Efficiency Improvement of Malaysia Palm Oil Process by Material Flow Analysis

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1. Introduction

Since 2006 Malaysia became the second largest country in production of palm oil after Indonesia. The palm oil production is the major crop in agriculture sector and the fourth largest contributor to the national economy, accounting 8% of the gross national income per capita in 2009 in Malaysia (1). However, Malaysia is facing many environmental issues related land use for production of palm oil and degradation of biodiversity. This study is focused on assessment of palm oil factory A to define the hidden flows in the process chain and to design a new proposal on improvement efficiency of palm oil production.

2. Methodology and data collection

In this study for assessment of palm oil factory process chain we employed the methodology of Material Flow Analysis (MFA). MFA is analytical method to quantifying flow of materials and energy in well-defined system. We collected all data from Factory A during the period of survey. As raw material in input side we used Fresh Fruit Bunch (FFB) while as output Crude Palm Oil (CPO) product. Between input and output system boundary, material and energy balance tried to evaluate for transparency of each process hidden flow.

3. Research Area

This research has been done by collaboration with one of the Malaysia FELDA palm oil mill as factory A. Factory A is known as the latest type of the FELDA palm oil mill in Malaysia by using vertical sterilizer system that has been installed from year 2010. The comparison between factory A and factory B which is the conventional type is to understand the characteristic of the each factory. There are four vertical sterilizer in factory A and this automatic system which has three inlet of steam so that the efficient of sterilize fruit will be improve and less consumption of steam amount. The vertical system is believed could improve the performance of palm oil production rather than the factory B. The through put of the production is 45 ton per hour (t/h). The factory A working hour depend to the amount of the harvested FFB of each day. The research scope is determined from sterilization station until the press station process.

4. Results

From the comparison of factory A and factory B, factory A has more benefit and easy to be handle rather than factory B (Table 1). In case of operation, factory A has more severe control due to sterilization space structure is tighter than factory B so that steaming timing of FFB should be strictly observed. Material flow of the palm oil process chart been made from sterilization station through Crude Palm Oil (CPO) production (Figure 1). The mass balance shows that from 100% FFB, 20% CPO, Kernel 6%, other loss 14% and by-product 45%. Kernel will be send to other factory to extract the kernel oil. From sterilization station to press station, the through put FFB is determined and we set the boundary of this research. In every each process is going to be assessing by using material flow analysis, and to define the hidden flow to increase the performance of the process production aiming up to 45 t/h. In the other hand, energy capacity of every each station was calculate to assist this material flow analysis so that the hidden flow of the production process could be define more easily. Factory A has Independent Power Plant (IPP) for running the production of palm oil and the energy resource is fully supply by oil palm solid by-product such as mesocarp fiber, Empty Fruit Bunch (EFB), and Palm Kernel Shell (PKS) which are consider as residues emitted from the palm oil process.

Table 1: Comparison between Factory A (Latest-type) and Factory B (Conventional Type)

Items	Factory B (Horizontal)	Factory A (Vertical)
Operation system	Manual	Automatic
Maintenance	High	Less
Monitoring time	Long	Short
Operation	Easy	Difficult
Safety Operation	Risky	Safe
Handling	Double-Handling	One-Traffic
Cleanliness	Inaccurate	Accurate

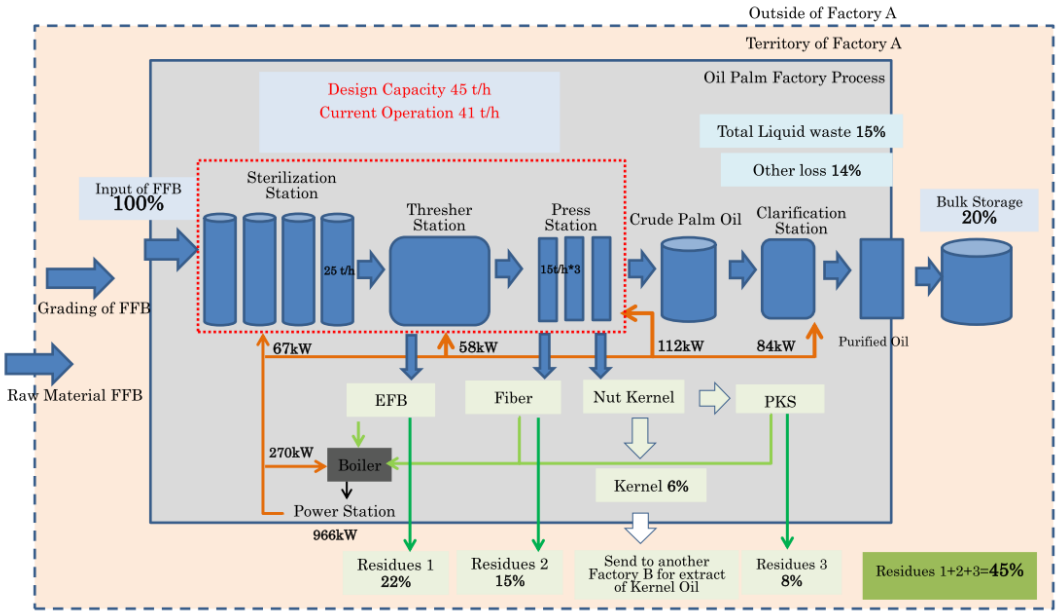

Fig.1 Material Flow Chart process flow in factory A

5. Conclusion

The future plan of this research is to define the hidden flow by assess all factor including mass balance and the energy balance of each process chain. Energy balance calculation is also required to seek more accuracy result. From the calculation of energy balance and the mass balance of material, it will be more clear which part of process should be focus on. After the hidden flow inside the process is discovered, new design idea would be applied to improve the performance of the palm oil production and also increase the through put amount of fruits.

6. References

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