



Energy Audit in Tofu Industry: Evidence from Indonesia

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Introduction

Tofu industry production in Indonesia is generally producing on small- and medium-scale levels, which requires a lot of energy inputs in the production process. In general, the fuels used are not environmentally friendly, such as firewood and liquid petroleum gas (LPG). In addition, the tofu industry also uses large amounts of water for the production process, generate wastewater in large quantities. It is resulting in significant negative effects on the environment. Therefore, it is necessary to study the process systematically and propose ways how to overcome it. This study aimed to audit the energy consumption to obtain the energy consumption and the habits of small and medium-scale level tofu producers.

Methodology

The data collection method involved semi-structured interviews and questionnaire surveys carried out in 31 tofu industries in Gunung Sulah District, Bandar Lampung City, Lampung Province, Indonesia, in December 2020. Furthermore, the data were analyzed using Minitab 18 to determine energy consumption for all activities in the tofu industry.

Results

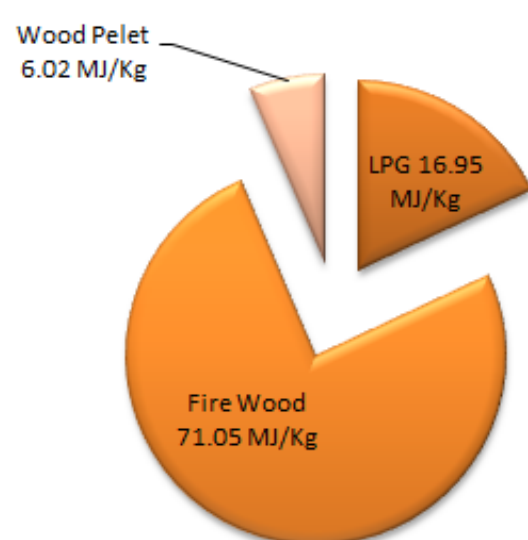


Fig.2. Energy consumption for cooking

Energy consumption varies according to the fuel used within the tofu cooking (boiling the soybean and frying tofu) on average; 71.05 MJ/Kg soybean for fuelwood, 16.95 MJ/Kg soybean for LPG, and 6.02 MJ/Kg soybean for wood pellets.

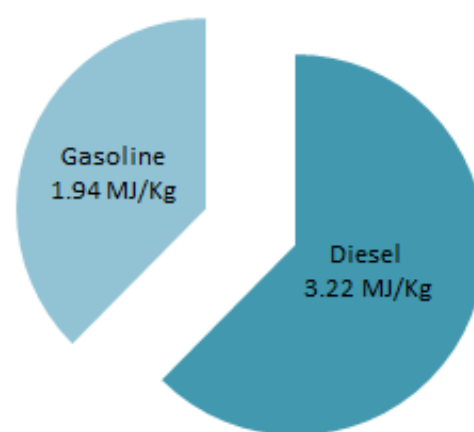


Fig.3. Energy consumption for milling machine

The fuel, gasoline or diesel, consumed for milling depend on the type of milling machine used. The gasoline consumption is 1.94 MJ/Kg soybean, and the diesel is 3.22 MJ/Kg soybean

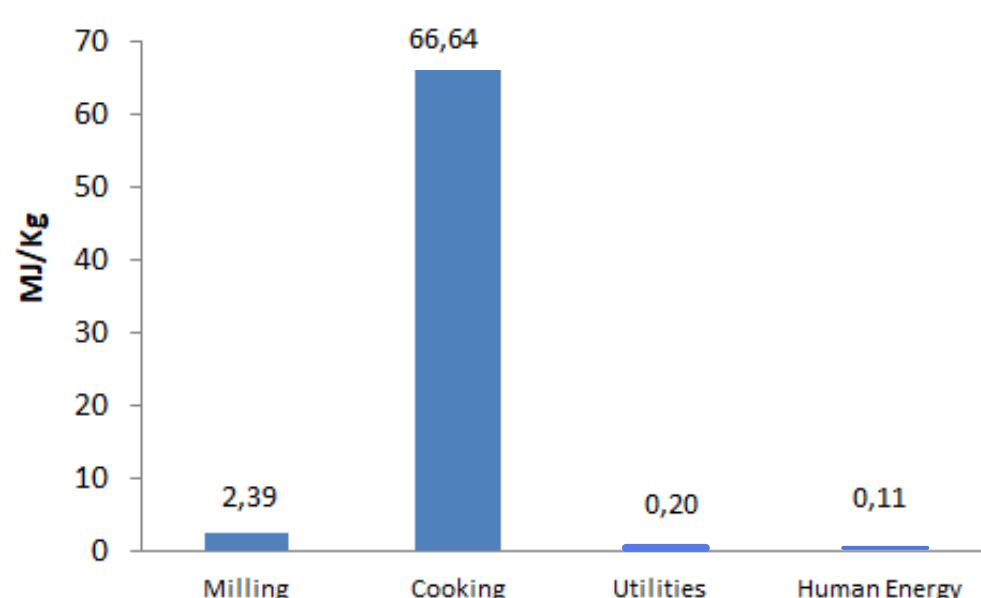


Fig.4. Total energy consumption in tofu industry

Total energy consumption in 31 tofu industries is 69.33 MJ/Kg soybean, consisting of energy for cooking 66.64 MJ/Kg soybean, milling machine 2.39 MJ/Kg soybean, utilities (electricity) consumption 0.20 MJ/Kg soybean, and human energy 0.11 MJ/Kg soybean.



Fig.1. Frying tofu using firewood by tofu maker in Indonesia

Conclusion

- The highest energy consumption is for cooking, soybean grinding machines, utilities (electricity) and human energy.
- Tofu industry has high energy requirements and produce a lot of wastewater in the production process.
- Therefore, it is necessary to carry out energy audits more deeply to utilize the wastewater as material for bioenergy, such as biogas to replace the primary fuels and to reduce environmental pollution.

References

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