



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

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Thesis Title: Development and Performance Investigation of a Biomass-fired grain dryer Coupled with Solar Air Heaters

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**SHORT ABSTRACT**

In the present investigation, a cost-effective and efficient biomass-solar hybrid dryer has been developed for meeting the drying demand of agricultural products suitable for developing countries. The dryer mainly consists of a furnace, rectangular chamber, PCM tray, drying chamber, drying tray, solar air heaters, PVC pipe, sensible thermal storage (pebbles), and latent thermal storage (paraffin wax). In the present study, thermal analysis of the dryer is done for optimum removal of moisture. Energy and exergy analysis of the biomass-operated dryer, natural convection solar dryer, and forced convection solar dryer has been carried out. The drying characteristics of paddy have also been studied in the dryer. In the biomass-operated dryer, the effect of the sensible heat storage medium in the rectangular chamber was studied and found that the use of a sensible heat storage medium reduces the energy losses from the rectangular chamber (brick wall). It also reduces the exergy destruction in the rectangular chamber and retains a higher temperature for a longer period. Hence, it enhances the performance of the biomass-operated grain dryer. The effect of flue gas energy recovery has also been studied and found that the energy recovery technique reduces the wastage of energy in the flue gas. The use of a regulator valve in the exhaust pipe increases the temperature in the drying chamber.