ABSTRACT

TOTOK PRASETYO. Study on Recirculation Dryer of Rough Rice Using Pneumatic Conveyor and blended kerosene and *jatropha curcas* oil.

Supervisors: KAMARUDDIN ABDULLAH, I MADE KARTIKA DHIPUTRA, ARMANSYAH H. TAMBUNAN, AND LEOPOLD OSCAR NELWAN.

Post harvest losses of rice in Indonesia was estimated to reach 20 % in which drying alone accounted for 2.3%. Most farmers in this country use the traditional direct sun drying, although cheap in cost it has the demerit of being dependent on weather conditions, susceptible to damage by rodent and easy being contaminated with dusts and foreign materials which can reduce the quality of products. Any delay in drying due to bad weather conditions will lead to excess in respiration and fungal growth, and sprouting due to re-wetting of products causing great losses in rice quality. The effect of global warming, due to accumulated green house gas (GHG) emissions in our atmosphere has created global climate change and uncertainty in weather conditions. Rainy days may occur during golden harvest making sun drying impossible and consequently drying should be delayed. The use of artificial dryer is facing another problem where fossil fuel as source of hot air generation is becoming scarce and high price.

The aim of this study was to design a recirculation dryer of rough rice using pneumatic conveyor and blended fuel between kerosene and *jatropha curcas* oil to generate hot air for drying. This study comprises of five major components. First, is the study about the feasibility of using *jatropha curcas* oil as an energy source to produce drying air, second, experiments related to the influence of drying time and tempering durations on head rice yield (HRY) under non-flow static grain conditions, third, performance test of the proposed recirculation dryer, fourth computer simulation on recirculation dryer of rough rice using pneumatic conveyor and lastly, economic benefit of the proposed drying system.

A series of drying test using an average of 450 kg of rough rice, powered by 350 Watt pneumatic conveying system, had indicated that the best drying time every cycle was 11.8 minutes with 48.9 minutes tempering period, resulting in 74.3 % of head rice yield. The resulting HRY was about 7-9 % higher than those obtained using the conventional mechanical dryer. Results of this study had shown that, properly blended *jatropha curcas* oil and kerosene could be used as to generate the drying air and thereby reduce the quantity of kerosene which has become less available in the rice production area. The drying efficiency of the proposed drying system was between 22.2 % to 31.1 %, the specific energy consumption using non renewable energy was between 3.475- 4.785 MJ/kg water evaporated, fuel consumption at 0.95 to 1.15 (liters/hr) and the average drying rate was 0.9 %/hr. It was also found that a ratio between the durations of drying time and tempering has significant effect on the HRY beside air temperature. The recommended operation procedure using the dryer under study will be to conduct drying every 11.8 minutes/cycle followed by tempering 48.9 minutes. The power required for pneumatic conveying used was 1.028 Wh/kg as compared to 1.35 Wh/kg. The average deviations between computer simulation...
and experimental data was between 7-10 % for drying time and 2-3 % in final moisture content of the dried products. Financial analysis had shown that assuming 15 percent of interest rate and 5 years of project lifetime would give positive NPV of Rp 8186391., 31.19 % IRR and 1.82 of net B/C ratio.

Key words : recirculation dryer, blended *jatropha curcas* oil, pneumatic conveyor, tempering, head rice yield.