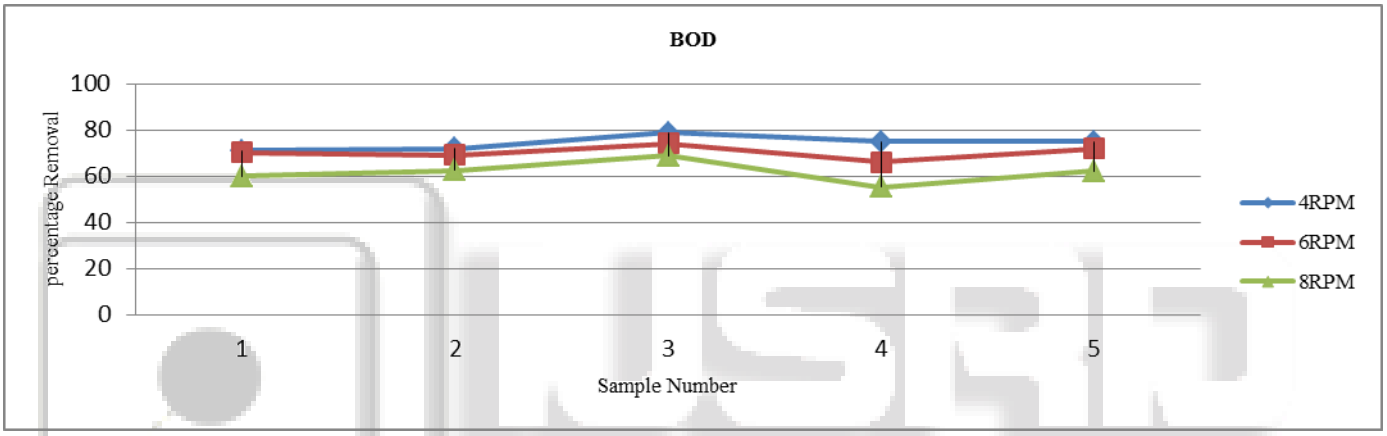

Fig. 1: Graphical representation of percent removal efficiency of BOD

24HOURS									
SAMPLE NUMBER		**INFLUENT**			**EFFLUENT**			**% REMOVAL**	
	4RPM	6RPM	8RPM	4RPM	6RPM	8RPM	4RPM	6RPM	8RPM
1	356	395	322	106	139	119	70.22	64.81	63.04
2	254	353	372	68	140	182	73.22	60.33	51.07
3	260	364	373	76	128	153	70.76	64.83	58.98
4	396	394	302	127	153	106	67.92	61.16	64.90
5	470	331	328	137	129	138	70.85	61.02	57.92

Table 2: Performance of the Model for COD at 24 Hours Detention Time

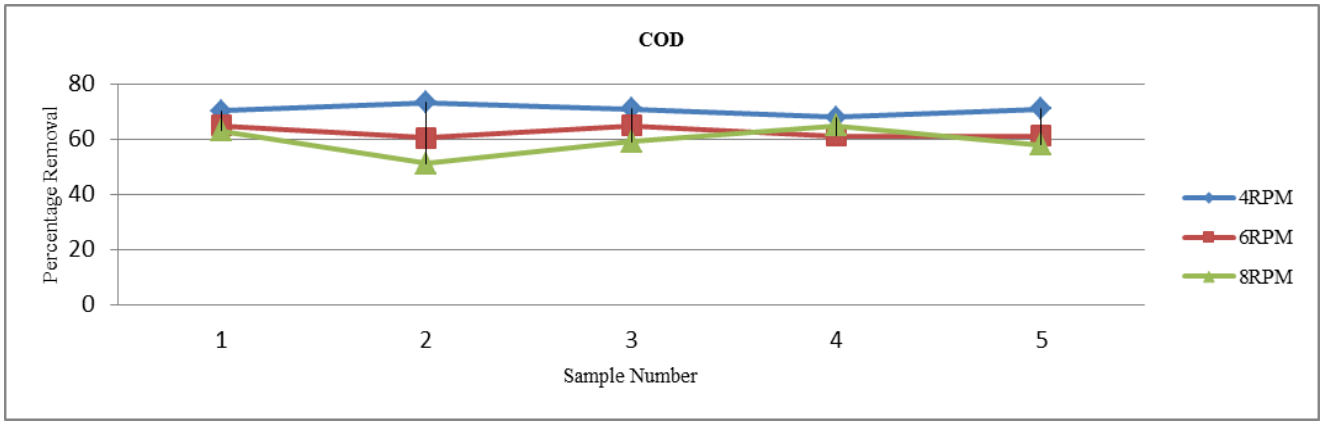

Fig. 2: Graphical Representation of Percent Removal Efficiency of COD

24HOURS									
SAMPLE NUMBER		INFLUENT			EFFLUENT			% REMOVAL	
	4RPM	6RPM	8RPM	4RPM	6RPM	8RPM	4RPM	6RPM	8RPM
1	255	361	345	28	69	76	89.01	80.88	77.97
2	235.6	347	363	23	62	76	90.23	82.13	79.06
3	273.8	281	407	25	48	81	90.86	82.91	80.09
4	312.8	276	381	36	44	73	88.49	84.05	80.83
5	216.41	323	374	26	55	82	87.98	82.97	78.07

Table 3: Performance of the Model for TS at 24 Hours Detention Time

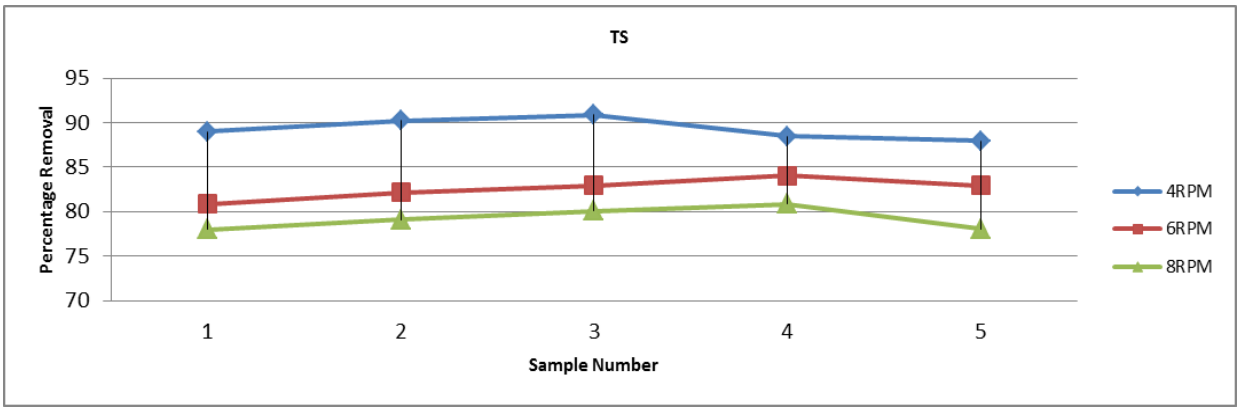

Fig. 3: Graphical Representation of Percent Removal Efficiency of TS

V. CONCLUSIONS

These two models worked parallel with the same influent wastewater and the same experimental conditions to investigate the effect of the added media volume in the RBR and results of the removing BOD5 and COD is carried out. After thorough evaluation of the related literature, it can be seen that the work has been carried out for the combined attached & suspended growth system. But very few literatures available regarding the treatment of wastewater using combined attached & suspended growth system with rotary drum reactor. Hence the study is required to be undertaken to analyze the overall performance of rotary drum reactor under various speed variation, trials and errors. It was noted that with the increase in detention period of the treatment there was remarkable increase in removal efficiency. Increasing of packing ratio cannot only increase attached biomass ratio but also capacity of total biomass. So, attached growth process has more possibility for capacity of biomass than suspended growth process. But loss of membrane permeability proceeded more rapidly with the attached growth system than with the suspended one. Hence Rotating Biofilm Reactor show improvement when inner drum is provided with perforation. The study claims that the modifications suggested in the model prove to be economical and efficient. This system can be used for wastewater treatment of industrial waste, domestic waste, agricultural waste and dairy waste.

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