

QUALITY STUDY OF WASTE WATER PROCESSING

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ABSTRACT

Water is well thought-out as one of the basic need of human life. Beside its significant role in income contribution in the region, tourism industry is almost blamed as an environmental demolisher and polluter in Bali. This matter writer interest for research something result quality waste water processing at one case hotel and specific as know bacteriology and chemistry quality, because the result of quality hotel waste water processing very influential about water of river already polluted as physical, chemistry and bacteriology. The study aimed to investigate water quality of River at the nearest outlet of a star hotel STP and at upper-site river..

The research of methodology is hotel waste water analysis be based on the Minister of Environment Life Regulation number 52, 1995. Analysis result waste water process and water of river be based on Government Regulation number 82, 2001.

The water analysis results evidently showed that water sample taken during the 1st - 3th weeks before processing at hotel's STP were classified as heavily polluted based on water quality class I, II, III, and IV, with lowest pollution index (PI) of 33.23 and highest at 42.56. Amazingly, samples taken after STP processing were categorized as heavily polluted as well, based on water quality class I, II, III, and IV. The lowest PI was 13.4 and the highest at 22,15. Water sample taken at the nearest STP outlet at river was categorized as slightly polluted based on water quality class I and fill quality criteria based on water quality class II, III, and IV. Water sample taken at upper-site of Ayung River was categorized as slightly polluted based on water quality class I, and fill quality criteria polluted based on criteria of water quality class II, III, and IV.

Keywords: Pollution Index, WWTP, Waste, Water Quality, Pollution.

1. INTRODUCTION

Water is essential for life, water requirement concerns not only the quantity but also the quality and continuity of effort. Besides positively beneficial to sustain life, yet if managed poorly and water contaminated by hazardous materials, the water can be bad for life (Soemarwoto, 2001).

One of the industry in the province of Bali, which could give an impact on the economic development of less than 75 % is the tourism industry (Darmawan, 2002). The tourism industry requires a very large amount of water. In addition to being the largest contributor to income areas (especially Bali), the tourism industry also feared as a destroyer and high environmental pollutants in Bali. Call it the news in the media about the hotel that throw waste into the river, sea without being treated before discharge (Dalem, 2004).

Event tourism industry can not be separated from the need for water. In the

course of the tourism industry of water used for the toilets, laundry, kitchen activities/ restaurants, and activities of the garden (hotel landscape). Waste it produces is worth discharged directly into the environment, should be processed for eligibility can even be re-used for watering the garden such as an effort to save the use of water or discharged back into the environment without causing environmental pollution. The process of recycling industrial waste or Recycle Water Treatment Process is one of the requirements that must be owned by the industry environment (Ward, 1995). This study aims to determine the quality of the wastewater treatment one hotel, and specifically determine the bacteriological and chemical quality, because the quality of the processing is very influential on the surrounding environment, especially rivers that are in front of the hotel as the result of wastewater treatment will be discharged into the environment. Distance of the hotel adjacent to the river will be affected if the waste is disposed of hotels yet meet

the standards established in accordance with Government Regulation no. 82, 2001.

River crossing in the tourism area of Ubud has been under pressure both physical, chemical and bacteriological (Adnyana et al., 2002). According to the Bali Provincial Environmental Impact study of 2004 stated that the river has suffered severe pollution especially in the lower reaches. This will affect the impact of river pollution, because water from the River Atung be used by people who are in the downstream. Based on the above prompted the authors to examine the water quality of the river both upstream adjacent to the hotel and at the downstream.

2. METHODS

Research Sites

Location of research carried out at the hotel and the river is located at an altitude of 450 m above sea level. Monthly average temperature of 23.60 C with a maximum temperature of 28.40 C and the average minimum air temperature average of 18.00 C.

Water Sampling

The method of determining the water sampling station was done by purposive sampling observation stations determination made by considering various conditions and circumstances where considerations such research utilization dominant condition intalasi Wastewater Treatment, activity at

the study sites were allegedly affect the water quality of waste water treatment.

Water sampling technique for the measurement of physical parameters, chemical and microbiology at each study site by taking on the right, middle and left water reservoirs wastewater treatment outcomes at a depth of 30 cm and then mixed that into the composite sample. Sampling was also conducted on the outlet nearest to the hotel and downstream to get perbdingan between effluent quality with the quality of the river water.

Measured variables, the analyst and the Tools Used

The variables measured in the study of the quality of wastewater treatment in the hotel can be seen in Table 1.

3. RESULTS AND DISCUSSION

Water sampling conducted at a wastewater treatment plant (STP Sewage Treatment Plant or) and in the river is the outlet nearest to the hotel and on the lower reaches of the river. Sampling of wastewater treatment plants do repetitions three times that on the spot and at the entry of the tank waste prior to the waste water bodies in the environment. Sampling of water at the upstream and downstream parts of the river made one time . The results of the analysis of water samples taken can be seen in Table 2 .

Table 1. Water Quality Measured variables, the analyst and Used Equipment

No	Variabel	Unit	Analysis Methods	Used Equipment
A	Physical			
1	Temperature	°C	Expansion of mercury	Thermometer
2	TDS	ppm	Gravimetri	Analytical scales
B	Organic Chemistry			
1	DO	Ppm	Elektrokimia	DO meter
2	pH	-	Elektrometri	pH meter
3	BOD ₅	ppm	Spektrofotometrik	Spektrofotometer
4	COD	ppm	Spektrofotometrik	Spektrofotometer
5	NO ₃ ⁻	ppm	Spektrofotometrik	Spektrofotometer
6	NO ₂	ppm	Spektrofotometrik	Spektrofotometer
7	NH ₃	ppm	Spektrofotometrik	Spektrofotometer
8	PO ₄	ppm	Spektrofotometrik	Spektrofotometer
	Oils & Fats	ppm	Gravimetri	Analytical scales
C	Microbiology			
1	<i>Fecal coliform</i>	Jm/100 ml	MPN	Test tube

Table 2. Test Results Mean Wastewater Before and after treatment at the WWTP hotels as well as in Section Upper and Lower River

No	Parameter	Unit	Before Treatment	After Treatment	Upstream	Downstream
Physical						
1	Temperature	⁰ C	27,83	27,4	26,4	26,8
2	TDS	ppm	259,33	236	84	97
Chemistry						
1	pH	-	7,22	7,56	7,658	7,457
2	BOD ₅	ppm	301,43	20,33	5,63	7,5
3	COD	ppm	241,72	11,25	1,52	1,83
4	DO	ppm	1,44	3,6	4,86	3,93
5	NO ₂	ppm	0,47	0,26	0,0717	0,0555
6	NO ₃	ppm	17,63	1,12	0,9495	0,8422
7	NH ₃	ppm	8,53	0,18	0,0706	0,0878
8	PO ₄	ppm	0,59	0,17	0,1584	0,0615
9	Oils & Fats	ppm	94,17	0,72	0,75	0,75
Microbiology						
1	<i>E. coli</i>	MPN	900.000	6.000	10	300
2	<i>Coliform</i>	MPN	37.000.000	350.000	460	2400

Source: Results of lab analysis . UPTD PU and Lab . Faculty - unud Microbiology

The average yield analysis of water samples before treatment in the first week , second , and third can be explained as follows :

a. Physical parameters

Physical parameters such as temperature exceeded the threshold level of water quality standards for water quality criteria for Class I, II, and III, while for class IV water quality criteria do not pass the quality standard limits the maximum and minimum . The water temperature in the upper reaches of the Ayung River at 26.40 C. The parameters TDS does not pass the quality standard limits for all classes of water.

b . Chemical parameters

The results of the analysis of chemical parameters showed that pH parameters do not pass the quality standard limits for all classes . COD and BOD5 parameters passed the quality standard limits . Levels of COD parameter analysis shows a figure far above the standard limits the maximum set in the amount of 301.43 ppm. BOD5 parameter levels are also above the maximum threshold specified quality standard that is equal to 241.72 ppm.

c. Microbiology parameters

Microbiological parameters consisting of *E. coli* and coliform parameters for all

classes of water has not passed the quality standard limits.

The average results of the analysis of water samples taken after treatment in the first week, second, and third can be explained as follows :

a. Physical parameters

Physical parameters such as temperature and TDS did not pass the quality standard limits for all classes , with an average temperature of 27.4 ° C and the residue dissolved concentration of 236 ppm.

b . Chemical parameters

The results of the analysis of chemical parameters showed that pH parameters do not pass the quality standard limits for all classes , large pH value is 7.56. COD parameter passes the threshold for water quality criteria for Class I value the quality standards required for water quality criteria for Class I is 10 ppm , while the average value of the results of the analysis of COD 20.33 ppm . Parameter BOD5 over the threshold for water quality criteria for Class I, II , and II . Large value of the average BOD5 analysis results amounted to 11 ppm, while the value of quality standards established criteria for water quality criteria for class I, and III has a range between 1-6 ppm. DO parameters passed the quality standard

limits for water quality criteria of class I and II. DO values specified in the criteria for water quality standards are grade I and II by 6 and 4 ppm while the DO value is smaller than the results of the analysis of 3.6 ppm. Parameter NO₂ cross the threshold standards for water quality criteria for Class I, II, and III. NO₂ values greater analytical results is 0.26 ppm. Parameters NO₃, NH₃, oils and fats do not pass the quality standard limits for all classes of water. PO₄ parameter water quality criteria showed only class I and II, which passed the quality standard limits while the water quality criteria for Class III and IV also passed the quality standard limits. Value set for the water quality standard Grade I and II at 0.2 ppm, class III and IV are 1 ppm and 5 ppm, while the value of PO₄ analysis results are still much greater was 0.17 ppm.

c. Microbiology parameters

The results of the analysis of the average microbiological parameters consisting of E. coli and coliform parameters for all classes of water far beyond the standard limits for all classes of water quality.

The results of the analysis of water samples outlet closest to the Hotel or on the upstream side of the river can be described as follows :

a. Physical parameters

Physical parameters such as temperature exceeded the threshold level of water quality standards for water quality criteria for Class I, II, and III, while for class IV water quality criteria do not pass the quality standard limits the maximum and minimum. The water temperature in the upstream area of 26.40 C. The parameters TDS does not pass the quality standard limits for all classes of water.

b. Chemical parameters

The results of the analysis of chemical parameters showed that pH parameters do not pass the quality standard limits the maximum and minimum for all classes of water. COD and BOD₅ were below the threshold of the maximum quality standard for all classes of water. Parameters DO levels are below the threshold of minimum quality standards for all water quality criteria for Class I DO levels are the result of analysis of 4.86,

while the quality standards established at 6 ppm and 4 ppm for water quality criteria for class II. Parameter NO₂ cross the threshold standards for water quality criteria for Class I, II, and III, in which the parameters of NO₂ levels at 0.0717 ppm, while the water quality criteria for Class I, II, and III of 0.06 ppm. Parameters NO₃, NH₃, PO₄, fats and oils do not pass the quality standard limits for all classes of water.

c. parameters Microbiology

Microbiological parameters consisting of E. coli and coliform parameters for all classes of water has not passed the quality standard limits.

The results of the analysis of water samples at the lower reaches of the river can be described as follows :

a. Physical parameters

Physical parameters such as temperature exceeded the threshold level of water quality standards for water quality criteria for Class I, II, and III, while for class IV water quality criteria do not cross the threshold. This is because the results of the analysis of the temperature 26.8 ° C, while the water quality criteria for Class I, II, and III ranged between 27o C - 33o C. TDS parameters are below the threshold standards for all classes of water.

b. Chemical parameters

Chemical parameters indicate that the parameters pH remained at the maximum threshold and the minimum standard criteria of quality standards for all classes of water. COD and BOD₅ were below the threshold of the maximum quality standard for all classes of water. DO parameters for water quality criteria for class I and II passed the minimum quality standard limits. Parameters NO₂, NO₃, PO₄, fats and oils do not pass the quality standard limits the maximum for all classes of water

c. Microbiology parameters

Microbiological parameters consisting of E. coli and coliform parameters still pass the quality standard limits the maximum for Class I water quality criteria and have not passed the quality standard limits for water quality criteria for Class II, III, and IV. The results of the analysis of waste

water at WWTP Hotelbaik before and after treatment and the water of the river both upstream and downstream have not shown alarming levels of water parameters , only a little past several parameters such as the quality standard DO , NO₂ , NH₃ , E. coli and Coliform .

Pollution Index

Pollution Index (IP) wastewater hotel taken in the first week reached 9.24 , the second week reached 9.14 , and the third week reached 9.09 . Pollution Index (IP) at the time after waste water treatment in hotels , at the outlet closest to the hotel (up the river) and the downstream river , judging criteria based on water quality class I with the lowest value of 1.34 at the upper reaches of the river water samples Ayung and the highest value of 22.15 in the second

week of water samples after processing . Based on the criteria for class II water quality standards , the lowest value of 0.85 at the upstream river water samples and the highest value of 16.14 in the second week of water samples after processing . Based on the criteria of Class III water quality standards , the lowest value of 0.76 at the upstream river water samples and the highest score of 13.58 on the second week of water samples after processing . Based on the criteria of water quality class IV , the lowest value is almost zero at the upstream river water samples and the highest value of 13.41 in the second week of water samples after processing . Distribution of Pollution Index (IP) Water Waste Water Treatment Plant (WWTP) of water at the outlet closest to the hotel (upstream river) and the downstream river to Table 3 .

Table 3. Air Pollution Index hotel WWTP and river

No.	Time & Place	Hotel and River Water WWTP			
		I	II	III	IV
1	AM1	22,1	16,1	13,49	13,39
2	AM2	22,15	16,14	13,58	13,41
3	AM3	22,11	16,13	13,55	13,4
4	Upstream	1,34	0,85	0,76	Near 0
5	Downstream	4,66	0,98	0,92	0,14

4. CONCLUSION AND SUGESTIONS

Conclusion

Based on the research results and the above discussion the following conclusions can be drawn:

1. Wastewater quality hotel compared to the Decree of the Minister of the Environment 1995 including being polluted. Parameters that have passed the threshold is COD and BOD 5. Results of wastewater treatment compared to hotels of water quality standards based on Government Regulation No. 82 of 2001 has passed the maximum threshold criteria for water quality standards on levels of COD , BOD 5, DO, NO₂, PO₄, E coli and Coliform . Parameters which still meets the minimum quality standard limits are temperature and maximum threshold levels of TDS, pH, NO₃ , NH₃, oil and grease .
2. Results calculated with Pollution Index shows that wastewater treatment outcomes compared to hotels of water quality standards based on Government Regulation No. 82 of 2001 , including heavy pollutants to water quality criteria class I and II , as well as criteria pollutants for water quality was grade III and IV .
3. River water quality upstream compared with the water quality standards based on Government Regulation No. 82 of 2001 has passed the maximum threshold criteria for water quality standards on levels of DO, NO₂ , and NH₃ , water quality in the lower reaches of the river compared to water quality standards based on Government Regulation No. 82 of 2001 have already passed the threshold of the maximum water quality criteria on levels of DO . The number of E coli and Coliform have

passed the quality standard limits for water quality criteria for Class I only.

4. Water Pollution Index in the upper reaches of blackened mild to criteria including water quality class I , meet the quality criteria for water quality criteria for Class II, III, and IV . Water pollution index in the lower reaches of blackened mild to criteria including water quality class I and meet the quality criteria for water quality criteria for Class II , III , and IV compared with water quality standards based on Government Regulation No. 82 of 2001 . Ai waste processing results in not polluting the river.

Suggestion

Based on the above conclusions can be advised of the following :

1. Wastewater treatment process at the hotel need to be monitored continuously to get better treatment outcomes, especially in processes that are not running as it should.
2. Monitoring water quality in wastewater treatment should be carried out periodically by reference to a set of parameters such as temperature , TDS , pH, COD, BOD5, DO, NO2, PO4, NO3, NH3, Oils and fats, E coli and Coliform. The number of E coli and Coliform needs to be a serious concern.

3. River water quality monitoring should be carried out periodically by the Regional Government of Gianyar. Associated with business activities are likely to cause pollution in river bodies need to be watched closely, conduct periodic coaching and counseling as well as enforcement of environmental law for the intentional or unintentional (negligent) or violated shall be implemented without favoritism .

5. REFERENCES

- (a) Adnyana, W. S., Sumarniasih, M. S., Trigunasih, M., Puja, N., Wiyanti, Diara, W. (2001) *Pengelolaan Daerah Aliran Sungai*. Universitas Udayana. Denpasar.
- (b) Dalem, R. (2003). *Hotel Berwawasan Lingkungan*. Bali Travel News. September, Edisi II, hal : 8, Kol. 6.
- (c) Darmawan, I. (2002). *Pengaruh Industri Pariwisata Terhadap Ekonomi Bali*. Bali Post. 22 Oktober, hal : 2, Kol. 4.
- (d) Soemarwoto, O. (2001) *Paradigma Baru Pengelolaan Lingkungan Hidup*. Gajah Mada University Press.
- (e) Wardana, A. W. (2001). *Dampak Pencemaran Lingkungan*. Andi. Yogyakarta.