THE EFFECTIVENESS OF LIQUID WASTE TREATMENT WITH TOFU INDUSTRY AERATION METHOD

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Abstract : The tofu industry is processed from soy extract which mostly is a household industry producing waste with high protein and carbohydrate content. Waste produced by washing process, boiling, pressing give burden of high enough contamination because without going through the processing process before disposed of environment. For that it needs a simple and simple technology that can be utilized for the processing waste of industrial tofu. One simple technology that can be applied to waste treatment by combining aeration and biofilter methods to reduce levels of BOD, COD, TSS and pH improvement.

Type of quasi experiment research, pre-post test research design. 90 lt plastic containers and equipment, aerators, water pumps, hoses, brick-shaped media. This research was conducted with variation of 10Cm, 20Cm, 30Cm and 3 days, 6 days and 9 days contact time. Measurements of BOD, COD, TSS and pH parameters were performed before treatment and after treatment on day, third, sixth and ninth. The result of the measurement is compared with the quality standard of waste water based on PerMenLHRI no. 15 Year 2014. Data were analyzed univariat and presented descriptively.

The result of Kruskall Wallis statistic test showed that there was no difference of BOD, COD, TSS and pH levels on the thickness of the 10 cm, 20 cm and 30 cm fine brick media on the 3rd, 6th and 9th days. The most effective reduction of BOD at thickness 10 cm day 6 decreased by 64.27%, decrease of COD level on the thickness of 10cm brick and 3rd day by 58,84%, decrease of TSS by day 3rdebesar 81,73%, To change pH according to the quality standard between 6 - 9, then on the thickness of brick liniment media on the sixth day has been effectively improve pH to 8.1.

This research can be used as one of alternative waste treatment and this research can be continued with the addition of specific bacteria to increase its effectiveness.

Keywords: Aerationbiofilter, waste

I. INTRODUCTION

Environmental pollution is one of the factors that damage the environment which has an impact on living things around it. Tofu industry is one industry that produces organic waste. If this waste is channeled to the river, it will pollute the water body and if it is still used it will cause health problems[1].

Tofu industry waste is immediately discharged into the body of water without passing through the processing process so that it is not in accordance with the waste quality standard Permen-LH Number 15-2008 quality standard for waste water for soybean management business / activities.

To overcome this problem, it is necessary to carry out the process of tofu wastewater treatment using a simple method so as to meet the waste quality standards. Biofilm and aeration methods can decompose tofu waste more quickly to reduce levels of COD, BOD, TSS and pH according to quality standards.

II. METHOD

The type of this research was a quasi-experimental research using a "pre-post test" design research design. Samples of tofu waste were taken in the industry, knowing that Tebeng Bengkulu was then included in a waste treatment tank. The sample was processed in a processing bath with a medium thickness of brick 10 cm, 20 cm and 30 cm with a volume of 90 lt. Data of BOD, COD, TSS and pH data were examined before treatment and after treatment on the 3rd, 6th and 9th day. The research was carried out at the Poltekkes Kemenkes Bengkulu Workshop. Examination of research parameters was carried out in the laboratory of the Bengkulu City Environment Agency. The data that has been collected is then carried out by Kruskall

Wallis test and presents it in narrative form and table.

III. RESULT

This research was conducted at the Environmental Health Department Workshop (Workshop) from October to November 2016, aiming to determine the decrease in BOD, COD, TSS and pH levels in Tofu industry wastewater.

The results of measurement of BOD, COD, TSS and pH levels in various media thicknesses and contact duration are presented in table form and analyzed univariately.

Table 1. Average BOD Levels Before and After Aeration and Biofiltration Processes

Treatment / Thickness	Day	Consen-tration BOD (mg/l)	Number of decreases	% de-creases
	Before Treatment	229,5	-	-
10 Cm	Third	148,5	81	35,29
	Sixth	82	147,5	64,27
	Ninth	105,5	124	54,03
20 Cm	Third	127	102,5	44,66
	Sixth	78	151,5	66,04
	Ninth	66	163,5	71,24
30 Cm	Third	141	88,5	38,56
	Sixth	85	144,5	62,96
	Ninth	121	108,5	47,28

Based on table 1, each of the BOD levels before treatment was 229.5 mg / l, the highest of the 3 treatments was in the treatment with a media thickness of 20 cm and the ninth day with a decrease in 71.24%.

Table 2. Average COD Levels Before and After Aeration and Biofiltation Processes

Treatment / Thickness	Day to-	Concentra-tion COD (mg/l)	Number of decreases	% de-creases
	Before Treatment	362	-	-
10 Cm	Third	149	213	58,84
	Sixth	146	216	59,67
	Ninth	161	201	55,52
20 Cm	Third	128	234	64,64
	Sixth	111	251	69,34
	Ninth	107	255	70,44
30 Cm	Third	154	208	57,46
	Sixth	159	203	56,08
	Ninth	128	234	64,64

Based on table 2, each of the COD levels before treatment was 362 mg / l, so from the 3 treatments the highest decrease was located in the media thickness treatment of 20 Cm on the ninth day with a percentage decrease of 70.44%.

Table 3. Average TSS Levels Before and After Aeration and Biofiltration Processes

Treatment / Thickness	Day	Concentra-tion TSS (mg/l)	Number of decreases	% de-creases
	Before Treatment	202,5	-	-
10 Cm	Third	37	165,5	81,73
	Sixth	39	163,5	80,74
	Ninth	23,4	179,1	88,44
20 Cm	Third	4,5	198	97,78
	Sixth	9	193,5	95,56
	Ninth	6	196,5	97,04
30 Cm	Third	158	44,5	21,98
	Sixth	18	184,5	91,11
	Ninth	14,4	188,1	92,89

Based on table 3, each level of TSS before treatment was 362 mg / l, so from the 3 treatments the highest reduction was in the treatment of media thickness of 20 cm on third day with a percentage decrease of 97.78.

Table 4 Average pH Before and After Aeration and Biofiltration Processes

Treatment / Thickness	Day	Concentra-tion pH (mg/l)	Number of change	% of change
	Before Treatment	4,5		
10 Cm	Third	4,8	0,3	6,67
	Sixth	8,2	3,7	82,22
	Ninth	8,1	3,6	80,00
20 Cm	Third	5,1	0,6	13,33
	Sixth	7,8	3,3	73,33
	Ninth	8,0	3,5	77,78
30 Cm	Third	6,1	1,6	35,55
	Sixth	7,8	3,3	73,33
	Ninth	8,0	3,5	77,78

Based on table 4 changes in pH at a media thickness of 10 cm, 20 cm, and 30 Cm on the sixth day had met the quality standard of limestone water with variations in pH ranging from 7.8 to 8.2.

IV. DISCUSSION

The results of univariate analysis, it was found that BOD levels in the treatment using variations in media thickness and length of contact found that the highest decrease in BOD levels before treatment was 229.5 mg / l, from the 3 treatments the highest reduction was in the treatment with media thickness 20 CM and the ninth day with a percentage reduction of 71.24%. The COD parameter was found that COD before treatment was 362 mg / l, so from the 3 treatments the highest reduction was in the treatment of media thickness of 20 Cm on the ninth day with a percentage decrease of 70.44%. Whereas for the reduction of TSS before treatment was 362 mg / l, so from the 3 treatments the highest reduction was in the

treatment of media thickness of 20 cm on the third day with a percentage decrease of 97.78 and a change in pH at a media thickness of 10 Cm, 20 Cm. and 30 Cm on the sixth day had met the quality standard for limah water with a variation of pH ranging from 7.8 to 8.2.

Some of the advantages of the wastewater treatment process with this process include: its management is very easy, the mud produced is relatively small, can remove nitrogen and phosphorus which can cause euthropication, the air supply for aeration is relatively small, can be used for wastewater with a load of COD, BOD5 , TSS and pH are quite large, aeration methods are made from organic materials, are lightweight and have a high specific surface area. The higher of the specific surface area, the greater the number of microorganisms that can be attached.

The results of this research indicate that the biofilter process has a large influence on the reduction of the parameters of BOD, COD and TSS and the improvement of pH of acidic wastewater from 4.5 to the standard pH of wastewater ranging from 6 - 9. The contact time and thickness of the media also have influence on the effectiveness of the biolilter in degrading organic materials in wastewater. It can be seen in the 3 days of contact parameters BOD, COD, TSS and pH still do not meet the requirements. This happens because the waste load of tofu waste is quite high and requires a longer time for the degradation process by organic-eating microorganisms.

The thickness of the media also has an influence on the reduction of BOD, COD, TSS and pH levels. The thickness of the media is related to the surface of the media surface to attach the biofilm. The more surface area of the media for biofilm attachment is more effective in reducing these parameters. With the surface area, more and more biofilms / microorganisms are doing the degradation process of organic materials in the tofu waste.

This result is in accordance with research conducted by Romayanto et al. (2006) with the title of processing domestic wastes with aeration and the addition of Pseudomonas putidi bacteria can reduce BOD by 71.48%, and TSS by 90.77% with 216 hours of aeration.

V. CONCLUSION

The results of the research that have been conducted can be concluded as follows:

1. The most effective decrease in BOD levels at 20 cm thickness on day 9 with a decrease of 71.24%.
2. The most effective decrease in COD levels at 20 cm thickness on day 9 with a decrease of 70.44%.
3. The most effective reduction in TSS levels at 20 cm thickness on the 3rd day with a decrease of 97.78%.
4. The most effective pH reduction at 10 cm thickness 6th day with a decrease of 82.22%.

This research can be used as a learning media for students, especially PAPLC courses and is an alternative waste treatment process in the community because it is quite effective in improving the quality of wastewater so that it meets the quality standards of waste water for soybean processing activities.

For further research, special bacteria can be developed that have more effective ability in treating tofu wastewater.

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