

Energy and rice quality aspects during drying of freshly harvested paddy with industrial inclined bed dryer

Abstract

The performance evaluation of any industrial dryer regarding energy consumption and product quality should be assessed to check its present status and to suggest for further efficient operation. An investigation was carried out to evaluate the impact of drying temperature and air flow on energy consumption and quality of rice during paddy drying with industrial inclined bed dryer (IBD) with average holding capacity of 15 ton in the selected complexes of Padiberas Nasional Berhad (BERNAS)-the national paddy custodian of Malaysia. In reducing paddy moisture content (mc) from 22% to 23% wet basis (wb) down to around 12.5% wb, the final mc, the specific electrical (in terms of primary energy) and the specific thermal energy consumption were found to be varied between 1.44 to 1.95 MJ/kg water evaporated and 2.77 to 3.47 MJ/kg water evaporated, respectively. Analysis revealed that the specific electrical energy consumption was around 20% lesser and the specific thermal energy consumption of IBDs was around 10% higher during drying with air temperature of 41–42 °C than drying with 38–39 °C in reducing paddy mc from 22% to 23% (wb) down to around 12.5% (wb). However, paddy being with almost same initial mc dried using drying temperature of 38–39 °C, IBDs yielded 1–4% higher head rice yield while milling recovery and whiteness were comparable at acceptable milling degree and transparency. The bed air flows between 0.27 and 0.29 m³ m⁻² s⁻¹ resulted in higher head rice yield slightly while its effect on drying time was not prominent so much. For paddy with initial moisture content below 23% wb, it is recommended that drying air temperature should not be higher than 39 °C in order to maintain rice quality at reasonable energy consumption.

Keyword: Industrial paddy drying; Inclined bed dryer; Freshly harvested paddy; Specific energy consumption; Rice quality