

Tofu Waste Management with the Application of Clean Production in the First Work Touch Industry in Bapang Village, Jogoroto District, Jombang Regency, East Java

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Abstract:- Tofu industry activities in Indonesia are dominated by small-scale businesses with limited capital. In terms of location, this business has also spread throughout Indonesia. In each stage of the process of making tofu requires materials, energy, some additional materials, and the use of technology that is still simple, so that the tofu industry has not implemented liquid waste management properly, research with the application of clean production is one way of influencing the management of liquid waste in the tofu industry.

Keywords:- *Liquid Waste, Tofu Industry, Clean Production.*

I. INTRODUCTION

The rapid development of industry in Indonesia cannot be separated from the problem of environmental pollution due to waste from the production process. According to Wijana, pollution is the entry of materials or energy by humans directly or indirectly into an area (water, land, and air) to cause a dangerous impact [1]. Currently, various industries, including the tofu industry, dispose of waste into rivers without any prior treatment or do not meet the liquid waste quality standards that have been set by the government [2].

Tofu industry activities in Indonesia are dominated by small-scale businesses with limited capital. In terms of location, this business has also spread throughout Indonesia. In each stage of the process of making tofu requires materials, energy, some additional materials, and the use of technology that is still simple [3]. The use of technology that is still simple is considered to be inefficient which can lead to waste both in the use of raw materials, production processes, or in energy use. Lack of efficiency in this production process can lead to large volumes of waste generated from raw materials, additives, and production processes [4].

According to Nastiti, the emergence of waste in industrial activities is difficult to avoid and requires considerable costs for companies to overcome [5]. The amount and intensity of waste that occurs can be reduced by taking preventive measures from each process, not only after the waste is formed (end of the pipe). This also applies to the food processing industry, including the tofu processing industry [6]. One of the methods developed is cleaner production. Clean

Production is a preventive and integrated production process related to production processes, products, and services. Operational activities in the tofu industry with the implementation of Clean Production will get direct economic, social benefits, and improve the environmental performance of the industries that apply it [7].

Tong et al. in an article entitled "An AHP-Based Water-Conservation and Waste-Reduction Indicator System for Cleaner Production of Textile-Printing Industry in China and Technique Integration" said that as an effective way to save water resources and waste emissions, Cleaner Production techniques can be used to solve the waste problem and achieve the goal of saving water and reducing the amount of pollutant discharged [8].

Djayanti, an article entitled "Study on the Application of Clean Production in the Tofu Industry in Jimbaran Village, Bandung, Central Java" said that the tofu industry is one of the small industries that have the potential to cause environmental problems. Almost all small industries, especially the tofu industry, mostly do not have waste utilization and waste treatment installations, because large investments are required to build these units. By looking at the problem, the approach that can solve the problem is by implementing Cleaner Production [9].

The study entitled "Feasibility of Utilizing Tofu Liquid Waste in Small Industries in Dusun Curah Reja, Cangkring Village, Jenggawah District, Jember Regency" Novita et al. said that tofu is a traditional food with basic ingredients using soybeans. In the manufacturing process, tofu produces liquid waste containing BOD, COD, TSS, and pH. If the tofu wastewater is directly discharged into the environment without prior processing, there may be environmental damage. So it is necessary to have a process for handling tofu liquid waste that is carried out first. One of the handling methods is Clean Production [10].

Based on the explanation of the relevant existing research, the author develops tofu waste management with the application of Clean Production which is associated with how to convert tofu waste into an alternative product that is profitable and environmentally friendly. So the title of this research is "Management of Tofu Waste with the Application

of Clean Production in the Tofu Industry in the Prime Work of Bapang Village, Jogoroto District, Jombang Regency, East Java".

Tofu is generally made by home industry players with simple equipment and technology. The sequence of processes or ways of making tofu in all small industries of tofu is generally almost the same. The following is an overview of the process of making tofu which will be presented in figure 1.

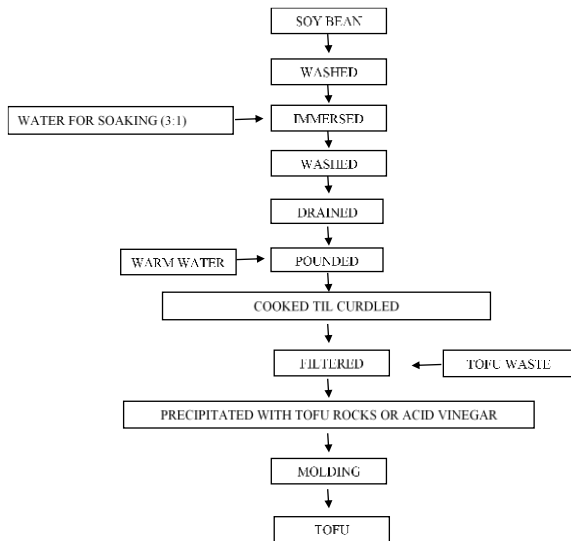


Fig. 1. The overview of the process of making tofu

II. RESEARCH METHOD

This research was conducted using a qualitative descriptive method supported by quantitative data, by conducting observations and analysis directly in the field. The scope of this research is limited to the production section of the home industry that produces tofu. Researchers want to examine how to manage tofu waste by implementing Clean Production and provide recommendations for the use of tofu industrial liquid waste. The flow of research in the tofu industry can be described in figure 2.

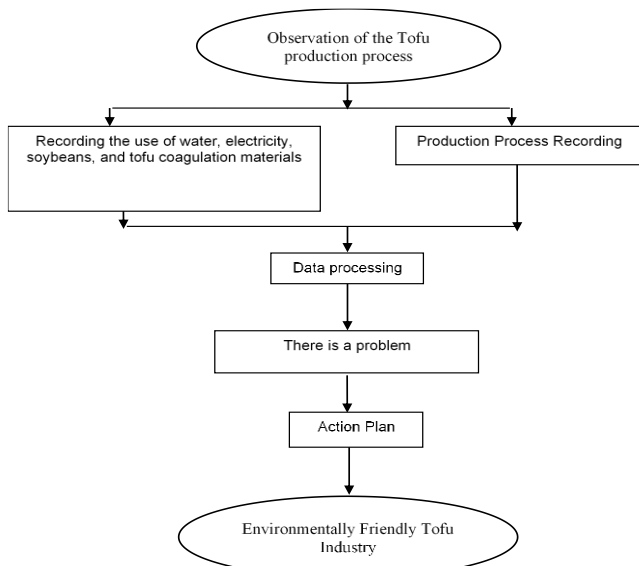


Fig. 2. The flowchart of tofu industry research

1. Observation of the production process, starting with the preparation of materials to be processed including electricity, water, soybeans, and tofu coagulation materials. The production process in making tofu consists of a preliminary process (preparation of ingredients and washing soybeans), boiling soybeans, milling soybeans, pressing, and the final printing process.
2. Recording of the production process, namely recording the use of water, electricity, soybeans, and coagulation materials, measurements are carried out to determine the amount of water, electricity, soybeans, coagulation materials used in the production process.
3. Data processing, data collected from observations is processed to be used as a basis for calculating the use of water, electricity, soybeans, coagulation materials, and production output in the form of production of waste. The calculation uses units of kilograms (kg) by calculating the density of each liquid (liquid waste, water, coagulation material).
4. There is a problem, it can be identified by identifying the existence of problems at each stage of the production process by measuring the amount of electricity, water, and materials used in the product unit. Based on these measurements, it can be seen the possibility of implementing Clean Production at this stage of the process. At the output stage, in addition to producing the desired product, it also produces waste whose type and amount depend on the materials used in the production process.
5. The action plan carried out is expected not only to increase or improve the company's production efficiency but also to manage and process waste so that the industry becomes more environmentally friendly.

Thus, in the end, companies that are more efficient and more environmentally friendly will produce by-products that can utilize waste that is usually wasted.

III. RESULT AND DISCUSSION

The production process at the Karya Perdana Tofu Industry is still in a conventional way so that the role of the workers, in this case, is very large in the tofu production process. The process of making tofu takes place in a large room and takes place constantly. There are 53 workers with their respective divisions of duties and responsibilities, in the production process there are those in charge of weighing soybeans, washing soybeans, soaking soybeans, seizing soybeans, grinding soybeans, coagulating soybean juice into tofu, and there is also a task of printing and cutting. You know, all employees get their respective tasks so that the production process takes place more quickly, precisely, and thoroughly.

The tofu production process in this industry does not take long and is easy, because it has the same production process as the tofu industry in general, from washing soybeans, soaking soybeans, milling, boiling to printing and cutting tofu. The stages of the production process are as follows:

1. Soybean Weighing

Unlike other industries, in the Karya Perdana (KP) tofu industry, soybeans must be weighed and put in sacks, each bag containing 16 kg of selected soybeans. Initially, the soybeans obtained from imported soybean collectors were sorted and then put in sacks to facilitate the process of making tofu.

2. Soaking and Washing Soybeans

The process of soaking and washing soybeans is stiffened in an iron tub measuring 1x1x3m, wherein this process there are 50 sacks of soybeans or 800kg per-process in an iron saucepan. The soaking process is carried out for approximately 1 hour. There is no definite measure of water usage in this process, so I think the water used is too much.

3. Soybean Mill

Soybean grinding is done before the soybeans are boiled, to facilitate the maturation of the tofu boiling. The addition of water in the milling process also does not use the right size, so if you think it is thick enough and not too runny, the finely ground soybeans are ready to be boiled.

4. Boiling/evaporating Soybean

The process does not use fire to boil, but hot steam that is channeled from burning wood in a kettle which is directly channeled into boiling tanks filled with ground soybeans plus 60 liters of clean water. Evaporation or what is more often called boiling is done for 3 minutes or 4 times boiling.

5. Filtering

This filtering process is carried out after boiling soybeans for 3 minutes and boiling 4 times, from the soybean water boiling tub it goes directly to the filtering device through iron pipes. The filter will automatically separate the soy juice from the soybean dregs or tofu dregs.

6. Clumping

This clumping process is carried out after the water from the filter is channeled into the coagulation bath using iron pipes. Furthermore, in this filtering process, the KP tofu industry uses tofu vinegar that has been mixed with water. In this process, there is no indicator or appropriate dose for giving tofu vinegar, so if you think the tofu water has started to thicken and clot, then giving tofu vinegar is considered sufficient.

7. Pressing and Printing

Before pressing the coagulated tofu water must be separated from the water in the tub, the water in the clumping tub is acidic. After separating the water, printing can be done, in the process of printing, this tofu requires a tool in the form of a tofu filter in the form of thin cloth and then pressed using a stone, namely closing the mold with a wooden board on which a stone is attached.

8. Cutting

This cutting process is the last in the process of making tofu. Cutting is done with a cutting tool or a special knife that has been designed by itself so that the tofu cuts are of the same size. Tofu cutting is divided into 3 sizes which are used to differentiate the selling price of tofu.

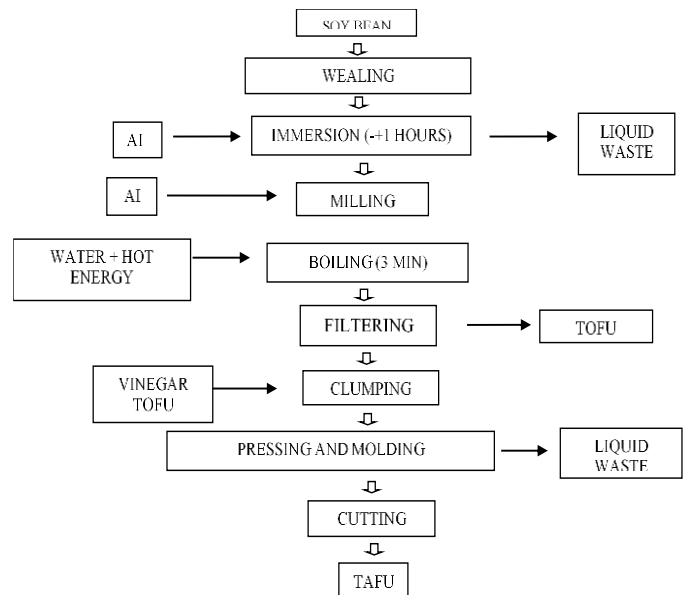


Fig. 3. The flowchart of tofu making process

Waste generated from the Karya Perdana tofu production process consists of liquid waste and solid waste, liquid waste generated by the KP tofu industry includes waste from washing soybeans, soaking soybeans, boiling, filtering, and printing tofu, and sanitation. Solid waste produced by the KP tofu industry includes wood-burning ash in the kettle, damaged soybean or soybean husks, and tofu dregs during screening.

The handling of liquid waste in the KP tofu industry does not use a wastewater treatment plant (IPAL) but the wastewater is directly discharged into the river which is close to the industrial building, the reason being that all tofu industries in the village dispose of their wastewater directly into the river without any prior management, and also the second reason is that there is no direct warning or guidance from the local related office. The handling of solid waste in the KP tofu industry is better than the handling of liquid waste in the KP tofu industry. That is, solid waste is used for animal feed and sold to the tempe gembus manufacturing industry.

The Karya Perdana Tofu Industry has implemented housekeeping procedures in the tofu production process, such as reducing the loss of raw materials by providing and using a container at the bottom of the soybean grinder to reduce the spillage of soybean slurry and prevent the mixing of waste streams from different sources. In implementing a good housekeeping routine, check whether the equipment has been damaged or the layout of the production equipment to optimize the flow of materials, product efficiency, industrial land and reduce the possibility of work accidents. Work accidents often occur if the layout of the production equipment is less than optimal. The Karya Perdana Tofu industry has experienced several improvements in the process of making tofu, such as improving the flow rate in production equipment, temperature, pressure on production equipment, and storage time for raw materials and finished products, eliminating excess packaging so that the quality of the final product is better and reduces waste.

Several things need to be done to prevent environmental pollution of KP's tofu industry by reducing the use of pollutant materials (reduce), reusing goods for the same user in the tofu production process (reuse) and recycling production materials that can be reused (recycle).

The application of clean production affects work safety in the tofu production process. Work safety is very important in terms of protecting workers to avoid accidents. Therefore, the implementation of work safety in the workplace is a must for every workplace. Work safety is safety related to machines, aircraft, work tools, materials and processing processes, the workplace base and its environment, and ways of doing the work.

Things that need to be done as Maintaining Work Equipment, Controlling Work Equipment periodically, Hiring Cleaning Officers to Always Maintain Cleanliness of the industrial environment know KP, Providing Adequate Facilities, Conducting Assessments, and Follow Up on Work Safety Implementation. Meanwhile, the negative impacts that can be accepted if the workplace does not implement work safety are as follows:

1. The occurrence of injury can even cause death to the workforce This is because the workplace does not carry out regular maintenance and inspections of work equipment in the workplace. With the condition of damaged equipment, of course, it has the potential to cause harm, even in the worst cases, it can result in death.
2. Cause disease. Lack of cleanliness of the workplace environment is due to the lack of maintenance of the environment so that the workplace becomes a hotbed for disease intermediary vectors, which means workers have the opportunity to contract the disease.
3. Give a loss. If many workers have accidents, of course, the workplace will suffer losses because the workplace must pay to cover the accidents and damage that occurs, besides that the workplace suffers greater losses because production is not achieved.
4. The work process in the company is hampered. By not implementing work safety in the workplace, the potential for accidents is greater, so that the production process is disrupted, because the number of workers is reduced and the equipment is not functioning so that the work process becomes slower.

IV. CONCLUSION

Based on the results of the research and discussion, it can be concluded that the management of liquid waste in the Tofu Karya Perdana Industry has not been managed properly, and housekeeping in the Tofu Karya Perdana Industry has been implemented properly so that work accidents in the tofu industry workers are very rare.

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