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Comprehensive evaluation of direct aeration combined with closed internal circular ventilation in squat silos

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ABSTRACT

Ventilation is widely used in granaries. A well-designed aeration system improves ventilation efficiency and reduces the cost by lowering energy consumption. We investigated two common aeration systems: direct mechanical ventilation and direct ventilation combined with closed internal circular ventilation in 6789 tonne and 7500 tonne squat silos, respectively. Compared to direct mechanical ventilation system, the direct ventilation combined with closed internal circular ventilation system decreased operating time by 13.13% and energy consumption by 2381 kWh. When the direct ventilation combined with closed internal circular ventilation was conducted, the grain lost 0.5% less water, and grain moisture content also had a more homogenous distribution within the grain bulk. The two systems had a 0.5% difference of moisture content. Mild condensation was detected in the silo with direct mechanical ventilation system. These results could provide a guideline for choosing an effective ventilation system in squat silos.

Keywords: Squat silo, Direct mechanical ventilation; Direct ventilation combined with closed internal circular ventilation, Operating time, Grain moisture homogeneity