

## Study of Wastewater Management and Local Community Perception of Non-Dairy Creamer Industry

<sup>1</sup>Endah Rita Sulistyia Dewi, <sup>1,2</sup>Anang M. Legowo, <sup>1,3</sup>Munifatul Izzati and <sup>1</sup>Purwanto Purwanto

<sup>1</sup>Department of Environmental Science, School of Postgraduate Studies,  
Diponegoro University, Indonesia Jl. Imam Barjo, 50241 Semarang, Indonesia

<sup>2</sup>Department of Agricultural Sciences, Faculty of Animal and Agricultural Science,  
Diponegoro University, Indonesia Jl. Prof. Soedarto SH, 50275 Semarang, Indonesia

<sup>3</sup>Department of Biology, Faculty of Mathematics and Sciences,  
Diponegoro University, Indonesia Jl. Prof. Soedarto SH, 50275 Semarang, Indonesia

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**Abstract:** Industrial wastewater treatment has an objective to minimize its negative impact on environment there by decreasing the volume and the concentration of the industrial wastewater before disposing it to the receiving waters. The minimalization degree necessary can be estimated according to the characteristic data of the wastewater and the required environmental quality threshold. This study aimed to find out the assessment of the wastewater treatment and community perception of non dairy creamer industries in Central Java. The study applied a descriptive research method which consisted of non dairy creamer wastewater disposal system, waste-related environmental pollution analysis and analysis of community perception of the waste produced by the industries. The study revealed that the wastewater disposal from a non dairy creamer industry, produced an average rate below the quality threshold. In other words, the waste disposed along the waste tract had not polluted the environment nearby the industry. The analysis of the community perception proved that the waste disposal nearby the industry was not harmful to the affected environment.

**Key words:** Community perception, non-dairy creamer, waste, water, disposal

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### INTRODUCTION

The existence of industries in the community indicates manifestation and participation in an effort of improving and enhancing the community development. Industries along with the surrounding communities have become two interrelated components. Therefore, industrial activities must have impacts on physical environment where the communities are situated.

Industrial activities are the source of environmental pollution. Non-dairy creamer industry is one of those producing vegetable creamer. The non-dairy creamer is a substitute product to milk or cream which produce a high water dissolved fat emulsion. The non-dairy creamer is made from vegetable oil derived from hydrogenized coconut oil with permitted additives such as glucose syrup, sodium caseinate, emulsifier and stabilizers, salt and water (BSN, 2012; Ramesh *et al.*, 2008). The main technology applied to the product is spray-drying. This technology is capable of converting liquid ingredient phase into powder creamer.

The making of dairy creamer results in solid waste and wastewater. Solid waste is the remainder of the cream production of powder particles which will subsequently be used as feed animal. Solid waste is the residual of the creamer production in the form of powder particle. This solid waste is then reused for feeding animals. Wastewater is derived from suspended solids from fat residuals and can be reused in candle and soap industries.

Poor processing of the wastewater derived from the non-dairy creamer industry can contaminate the environment. The wastewater contain such pollutants as organic compounds (e.g., protein, carbohydrate, fat) and inorganic compounds (e.g., suspended or dissolved phosphor with bad smells). The pollution may interrupt the environmental balance.

Hilgard cited from Hadi (2001), Edwina and Maharani (2010), define perception as a point of view or an evaluation. It is a communication process that occurs because of a response to a stimulus. In principle, perception means perspective, interpretation, evaluation, expectation or aspiration of an individual towards an object.

The process of perception development takes place within each individual. Mayo cited from Suharto (2005) interpret a community into two definitions, i.e., community as a “common place”, a mutual geographical territory and community as “a common interest”, cultural and identity-based interest similarity. In the current study, community perception was understood as the perception of some individuals who were believed as representing the other individuals in the same territory.

## MATERIALS AND METHODS

The study was held in Cabean Hamlet, Mangunsari Village, Sidomukti District, Salatiga Municipality. The research location was determined because it became the place for a non-dairy creamer industry. It also became the place for wastewater disposal which affected the local community. This study performed analysis of waste water disposal system from the non-dairy creamer industry, analysis of waste pollution in the environment and analysis of community perception of the industrial waste.

**Research design:** This study applied a qualitative descriptive research design in analyzing the effect of environmental pollution from the non-dairy creamer industry and the local community perception of the wastewater disposal from the non-dairy creamer industry. The study conducted interviews at the industrial site using a question guide, water body sampling according to the sample requirement and analysis to find out the environmental pollution and questioner dissemination to find out the community perception.

**Population and sample:** The initial stage of this study applied a qualitative methodology. The study used 53 individuals who lived nearby the wastewater disposal sites from the non-dairy creamer industry in Sidomukti as the population. Of this total population there were 30 selected as respondents using a Slovin equation.

**Research variables:** Research focuses in the qualitative methodology consist of specific aspects as the followings effect of environmental pollution; community perception and environmental quality variables.

**Research materials:** Water samples from the river nearby the wastewater disposal for scaling the water quality including BOD, COD, TDS, TSS and pH. Community as respondent samples to find out the affected community perception of the wastewater disposal from the non-dairy creamer industry.

**Technique of data collection:** The qualitative-descriptive data collection in this study was performed by analyzing to find out the effect of the environmental pollution along the non-dairy creamery wastewater disposal site the study performed an observation of the water body quality, including BOD, COD, TDS, TSS and pH and collected water samples from the upstream, middle stream and downstream of the disposal. The sampling points were determined according to the river water debits. The river with the debits of 5-150 m<sup>3</sup>/sec was marked with two sampling points on the distances of 1/3 and 2/3 of the river width, respectively.

The questioners were disseminated to 30 respondents who lived nearby the wastewater disposal site to find out the community perception of the non-dairy creamer industry. The study had been assured that the respondents would give necessary information concerning the problem discussed. Some of these criteria are as follows: the respondents were determined by a purposive method. They had permanent domiciles in Sidomukti and fulfilled the predetermined criteria. The respondents had lived and domiciled in Sidomukti for at least twenty years. The respondents lived nearby the non-dairy creamer industrial wastewater disposal. This study selected 30 respondents as the research samples using the Slovin equation:

$$n = \frac{N}{N(d)^2 + 1}$$

Where:

n = Number of samples

N = Population

d = Error rate of 95% or significance rate of 0.05

### Research focuses:

- Observing a creamer factory in Salatiga to assess the non dairy creamer industrial wastewater disposal
- Analyzing the effect of environmental pollution along the non-dairy creamer wastewater disposal site
- Analyzing the perception of the community living nearby the non-dairy creamer industry

**Data analysis:** A qualitative analysis applied to the data collected from the qualitative-descriptive method, dealing with the community perception at the industrial site. In order to measure indicators of the perception this study applied a Likert scale technique. The indicators were measured using 1-5 scale scoring with the following classifications: extremely agree = 5; agree = 4; fairly agree = 3; disagree = 2 and extremely disagree = 1. The final results were derived from the total scores obtained by the respondents divided by the maximum

scores and multiplied by 100% (Safitri *et al.*, 2013). The data collected from the non-dairy creamer industrial wastewater processing system containing information about the characteristics of the non-dairy creamer wastewater and the polluting impact the wastewater.

## RESULTS AND DISCUSSION

**The effect of the non-dairy creamer wastewater pollution in the wastewater disposal site:** In order to find out the effect of the environmental pollution of the non-dairy creamer wastewater in the wastewater disposal site, the study performed an observation of the water body quality which involved the examination of BOD, COD, TDS, TSS and pH by collecting the water samples from the upstream, middle stream and downstream.

The observation documented that the processed non-dairy creamer wastewater flow through the settlements and rice fields. The water body flow was situated ten meter away from the settlements and one meter away from the rice fields. Figure 1 shows the initial flow of the processed wastewater from the industry.

Figure 2-4 shown the water sampling locations along the water body from the upstream (the wastewater disposal site from the industry to the environment), the middle stream and finally to the downstream. The laboratory analytical result is presented in Table 1.

The analysis at the three samples collected from the research location resulted in industrial wastewater below the quality threshold. The provincial Act 10/2004 of Central Java requires the quality threshold for the industrial wastewater as presented in Table 2.

The industrial wastewater produced by non-dairy creamer industry was considered safe. The wastewater disposed in the water body can be reused for irrigation nearby the settlements (Fig. 5).

**Community perception of industrial wastewater:** The questioners disseminated to thirty respondents who had permanent domiciles nearby the water body of Sidomulyo were used for finding out the perception rate of the local community of the industrial waste. The respondents answers to the questions on social aspects concerning the non-dairy creamer wastewater are presented in Fig. 6.

- Industrial wastewater is harmful for the environment
- Industrial wastewater is hardly manageable
- Industrial wastewater is harmless
- Industrial wastewater is beneficial for the affected community
- Industrial wastewater did not provide economic benefit to the affected community



Fig. 1: Wastewater disposal from the industry to the environment



Fig. 2: Water sampling location at the upstream of the water body



Fig. 3: Water sampling location at the middle stream of the water body

The community perception of the industrial wastewater resulted in as the followings: the industrial wastewater was harmful to the environment (66.7% of the respondents disagreed); the industrial wastewater was hardly manageable (80% of the respondents disagreed) the wastewater was safe (73.35% of the respondents agreed); the industrial waste water gave benefit to the



Fig. 4: Water sampling location at the downstream of the water body



Fig. 5: Wastewater reuse for irrigation

Table 1: Water body quality analytical result

Parameters	Up stream (1)	Middle stream (2)	Down stream (3)
pH	7.1	7.2	7.2
BOD <sub>5</sub> (mg/L)	3.5	5.1	3.3
COD (mg/L)	64	60	50
TDS (mg/L)	190	150	150
TSS (mg/L)	9.1253	10.8739	7.0010

Table 2: Quality threshold for industrial wastewater

Parameters	Values
pH	6.0-9.0
BOD <sub>5</sub> (mg/L)	250
COD (mg/L)	500
TSS (mg/L)	300
Lemak (mg/L)	30

community (66.7% of the respondents fairly agreed) and the industrial wastewater did not provide economic benefit to the affected community (66.7% of the respondents fairly agreed). Such conditions led to the conclusion that the industries had been aware of the waste they contributed by a best practice of management so it would be harmless to the environment. However, the answers provided by the respondents concerning the importance and the economic benefit of the wastewater to the affected community were in a moderate category.

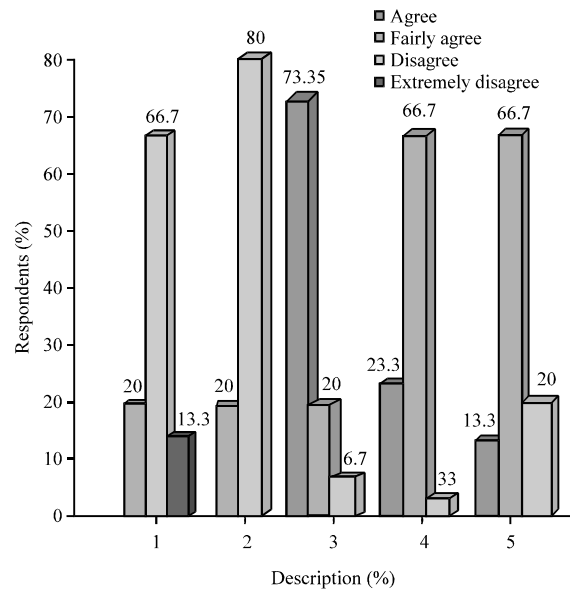


Fig. 6: Community perception of the wastewater produced by the industry

Therefore, this study recommended efforts of more optimal reuse of the wastewater. So far, the community involvement in the waste management had been implemented by the youth organization in collecting solid waste and selling it to the farmers.

A perception is a process result in which an individual organizes and interprets an object or a stimulus as such that he or she obtains a clear illustration of the object. This study treated the industrial wastewater as the object. Such illustration is obtained by a sensing process which involves information and experiences of the individual or other persons as such that the information and experiences affect him or her in giving the perception. According to the description, the community perception of the industrial wastewater was included into positive category. The positive perceptions developed with knowledge and information owned by the community who had been living nearby the industrial site for dozens of years.

Perception of the waste generated by the industry based on the Likert scale calculations obtained 17.67 value included in the category of positive in the range (16-20). Positive perception due to the knowledge and information gained by the community living around industrial areas as well as over a dozen years of experience living in the vicinity.

The non-dairy creamer wastewater in the form of sludge had been previously observed concerning its reprocessing into surfactane and glicerol (Ratnasari *et al.*,

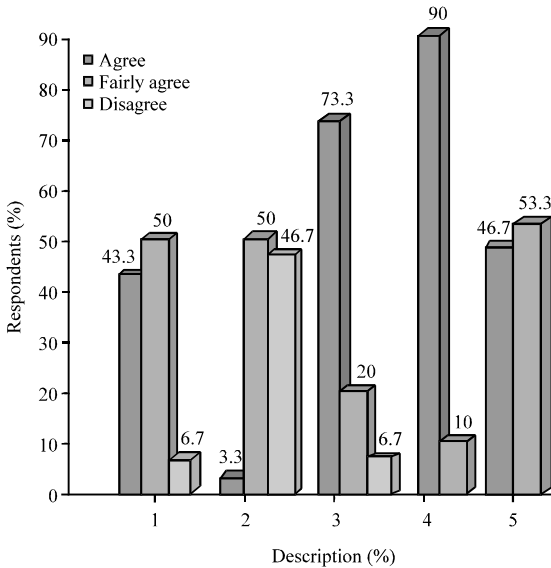


Fig. 7: Community perception of the effect of the industry on the environment

2013). The recovery of the creamer industrial waste, in addition to having valuable use, provides economic value because the unused waste can still be converted into environmental friendly commercial products without a minimum production cost. Suhendar *et al.* (2013) contends that in addition to the use for the surfactane and glycerol products, the non-dairy creamer waste can also be converted into biodiesel in response to the need of energy crisis for alternative fuels. Figure 7 summarizes the community perception of the effect of the industry on the environment:

- The environment nearby the industry was well maintained
- The industry made efforts for sustainable environment
- The industry made efforts for controlling emission, contaminated water, smell and waste
- The industry had taken measures to solve the environmental problem raised from its activities
- The industry responded to the environmental-related complaints posed by the affected community

The community perceptions of the industrial wastewater were as follows: environment nearby the industry was well-managed 50% of the respondents fairly agreed); the industry performed positive activities for sustainable environment (50% of the respondents fairly agreed); the industry's efforts in controlling the emission, contaminated water, smell and waste had help sustain the environment (73.3% of the respondents agreed); the industry had made efforts in solving problems raised in its environment (90% of the respondents agreed) and the

industry responded to the environment-related complaints posed by the affected community (53.3% of the respondents agreed). Such conditions led to the conclusion that the effect of the industry on the environment did not posed any harm. The industry was responsible for solving the problems related to the control of emission, contaminated water and smell. Perception of the impact of the existence of the industry based on Likert scale calculations obtained 16.73 value included in the category of positive in the range (16-20 ). According Andreas and Snyder, paradigm-oriented company that only makes a profit (profit ) as much as possible has begun to shift and start working to make a positive impact for the welfare of the community surrounding its existence. Efforts have been made by the industry in this regard is the involvement of the community in memanfaatkan solid waste into animal feed, the company's efforts can influence public perception about the company's activities.

Furthermore, environmental sustainability activities can also be done by involving the community, through the application of Corporate Social Responsibility (CSR) in any industry or company. Ambadar (2008) states that the CSR is a management concept which applies a "triple bottom line", a balance between profit, social functions and sustainable environment.

## CONCLUSION

The analysis of the environment effect of the wastewater disposal of from non-dairy creamer industry reported a rate below the quality threshold. Therefore, the wastewater that flew along the waste disposal tract did not resulted in pollution in the affected environment. The analysis of the community perception proved positive responses as the respondents found that the industrial wastewater disposal was harmless to the environment.

## RECOMMENDATIONS

Waste management industry is very important with emphasis on the interests of the environment, so the environment is maintained from pollution events

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