

Full Length Research Paper

Environmental risk analysis of sugar factory waste

Kris Tri Basuki

Sekolah tinggi teknologi nuklir – badan tenaga nuklir nasional
Jalan Babarsari Kotak Pos 6101 YKBB Yogyakarta

Accepted 2 June, 2015

At the end of the end of the period of agricultural products in recent years in Indonesia can not compete with neighboring agricultural products, particularly in post-harvest handling products. Refill beverage product that is widely available throughout the city in Indonesia feared contain contaminants that can damage the health. While industrial activity in Indonesia do not understand the nature of the ecosystem around it, which can cause environmental contamination. Ozone technology is a technology that has the ability to suppress bacteria, carried out at low temperature (20-25° C), do not turn off the eye grows, the process is simple, low operating cost, environmentally friendly and clean work area. Of the ability of ozone technology can be used for sugar processing wastes. Sugar from sugar waste wastewater collectors in tubs in Kediri, East Java is based on the analysis of BOD initially contains = 756 mg/L, COD = 873 mg/L, TSS = 406 mg / l, minyak 6,82, and H₂S initially contains = 8,59 mg/L. To reduce pollutant parameters are then needed a cheap alternative and efficient processing. One alternative that can be applied is the process of ozonation with ozone generator device (Ozonizer). Wastewater of sugar industry in Kediri case studies can be minimized by using a mixture of ozone technology and lime. The content of pollutants such as TSS, pH and color will decrease as the length of time the ozonation, BOD content dropped from 756 mg/ L to 32 mg/L or 97.76%, COD dropped 873 mg/L to 80 mg/L or 90,84%, TSS content dropped 406 mg/L to 14 mg/L or 96,55%, the Sulfite dropped from 8,59% to 0% or 100%, Minyak content dropped 6,82% to 0% or 100% on addition of 0,4% lime. This study with the goal of environmental risk analysis. Based on the analysis of the quality of the environment , it can be concluded based on the results of a qualitative analysis of risk components that have a high risk of surface water pollution, waste textile factory in Kediri, East Java Java has little risk, with the most influential component is liquid waste according to semi-quantitative analysis and the impact of waste overall toward humans and the environment around the plant is not significant.

Keywords : Sugar waste, BOD, COD, TSS, Oil, Sulfite, Lime, Ozone.

Email: kristri_basuki@batan.go.id

INTRODUCTION

Today many industries are agriculture -based populist experiencing problems associated with post- harvest products. This problem is not addressed by the government so that these products are wasted due to

spoilage that can not be accepted by the market , in this case are very different from those of neighboring countries such as Thailand or Malaysia can handle its agricultural products that can be accepted by the market

at home and abroad. Sugar industry took a big hit in Indonesia is estimated that nearly 60-70% out of business due to lack of the role of government, industry and the community.

In the process of production of sugar from sugar cane is processed into sugar until coarse or refined sugar sap the process that turned into molasses would reduce the sugar content, in this case the author in collaboration with The sugar industry is in P. Java. To participate actively resolve the problem in accordance with the national science and technology capabilities possessed by BATAN then we try to take advantage of Ozone technology in solving the national problem.

Industry in Indonesia do not understand the nature of the existing ecosystem at about the industry, so as to result in contamination of the environment caused by their activities . In this case would be very detrimental to society now and our children and grandchildren that will come due to damage to the environment which can not be utilized instead to pose a danger to the community . In the process of production of sugar from sugar cane is processed into sugar to have adverse outcomes in the form of waste products. Waste generated in the form of liquid wastes very detrimental to society in terms of physical or chemical terms that can interfere with public health workers around the industry or society. The main parameter is the sugar mill effluent TSS, BOD, COD, Oils, Fats and sulfide which is an important parameter in the sugar mill effluent, as it can have a direct impact on the community. To overcome this problem we need a better system for processing, in order to obtain water quality effluent that meets the requirements of quality standards , one of the alternatives that can be applied is the ozonation process using ozone generator device that is in BATAN.

Based on the above industrial development should be accompanied by efforts to manage the environment in the form of waste management are released. It is accompanied by an assessment of the environmental risks of activities due to the activities and the results of industrial waste to obtain the level of the risk and dangers of the industrial activities.

METHODOLOGY

Studies done by first finding and collecting the data, where data obtained from research to implementation and then analyzed the risk environment. The data standards and effluent disposal rivers and other data includes the data taken sewage treatment, quality/quality related. Analysis is performed by comparing existing conditions with environmental parameters so as to know the level of risk. A hierarchical method used for a

reference/qualitative matrix. Used in the matrix method/way of hierarchical levels, with this matrix form, chances are ranked based on how often the risk will occur and the magnitude are ranked based on a strong and great impacts.

RESULTS AND DISCUSSION

Prior to identify environmental risks due to the sugar processing industry activity , necessary to first know the hue environmental study area, which includes physical hue chemical, biological, and social, economic and cultural. Fairly dense residential areas, land is needed for housing, and commercial needs for commercial and recreational, so no more empty area that can be used for Sanitary Landfill . Most of the study area is residential with some groups of the urban forest. Common plants that exist in the urban forest is to live well in the lowlands are: acacia , sono, tembesu, bungur, bamboo, meranti, medang. Common fauna in the study area are commonly farmed animals by people such as cows, goats, buffalo, sheep, chickens, and ducks. In addition there are also in the water ornamental fish or fish for consumption. Most of the population lives on trade, industry, tourism, and civil servants. Kediri as coastal settlement is the exit and entrance to the lush hinterland and rich produce. Has made a trading city. Smooth trade in Kediri also supported by an adequate transportation system through the ground. In Table 1 below it can be seen how the pollutant characteristics derived from sugar factory waste.

Sources of solid waste from the sugar slurry filtration is through extortion flush repeatedly with hot water until no longer contains pollen. Although it is estimated there are risks in factory activity out in the study area, control efforts and minimized by the factory is done through the control and waste recovery.

Wastewater management is the use of an effluent treatment using ozone technology with the addition of lime for sugar processing wastes.

From the description of the environmental setting is described and an explanation of the process of waste management as mentioned above, can be identified and assessed risks to the sugar mill effluent environmental components as in Table 2 below.

Forecast risks to land use that may occur are risk primarily comes from sewage effluent that pollutes groundwater and surface water.

The pollution caused by the residents feel uncomfortable and move away from locations around the plant, resulting in a change in land use. Risks that arise are negative. Smaller weight due to contamination that Forecast risk to air , the risk comes from the smell of sewage Sugar increasingly unpleasant. The pollution

Table 1 Pollutant content of Sugar

Sample numbers	COD (mg/L)	BOD (mg/L)	TSS (mg/L)	Oil (%)	Sulfite (%)
1	860	763	410	6,78	8,78
2	874	755	402	6,81	8,40
3	884	751	406	6,88	8,60
Average	873	756	406	6,82	8,59

Tabel 2 Identification of risks

Environmental components	Effect of Waste	Environmental components	Effect of waste
1. Land Use	There is	8. Water Fauna	There is
2. Air Quality	There is	9. Structure of population	There is
3. Noise	There is	10. Education	Not There
4. Water Quality	There is	11. Religion	Not There
5. Terrestrial Flora	There is	12. Public Health Level	There is
6. Water Flora	There is	13. Income level	There is
7. Terrestrial Fauna	There is	14. Environmental Aesthetics	There is

Table 3 Waste effluent Sugar Factory in Kediri, East Java

Parameters	Laboratoty Data
BOD (mg/L)	32 (Standart 60)
COD (mg/L)	80 (Standart 100)
TSS (mg/L)	14 (50)
Oil (%)	0 (0,5%)
Sulfite (%)	0 (1,98%)

occurred did not have a direct impact on the community. caused by factory workers in particular residents feel less comfortable due to inhaling the smell to the breath. Types of risks that arise are negative. Smaller weight gas pollution arising due to its smaller amount and is not a harmful gas.

Forecast the risk to groundwater from waste water treatment, which may seep into the water and soil. Risks that may arise in the form of the emergence of diseases suffered by people who use ground water , such as skin diseases , stomach ailments , and others. Risks that arise are negative. Its weight is due to the location being close to the people so that there is likely to contaminate water wells.

Forecast the risk of surface water from wastewater treatment , which is discharged into the river. Risks arising on flora , fauna , and humans, who use the river. The biggest risk that may happen is the death of aquatic biota , aquatic plants, and aquatic animals. Risks that arise are negative.

From the results of testing the effluent from processing sugar factory in Kediri, East Java is in the quality of raw Lower East Java government permitted, if the waste is processed with ozone technology with the addition of 0.4% lime as in Table 3 above. If we compare it with the

sugar in conventional sewage treatment is huge difference because it is often disturbing the public will smell and its color.

Forecast risks to terrestrial flora derived from wastewater originating from the end of the separation process sugar factory waste have been processed using ozone technology and the addition of 0.4% lime and then dumped into rivers and then exploited by the plants that live around the river. Risks that may arise in the form of reduced ability of plants to photosynthesize, causing the plant to die and be negative. But little weight because the effluent from sugar factories have suffered dilution of river water that pollutant concentrations also decreased.

Forecast risks to flora derived from waste water originating from the end of the sugar separation of waste that has been processed then dumped into rivers and then exploited by the plants that live around the river. Risks that may arise in the form of reduced ability of plants to photosynthesize, causing the plant to die and be negative. Smaller weight because effluent from sugar factory has undergone dilution so that the river water pollutant concentrations also decreased. Thus little influence on water flora.

Forecast risks to terrestrial fauna derived from waste water originating from the end of the sugar separation

Table 4 Value Risk

Resiko	Frekuensi (F)	Pengaruh (S1)	Sensitifitas (S2)	Nilai Resiko $R = F \times (S1 + S2)$
1. Land Use	1	2	2	4
2. Air Quality	2	1	2	6
3. Ground-water Quality	2	2	2	8
4. Pollution of surface water	2	2	2	8
5. Decrease of Terrestrial flora	2	2	2	8
6. Decrease of water flora	2	2	1	8
7. Decrease of terrestrial fauna	2	2	2	8
8. Decrease of water fauna	2	2	2	8
9. Decrease of Public Health Level	2	2	2	8
10. Decrease of Environmental Aesthetic	2	2	1	6
Total Risk				72

processing that have been processed and then discharged into rivers and then exploited by the plants that live around the river. Reduced influence the terrestrial flora fauna. Risks that may arise in the form of a reduced number of mainland fauna and flora due to reduced land for food also reduces the land fauna as well as negative. Smaller weight due to the influence of waste for life on land is not very significant.

Forecast risk to aquatic fauna comes from the wastewater coming from the river to the treatment ponds Risks that may arise in the form of reduced fauna in the water as well as negative. Smaller weight because of the effluent treatment plant has undergone know good and well that pollutant concentrations are small. Thus less impact on aquatic fauna.

Forecast the level of risk to public health from the liquid waste from the treatment ponds into surface water/river, where communities live and use the river or ground water (wells). Risks that may arise in the form of skin disease, stomach, and so on as well as negative. Its weight is due to the use of the river being used for watering plants by water source for cooking, everyday purposes such as bathing, washing, and even

people around the river. While the use of wells used for Forecast the risk of environmental aesthetics derived from wastewater from the treatment ponds into surface water/river, stacked solid waste. Possible risks of decreased negative environmental and aesthetic as well as a small weight.

Environmental Risk Analysis is an activity estimate the possible emergence of a risk of an activity and determine the impact of the activities/events. In this analysis will be used three methods of analysis : analysis of qualitative, semi-quantitative analysis and environmental analysis significantly (Idris, 2003).

With this method of qualitative analysis will be made

matrix combination of the probability of risk and magnitude of risks that will produce a risk value of high, medium or low.

We also calculate and analyze the value of semi-quantitative analysis also uses risk assessment matrix that combines elements of frequency, magnitude effects, and sensitivity to obtain the level of risk by using ozone technology and the addition of 0.4 % lime produced in Table 4 above.

Description:

0-150 = Low risk, manage by routine procedures.

151-300 = Medium risk, requires a high level of management attention.

301-450 = high risk, requires detailed research and management.

It can be concluded waste of sugar factory in Kediri, East Java has a small risk. Table 5 below. Analysis showed that no significant environmental aspects.

Description:

A = The area of impact

B = The seriousness of the risk

C = Opportunity of the riskm

D = Time of exposure

E = Laws and regulations

F = control methods

G = the perception of public opinion

Value environmental aspects:

1-196000 = not significant environmental aspects

196001-392000 = Quite Significant Environmental Aspects

392001-588245 = Significant Environmental Aspects

(Razif, 2002)

It turns out from the results of the evaluation no significant environmental aspects, because it is under the 196,000 figure. Only one component of the surface water pollution is high but not until 196,000.

Table 5 Analysis of the significant environmental aspects

Resiko		Nilai							Resiko (A*B*C*D*E*F*G)
		A	B	C	D	E	F	G	
1.	Land Use	3	1	1	4	3	1	1	36
2.	Air Quality	1	3	3	5	3	1	1	135
3.	Ground-water Quality	6	5	3	4	1	3	1	1080
4.	Pollution of surface water	6	4	3	3	6	1	3	3888
5.	Decrease of terrestrial flora	2	3	3	3	2	3	1	324
6.	Decrease of water flora	3	2	1	5	4	4	1	480
7.	Decrease of terrestrial fauna	2	2	3	3	2	3	1	216
8.	Decrease of water fauna	4	2	1	4	4	4	2	1024
9.	Decrease of Public Health Level	2	2	2	3	3	1	3	216
10.	Decrease of Environmental Aesthetics	2	2	2	3	3	1	2	144
Total value analysis with significant Environmental Impact									<u>7543</u>

CONCLUSION

Based on the results of a qualitative analysis of risk components that have a high risk of the contamination of small risk, the most influential component is if the waste surface water. Sugar mill waste Kediri, East Java, have a water using ozone technology with the addition of 0.4% lime compared with the conventional processing now. Overall effect of human waste and the whole of the human and the environment around the plant is not significant. This is because due to sewage treatment units has been lowered a lot of waste components.

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