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Effect Of Glucose In Addition To The Sequenching Batch Biofilter Granular Reactor (SBBGR) For Microorganism Growth

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Abstract : Liqiud waste of slaughter house are mostly organic materials with high concentrations of BOD 344,56 mg/l,COD 880 mg/l, TSS 850 mg/l, while Nitrogen 4,675 mg/l. If the liquid waste dischanged into water bodies without treatment, environment will be polluted, because it needed wastewater treatment plant (WWTP). Sequenching Batch Biofilter Granular Reactor (SBBGR) is once of development actevated sludge conventional. Where the aeration and sedimentation proces done in one reactor with feeding intermetten. Media aims to reduce sludge index that is a by product of the activated sludge. To support the growth of microorganisms necessary macro and micro nutrien in comparison with the balanced. Preliminary analysis result abattoir waste having carbon ratio: nitrogen: phosphorous is 27:56:2, so it needs the addition of carbon from the outside. The purpose of this paper to determine the growth of micoorganisms, if added glucose to the variation of 1070 mg/l, 1080 mg/l and 1090 mg/l, as well as the growing influence of the media. The media used is a ceramic and plastic bottle cap. The analysis showed the addition of glucose 1080 mg/l in the ring ceramic can accelerate the growth of microorganisms as compareted to the control reactors and other glucose variations. While the media is a ceramic is better than the plastic bottle caps.

Keyword : ceramic,glucose,plastic,SBBGR, slaughter house.

1.Introduction

One urban facilities is slaughter house with an increased amount of demand for met, in order to meet the needs of the market meat abattoir is not only by the government but managed by the private sector with the production rate ranging from 1 to 2 head a day. Slaughter house which is managed by the regional government has been equippped with Liqiud Waste Treatment Plant (WWTP) while the privately- managed slaughter house is not equipped with a WWTP.

Wastewater by slaughter house in high organic matter, with a COD concentration 880 mg/l, BOD 344.56 mg/l, nitrogen 4,675 mg/l, TSS 850 mg/l and fatty oils 150 mg/l. The ratio of C:N:P in wastewater slaughter house has not complied with at 27:56:2. Anshori M,ectr [1]. To support the growth of microorganisms to maximum required ratio between carbon : nitogen and phosphorous of 100:5:1. Benefild and Randal[2].

Characteristics of wastewater slaughter houses contains a lot of organic material and production process takes approximately 7 hours per day, the appropriate processing is used is sequenching batcg reactor (SBR) where the processing is the development of processing models actevatad sludge with a time of aeration and

sedimentation occurred in one reactor. SBR development has been studied to obtain a liqiud waste treatment sludge product is lower than the conventional.

The addition of media as a growing media of microorganismsm, the name is sequenching batch biofilter granular reactor (SBBGR), in SBBGR can shorten the operating time with F/M rasio is higher so that the resulthing higher efficiencies.Vanhooren et al, in Yusup[3]. Another plus is the product of a lower sludge than conventional system.

Result of research is conducted Wichern M.et [4], the result of mathematcal modeling in conclusion get, SBBGR will go well if the oxygend concentration between 5 g O_2/m3, reactin time between 360-480 minutes. If it is lower than 360 minutes of NO_3-N are reduced only 40% and decrease the temperature will affecting the reduction of nitrate.

SBBGR tasted by C.Di Iaconi R, ramadori, A. Lopez and R. Passino[5], using two scenarois, using domestic waste (greey water) and leachete of landfill system. The result in domestic waste can lower cocentrations of COD 90%, nitrogen 90% and suspended solid 990%. As well as using leachete can reduce the concentration of COD by 80%. From both these scenarios, produc sludge lower than conventional system.

The adition of molasses with the concentration of 2%, 4% and 6 % can increase the layers of cellulose in the proceses biosenthesis cellose using liquid waste of tofu. Wardhani, ectr [6]. While the adition of co-glucose subtrate 10 gram in 18 liters of diesel at concentration of 830 ppm to give effect to reduction in diesel oil content. The larger the adition of co-subtrate, thr greater reduction in the efficiency of diesel oil content Putri,ectr [7]

2. Experimental

The adition of glucoe in reactor SBBGR, is expected to accelerate the steady state, wich is characterizedby a steady state has been reached removel efficiency of organic material in the reactor is no more than 10% for three days.

Variable used in this study, independent variable is the glucose concentration are 1070 mg/l, 1080 mg/l and 1090 mg/l. While the media used is a ceramic and plastic bottle caps. Dependent vareabel the growth of microoranisme. Vareable control of pH, temperatur and DO(Dissolved Oxygend). Seeding process aims to cultures of microorganisms an active role in the process biodegradation of organic matter in the wastewater. Seeding finally if the number of microorganisms in the reactor is more than 15 million. The calculation of the number of microorganisms from the number of MLVSS (Mixed Liquar Volatile Suspended Solid) in the reactor. The method used is gravimetric. While the concentration of organic matter expressed permanganate value (PV), the method used is titimetri.

Figure 1. Ceramic media before using in reactor SBBGR

Figure 2. Plastic bottlo caps before using in reactor SBBGR

Figure 3. Reactor SBBGR

3.Result and Discussion

Our preliminary analysis concentration MLVSS get 3880 mg/l and organic material in the wasteawater 2574,5 mg/l. Seeding last 4 days with a growth rate of microorganisms. Tabel 1.

Table 1. Growth of Microorganisms on Variasi media

NO	Ring Ceramic			Plastic bottle caps		
	1070 mg/l	1080 mg/l	1090 mg/l	1070 mg/l	1080 mg/l	1090 mg/l
1	21300	11600	22300	20800	2400	22100
2	24000	20000	24100	27800	27650	22100
3	88000	46500	49000	58500	55000	3500
4	18000	23500	20500	15500	21500	23000

Furthermore, the acclimatization so that microorganisms can adapted to the new environment so that it can degrade organic matter in wastewater. Data during the acclimatization process.

Table 2. Allowance for organic material on glucose 1070 mg/l in ceramic media

No	Before acclimatization	After acclimatization	Effiseinsi (%)
1	2536	859	66.13
2	2427	1197	50.67
3	2183	1330	39.09
4	2500	1071	57.17
5	2591	1377	46.86
6	5384	2810	47.81
7	3094	1660	46.33
8	3447	1903	45.20

Table 3. Allowance for organic material on glucose 1080 mg/l in ceramic media

No	Before acclimatization	After acclimatization	Effiseinsi (%)
1	2536	951	62.51
2	2427	1094	54.91
3	2183	1274	41.63
4	2500	1109	55.63
5	2591	1589	38.68
6	5384	1838	65.86
7	3094	1116	63.93
8	3472	1336	61.53

Table 4. Allowance for organic material on glucose 1090 mg/l in ceramic media

No	Before acclimatization	After acclimatization	Effiseinsi (%)
1	2574	2048	20.45
2	4021	2360	41.32
3	2438	914	63.52
4	5900	747	87.33
5	2536	1042	58.92
6	2427	1083	55.39
7	2183	1347	38.29
8	2500	930	62.79
9	2591	1576	39.19
10	5384	1824	66.12
11	3094	1029	66.73
12	3472	1238	64.35

Table 5. Allowance for organic material on glucose 1070 mg/l in plastic bottle caps

No	Before acclimatization	After acclimatization	Effiseinsi (%)
1	2536	734	71.06
2	2427	887	63.44
3	2183	1433	34.35
4	2500	1162	53.51
5	2591	1354	47.75
6	5384	1835	65.92
7	3094	1104	64.30
8	3472	1257	63.80

Table 6. Allowance for organic material on glucose 1080 mg/l in plastic bottle caps

No	Before acclimatization	After acclimatization	Effiseinsi (%)
1	2574	1267	50.79
2	4021	1198	70.20
3	2438	889	63.52
4	5900	767	86.99
5	2536	1018	59.87
6	2427	936	61.42
7	2183	1138	47.88
8	2500	1125	54.88
9	2591	1137	56.13
10	5384	1309	75.68
11	3094	1228	60.31
12	3472	1394	59.84
13	3046	1240	59.29

Table 7. Allowance for organic material on glucose 1090 mg/l in plastic bottle caps

No	Before acclimatization	After acclimatization	Effiseinsi (%)
1	2574	998	61.22
2	4021	1801	55.20
3	2438	1438	41.03
4	5900	9135	84.52
5	2536	1063	58.07
6	2427	1063	56.19
7	2183	1295	40.69
8	2500	1146	54.15
9	2591	1603	38.12
10	5384	1757	67.37
11	3094	1470	52.49
12	3472	1692	51.27
13	3046	1440	52.72

While the growth of microorganisms in the control reactor

Table 8. Allowance for organic material in control reactor of ceramic media

No	Before acclimatization	After acclimatization	Effiseinsi (%)
1	2536	736	71.06
2	2457	787	68
3	2345	2240	45
4	2450	1617	34
5	2546	1834	28
6	2479	1711	31
7	2531	2531	0
8	2434	2945	-21
9	2417	2297	5
10	2388	1481	38
11	2476	1042	58
12	2398	2303	4
13	2409	1735	28
14	2413	1328	45
15	2427	1117	54
16	2489	946	62
17	2495	724	71

Table 9. Allowance for organic material in control reactor of plastic bottle cap

No	Before acclimatization	After acclimatization	Effiseinsi (%)
1	2358	991	58
2	2361	1842	22
3	2459	3024	-23
4	2125	1615	24
5	2789	3067	-10
6	2408	1686	30
7	2456	2750	-12
8	2438	2949	-21
9	2467	1037	58
10	2491	1744	30
11	2478	1091	56
12	2497	974	61

13	2432	1362	44
14	2476	1313	47
15	2436	1097	55
16	2478	1438	42
17	2493	1097	56
18	2456	1376	44
19	2494	1452	42
20	2467	1530	38

The addition of glucose can accelerate growth of microorganisms on SBBGR reactor, it can be seen in the figure 4:

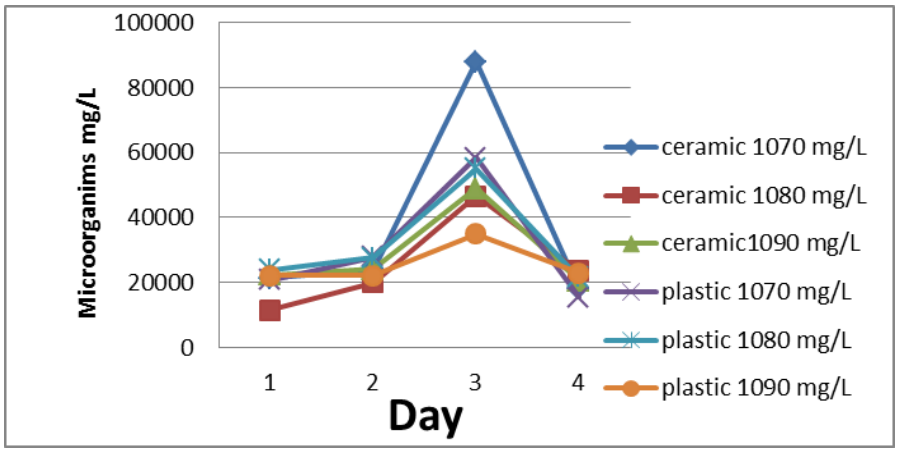

Figure 4. Growth of microorganisms in the reactor SBBGR

Total mikroorganime in Slaughter House waste average above 10,000 mg / l, after seeding to adapted microorganisme to their new environment in ceramic media with the addition of glucose as much as 1070 mg / L obtained microorganism Most ie 90000 mg / l, while the number of microorganisms at least HDPE contained on media with glucose 1090 mg / L. Media as a place to grow microorganisms are very influential in the growth micoorganisme. The ability of microorganisms to attach to the media surface roughness is strongly influenced by the media.

Stedy state condition can be seen in the amount of efficiencies gained, which is characterized by differences in the efficiency of not more than 10% for three consecutive days, following the process of acclimatization during the study. Figure 5.

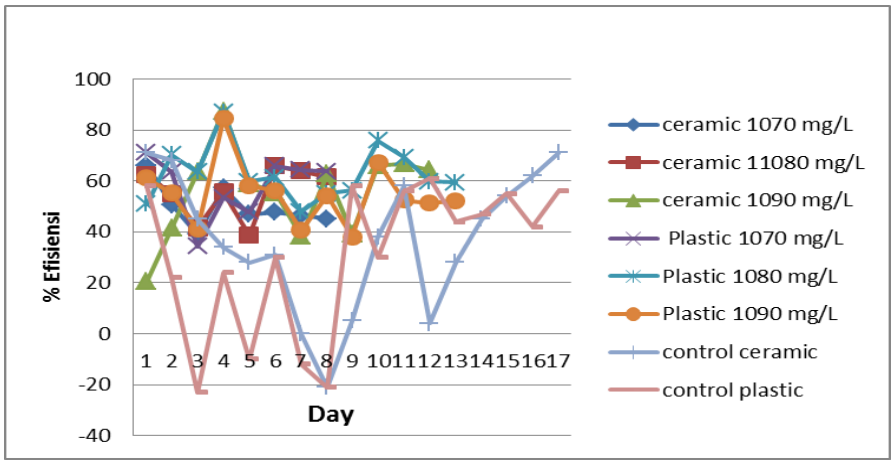

Figure 5. efficiency for the acclimatization

According Widyaningsih[8], acclimatization is an attempt physiological adjustments or adaptations of a micoorganisme to a new environment that will be entered. At the time of new biofilter media operated using ceramic ring andplastic bottle caps in a clean , yet there are microorganisms that attach to the surface of the media, therefore it is necessary for the breeding process (seeding) and acclimatization of microorganisms that grow attached to the surface of the media. After 3 days of seeding the surface of the media change the color to brown for their mikroorgaisme growing and developing to form slime.

Slime is a consortium of active microorganisms, whose role is to degrade organic material in the wastewater. Types of microorganisms present in the slime depending on the time of maturation slime. After more than one week and slime fully formed, there are three groups of bacteria, which form the outer layer of mold, mildew and algae middle layer while the inside of the bacteria, fungi and algae .Masduqi Ali,ectr.,[9]. The growth of microorganisms in the control reactor for 17 days either in medium ceramic or plastic HDPE longer than the reactor were added glucose. While the addition of glucose variation between 9 days to 13 days. During the acclimatization process, microorganisms percentage growth in the reactor to fluctuate, this is due not adapt microorganisms in their new environment. Allowance for volatile organic matter during the acclimatization shows yet insufficient population microorganisme available to convert organic matter into carbon dioxide, water, and ammonia. There are biochemical factors (nutrients) that may affect the availability of microorganisms such as carbon, nitrogen, sulfur, and trace elements.

While the addition of glucose variations in the growth of microorganisms more quickly than the control reactor. This is due to the addition of glucose to the reactor SBBGR can help the growth of microorganisms. Glucose once of the most important carbohydrate used as a power source. Monosaccharides glucose included in the class that has the molecular formula $C_6H_{12}O_6$. Glucose-containing carbon needed for cell growth and to help the microbial activity .Widjaja.,[10]. Extra glucose is adapted to the ratio C: N: P to the initial state of the waste water that is 27: 56: 1, where the microbes will grow at an optimum state with the ratio of C:N:P is 1107:56:11 Anshori,[1] According Putri[7]MLSS value in the addition of glucose as co-substrate 10 grams demonstrate the value is often higher than with the addition of a co-substrate in much smaller amounts. The more the addition of co-substrate is proven to increase the value of MLSS. Impairment MLSS in the early days of the study is because microorganisms need time to adapted before it can work with stable decompose organic matter. According to Wardani [6] the higher the concentration of molasses given the greater weight of the resulting cellulose layers.

Darwinastwantya research results[11] the addition of urea to give effect in the designated concentrations of diesel oil. The greater concentration of diesel oil used, urea is added also big enough to get a removal efficiency of high concentrations of diesel oil.

Results of research Suyasa[12] concerning the addition of urea and liquid compost on the content of BOD and COD saying that treatment with compost to give effect to a decrease in pH and decrease the best on the value of BOD waste dyeing that of the initial value before treatment 121.638 mg / dropped to 5.699 mg / l whereas treatment with urea provides the best influence on dyeing wastewater COD impairment is becoming 34.240 mg / l of the initial value before treatment is 454.064 mg / l. MLSS value increases with increasing concentrations of urea until the sixth day. Urea concentration MLSS very significant effect on the first day, third, fourth, fifth and sixth. The concentration of urea is also very significant effect on decreasing the value of the effluent BOD instant noodles. Udiontoro,ectr.,[13].

In this study, using a variation of glucose concentration indicates that the reactor media ceramic ring and plastic bottle caps with the addition of glucose concentration more results are better than the other concentration because in the early days MLVSS value has exceeded the existing standard is 15000. It is also shows that with the addition of micronutrients glucose also affect microbial growth than without the addition of glucose.

4. Conclution

The conclusion of this study is, SBBGR can be used as an alternative treatment for slaughterhouse waste, the addition of glucose can accelerate the growth of microorganisms during seeding and acclimatization process, the addition of 1080 mg / l is better than the other variation. Media ceramik better than plastic bottle caps.

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References:

1. Anshori, M Iffah, Biogas-Cheap Energy From Manure**.** Chemical Engineering, Bandung
2. Benefied and Randal, Biological Proces Design for Wastewater Treatment,Prentice-Hall,Inc. Englewood Cliffs.
3. Yusup Setiawan, Sri Purwati, Rina S Soetopo, Kristaufan J.P. Increasing Effectivite of Waste Water Treatment Pulp Bleaching Process with Reactor Up-Flow Anaerobic Sludge Blanket (UASB) and Active Sludge mobilized. 2008, Berita Selulosa Vol 43(2) page 74-82.
4. M. Wichern, M. Lübken and H. Horn, 2008. Optimazing Sequenching Bcth Reactor (SBR) Operation For Treatment of Daily Wastewater With Aerobic Granular Sludge, Water Science & Technology-WST 58.6, 2008. Page 1199-1205.
5. Laconi, C, Ramadori,R., Lopez, A. And Passino,R. Hydraulic Shear Stress Calculation in a Sequenching Batch Biofilm Reactor With Granular Biomass,2005. Environmental Science & Technology, Vol 39, pp 889-894.
6. Wardhani, Novita Kusuma, et al. The Decline Concentration BOD and TSS in Liquid Waste of Tofu with Biofilm Pond Using Fish Nets and Bioball.2015. Portal Garuda
7. Putri. The Effect of Addition of Glucose as co-substrate in The Wastewater Treatment System Using Diesel Oil Hihg Rate Alge Reactor (HRAR). 2014. Jurnal Teknik POMITS Vol 3 NO 2.
8. Widyaningsih. Liquid Waste Processing in Canteen Yogma Fisip UI. 2011. Ojs.ui.ac.id.
9. Masduqi,Ali and Agus Slamet. Unit Operasi for Water Treatment, Environmental Engineering ITS,2002.
10. Widjaja, Tri. The Effect Comparison of Nutrition Against Biological Treatment with Mixed-Culture Bacteria. 2012. Ejurnal.its.ac.id, Vol 3 No 2.
11. Darwinastwantya, Ayu Syafira,2014. Aditions Urea as Co-Substrate at High Rate Algae Reactos System (HRAR) for Wastewater Treatment Contaminated Diesel Oil. 2012.Ejurnal.its.ac.id, Vol 3 No 2.
12. Suyasa, Budiarsa. The Effect of Addition Urea, Liquid Compos and Compost Mixture with Sugar Againt The Content of BOD and COD in Dyeing Waste 2012. OJS.unud.ac.id. Vol 4 no 1.
13. Udiantoro, et al. Effect of Addition Urea at Aeration Tank Seed Sludge System in Instant Noodles to Concentration BOD_3,DO,MLSS and SV_{30}.2011. Jurnal Agroscientiae Vol 18 No 2.

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