

CHAPTER V

CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

According to the results that have been obtained, it can be concluded that:

1. Jackfruit skin biomass pellets have the density of 1.007 g/cm^3 , moisture content of $7.81 \pm 0.07\%$, volatile matter of $67.52 \pm 0.012\%$, ash content of $3.79 \pm 0.06\%$, fixed carbon of $20.89 \pm 0.13\%$, calorific value of 16.88 MJ/kg or $4,031.796 \text{ kcal/g}$, and sulfur content of 0.27% . The quality of jackfruit skin biomass pellets meets the reference values attached in SNI 8675:2018 concerning Biomass Pellets for Energy with the exception of sulfur content, which exceeds the maximum value.
2. The combustion of jackfruit skin biomass pellets in the Top-Lit Updraft (TLUD) biomass stove produced Particulate Matter 2.5 ($\text{PM}_{2.5}$) emission factors of $252.52 \pm 32.47 \text{ mg/kg}$, carbon monoxide (CO) of $6.940 \pm 1.46 \text{ g/kg}$, and carbon dioxide (CO_2) of $173.88 \pm 5.07 \text{ g/kg}$. The emission factors of $\text{PM}_{2.5}$ and CO do not exceed the maximum value attached in SNI 7926:2013 concerning Biomass Furnace Performance, while CO_2 is not regulated for its maximum emission factor value in SNI.
3. Jackfruit skin biomass pellet combustion resulted with the specific fuel consumption of $0.882 \pm 0.003 \text{ kg/hour}$, combustion efficiency of $96.008 \pm 0.82\%$, and thermal efficiency of $24.31 \pm 0.32\%$. All the parameters meet the reference values attached in SNI 7926:2013 concerning Biomass Furnace Performance, with specific fuel consumption not exceeding the maximum value, and combustion efficiency and thermal efficiency fulfilling the minimum value.

5.2 Suggestions

Suggestions that can be given for future research are as the following:

1. Incorporate other biomass materials as additives to develop formulation that can enhance biomass pellet quality in accordance with SNI 8675:2018, mainly utilizing biomass materials that have low sulfur content in order to decrease the

sulfur content. Examples of biomass that has low sulfur content are rice husks, corncobs, coffee husks, and peanut shells.

2. Optimize the TLUD biomass stove design to decrease the specific fuel consumption and increase the combustion efficiency and thermal efficiency. This can be done by modifying the size, arrangement, and number of air holes on the TLUD biomass stove. In addition, insulators and a fan can be installed onto the stove.

