

Title Integration of desiccant tray unit with internal cooling for aeration of paddy silo in humid tropical climate

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Abstract

This research work describes a method to control the humidity of ambient air for aeration of paddy silo, particularly in humid tropical region, by using a desiccant tray with internal cooling. Moisture in the air is adsorbed by the desiccant unit and the heat of adsorption is captured by internal cooling water before passing the controlled air into the stored paddy bin. The temperature and the grain moisture content during aeration are predicted by combining an analysis of the heat transfer phenomena that occur in stored grain with empirical model of desiccant beds.

The simulated result showed that four desiccant trays with internal cooling (3.5 kg of silica gel per tray) were appropriate to control the grain temperature and the moisture content of 18 t of grain stored in a cylindrical silo at ambient air temperature of 28 °C and relative humidity of 80%, or six desiccant trays with internal cooling at the ambient air temperature and relative humidity of 26 °C and 90%, respectively. It can be concluded that this method could be applied for aeration control strategies in stored grain and for evaluating the suitable number of trays under various environmental conditions.