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Preface: 11th Annual International Conference (AIC) 2021

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Preface: 11th Annual International Conference (AIC) 2021

The Institute of Research and Community Services (LPPM), Universitas Syiah Kuala is the organizer of the 11th Annual International Conference (AIC) 2021. The conference was held on September 29-30, 2021, at Universitas Syiah Kuala Banda Aceh, Aceh Province, Indonesia. This conference allows all presenters to promote their current research and innovations through discussion, sharing ideas and best practices among researchers and academics under the theme of strengthening the dissemination of research and innovation to enhance the transfer of knowledge in the fourth industrial revolution. The AIC on Sciences and Engineering topics of interests cover all, but are not limited to, theoretical and practical aspects of (1) Geology, Mining, Petroleum, Mechanical and Industrial Engineering, (2) Civil Engineering, Architecture, and Urban Planning, (3) Chemical, Physical Sciences and Engineering, (4) Electrical, Computer Engineering, Information System, Mathematical Sciences.

This year the conference was done virtually, and presenting the following the keynote and invited speakers, Prof. A. Min Tjoa, the Vienna University of Technology (Austria); Prof. Dr. Michele Notari, University of Teacher Education (Switzerland); Prof. Siti Azizah Mohd Nor., University Terengganu (Malaysia); Dr. Hawis Maduppa, B.Sc., M.Sc., Institut Pertanian Bogor (Indonesia); Prof. Amirul Mukminin, S.Pd., M.Sc.Ed., Ph.D., Universitas Jambi (Indonesia) and Associate Prof. Dr. Muhammad Roil Bilad, Faculty of Integrated Technologies, University of Brunei Darussalam (Brunei Darussalam).

Two keynote speakers and three invited speakers were presented on the first day, and one keynote speaker was presented on the second day. All keynote and invited presentations were run smoothly despite the time difference between Aceh, Indonesia, and the keynote and invited speakers' time zone. The online oral presentation sessions also run well with the excellent teamwork between the host, moderators, and operators.

Double-blind review applied to all papers submitted to the conference. In total, 68 papers were presented, and 52 papers were accepted for publication. The authors covered nine countries: Indonesia, Malaysia, Peru, Australia, Saudi Arabia, Malaysia, New Zealand, Maldives, and the Philippines. This number of papers is received from three multidisciplinary conferences: sciences & engineering, environmental & life sciences, and social sciences. The reviewed and selected papers are published in reputable proceedings and journals.

I would like to express our thanks to Prof. Dr. Taufik Fuadi Abidin, S.Si., M.Tech., the Head of Institute for Research and Public Services of Universitas Syiah Kuala; Dr. Dra. Sulastri, M.Si., the Secretary of Institute for Research and Public Services of Universitas Syiah Kuala; Prof. Dr. Nasrul, S.T., M.T., the Head of Scientific Journals Center of Universitas Syiah Kuala; and Dr. Syamsulrizal, M.Kes, the Dean of Teacher Training and Education Faculty of Universitas Syiah Kuala, for their wise advice and suggestions. We also would like to acknowledge the conference secretary, treasurer, chief editors, and track editors for managing the paper review and organizing the technical program. Of course, we also would like to thank the rest of the committee members of AIC 2021 who have the spirit of volunteerism to succeed this conference.

Wassalamu'alaikum warahmatullahi wabarakatuh,

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Evaluation of clean production application in a palm oil mill: A case study at the palm oil factory in Nagan Raya, Aceh

Safrizal; Syawaliah Muchtar; Tiara Lauzia; ... et. al

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Evaluation of Clean Production Application in A Palm Oil Mill: A Case Study at the Palm Oil Factory in Nagan Raya, Aceh

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Abstract. The analysis of the application of clean production in one of the oil palm industries in Nagan Raya district has been carried out. The company produces palm oil and palm kernel oil. The application of clean production has the aim of increasing productivity by providing a better level of efficiency in the use of raw materials, energy, water, and encouraging better environmental performance. The method used is a descriptive method with interviews, observations that become primary data, primary data is analysed to obtain a causal relationship. Data analysis is carried out on the data obtained in the field and overcome by implementing clean production actions based on these problems. The results show that the problems that occur at each production process station can be overcome by implementing clean production techniques (good house-keeping techniques, in the form of good operating procedures and implementation of standard operating procedures that need to be carried out optimally, re-recovery) and improving the employees' knowledge of clean production.

INTRODUCTION

Agroindustry plays an important role in supporting the Indonesian economy. One of the agroindustry is the palm oil industry which produces palm oil and palm kernel oil. The increase in demand for palm oil is projected to occur in the future. This is due to the increasing demand for palm oil-based products such as cooking oil, cosmetics and food. Furthermore, palm oil was announced as one of the alternatives to non-renewable fossil fuels. This should be followed by an increase in palm oil production [1]. In the palm oil industry, the activities carried out are processing fresh fruit bunches (FFB) into Crude Palm Oil (CPO) and Palm Kernel. In the production process of Crude Palm Oil (CPO) and Palm Kernel the necessary materials are the fresh fruit bunches (FFB) of palm, and the factors involved in the processing in the form of human resources, machines and equipment used in the palm oil processing production [2].

The palm oil production process does not require chemicals as auxiliary materials. All substances found in products, by-products and residues come from fresh fruit bunches. However, there are a number of problems that occur in the production facilities, such as high consumption of water, increased generation of waste and large amounts of air pollution [3].

The palm oil extraction process requires large amounts of water which consequently generates a notable amount of waste [4]. Along with current technological developments, the end of pipe approach is no longer relevant for solving problems caused in the palm oil processing industry. Along with the development of technology in processing various products from a production, there is a strategy to implement clean production in an industry. The clean production strategy has a very broad meaning because it includes prevention efforts, pollution through the choice of environmentally friendly processes, waste minimization, life cycle analysis, and green technology [5].

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Clean production is recommended as an effort to provide benefits both in the field of engineering and production processes [5]. The implementation of clean production offers many advantages such as reducing costs, is easy to apply to the employees, and increasing productivity. application of cleaner production (ILO, 2013) is more effective and efficient in the use of natural resources, reduces or prevents the formation of pollution, provides opportunities for achieving ISO-14000 EMS, reduces costs for environmental impacts, has competitive advantage in domestic and international markets and increasing production quality [6]. The application of clean production in industry is environmental management as a preventive and integrated effort that is carried out on an ongoing basis to processes in production [2]. In this study, an evaluation of the application of clean production was carried out at one of the oil palm plantation oil factory in Nagan Regency, Aceh Province.

EXPERIMENTAL

This research on the analysis of clean production techniques was carried out using descriptive methods which evaluated from several production stations such as fruit reception, boiling, digester and press stations, as well as clarification to nut kernel stations by conducting interviews with employees, foremen and assistants about the potential for harm in production, and direct observation to obtain primary data. At the preparatory stage, a literature review was carried out including those materials from seminars and papers, journal articles, books, and company administration reports that are relevant with the research theme.

Primary data obtained from each of these stations is a problem or constraint in production that is detrimental and recorded during the research process. This loss is caused by human resources, methods, materials in the form of oil spills, the condition of fresh fruit bunches received and equipment damage. The primary data obtained were analyzed for the problems of each station at the palm oil processing plant in Nagan Raya, then a technique was determined to overcome these problems based on the application of clean production as a plan that resulted in the program objectives of implementing clean production in the processing of crude palm oil and kernels.

RESULT AND DISCUSSION

Palm oil processing has risks to the environment. This is because during the processing of palm oil, crude palm oil produces waste. In addition, the process of handling waste has not been carried out properly. One way to reduce environmental pollution that can be applied to the palm oil industry is to apply a cleaner production process. The implementation of clean production is carried out by implementing good housekeeping for process equipment, chemicals and other raw materials [7]. The implementation of this clean production application in addition to having a good (positive) impact on the environment also provides financial benefits that can be seen when the clean production is applied on the waste treatment and production costs due to inefficiency [2].

Analysis of the application of cleaner production in the Palm Oil production process is discussed as follows.

1. Fruit Reception Station

At the fruit reception station, the problem that occurs is the presence of contaminants in oil palm fruit. Contaminants including soil, sand or leaves when the palm fruit was picked up from the ground [8]. These contaminants must be removed in order to prevent the damaging of the processing equipment which also may reduce the quality of the products [2]. Implementation of the clean production at this stage is by applying the good housekeeping in the form of applying worker operational standards properly. The solution that can be implemented is to re-optimize the supervision of fruit sent from the garden at the time of fruit cutting. In addition, floor cleaning also needs to be carried out regularly during the process and at certain times[9].

2. Boiling Station

The boiling process is aimed at reducing the increase in free fatty acids, maximizing the curvature of the kernel in the seeds, softening the fruit flesh and reducing the water content and facilitating the fruit squeeze process in the compression process. The boiling process is carried out with a three-peak boiling system. Boiling pressure used in

the third peak is not more than 2.8 bar. This is because in the boiling column there is a steam leak that occurs from the sidelines of the steaming room and the steaming pipe, this often happens and causes steam to evaporate in the room and the water used is often wasted because when the steam boils out and cause the water pipe leaks. If this continues to happen it will have a bad impact on the factory area and if it is carried out at a maximum bar pressure of 2.8bar, it might cause a possible severe explosion in the boiler [10]. The application of clean production to this problem is by re-checking and repairing any problems that occurred. It is also encouraged for the workers to know about the boiling pressure, steam leakage, and boiling time. Boiling time is also suggested to be checked every morning before the boiling process takes place so as not to occur error during the process. In addition, the leaked boiler should be immediately repaired so that steam can be obtained at 2.8 bar. It is also suggested that the height of the boiling tile must be raised higher, by at least 2 meters, to ease the air circulation when the steam is out.

3. Threshing Station

At the threshing station, palm fruit and the empty bunches are spilled on the floor area of the factory. After the boiling station, the lorry was then hauled to the dumping station area for further separation between the fruit and the empty bunches. The lorry which is pulled manually using a trend by workers is then attached with a trend chain so that it can be pulled up to be poured into a drum that rotates vertically to speed up the separation process. However, some of the fruits fall out of the thresher drum and spilled on the ground due gaps in the machine, which sometimes also occurs due to the piled up of empty bunches that is not properly controlled. This problem resulted in a declining of production yield. The solution for this is to re-collect the remaining fruit in the empty bunch, fix the gap and do regular picking up of the fruits that fell on the ground to keep all areas clean, this effort will maintain production results and factory cleanliness (Gusti putu et al., 2005).

4. Crushing Station

At the crushing station, the digester that carries the remaining kernels separated from the seeds into small kernels causes the overflow and leaks of the pipes that prevents the kernels to be carried wholly to the reservoir. The spills that occur makes the area dirty and poses a risk to the workers. A good implementation of clean production for this issue is by cleaning up the spills immediately and tightening the workers at paying more attention in noticing leaks [11].

5. Pressing Station

At the pressing station there is often water spillage and rust on the tool. During the process, a leaking in the pipes is tend to happen which results to the spillage of water that seeps in the floor area. This issue occurs due to the strong applied pressure. The clean production that can be implement for this case is this by reducing the pressure and by repairing the rusty equipment as soon as possible.

6. Purification Station

This station is the stage in which the palm oil is purified from excess water, and other impurities. However, improper checking and control might cause the occurrence of leaks causing the oil to spill out with water. For this case, repairment of instruments is necessary, as well as regular cleaning [12]. There is a big problem that occurs which is the unavailability of equipment to process kernel into kernel oil despite the product has more value economically. This problem brings a new issue to the factory which is accumulation of kernels. This issue can be resolved by accommodating the stockpile kernels and selling it away at a good price. This is very important to do to maintain the cleanliness of the factory from every processing process that occurs, all existing problems will be resolved properly without a large cost burden [13]. The application of clean production in this problem is to collect and avail a shelter for the kernels, and better, a factory to process the kernels is needed for this case, especially in Aceh [14].

CONCLUSION

Based on the results of the research it can be concluded that the problems that occur at each station of the production process can be overcome by applying clean production with good housekeeping technique in the form of proper supervision, repairment, good operating procedures, recovery, and increase workers' knowledge and awareness of clean production. The evaluation also emphasized that the palm oil mill as a whole has implemented clean production in the processing process while maintaining the quality and maintaining the environment in accordance with the specified rule and maintaining the PROPER award in Blue category as given by the ministry.

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