

Title Adaptive discounting control: a new aeration control method.
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Abstract

Aeration is a common and flexible grain storage tool that is experiencing increased demand in Australia at present. This is due to interest in drying wet grain, preserving specific quality attributes, non-chemical insect suppression, and preventing spoilage during storage. For most benefits, an aeration system must change the grain moisture or temperature at the time of in loading to suitable levels throughout the whole store. Different levels are required for different aims. The grain-conditioning performance of any aeration system is dependent on the local weather, and a key part is the control of the air-selection process. The climate of most grain-producing areas across Australia allows properly sized aeration equipment to condition grain to beneficial moistures and temperatures, if the air-selection process is controlled accordingly. However, control methods that specifically target moistures and temperatures are not currently available. A new aeration-control method that conditions grain to moisture and temperature targets is described in this paper. This new method is called adaptive discounting control (ADC) and will implement all modes of aeration: drying, cooling and maintenance. The method offers the capacity to target out-turned grain moisture and/or temperature conditions, high thermodynamic efficiency, a 'user friendly' interface, and a simple but sound technical basis. The ADC method is based on the sequential propagation of fronts through the grain bulk until the target average grain condition is achieved. A 'discounting' action adjusts the air-selection process to maximize the propagation rate and 'smooth out' the grain conditions at the target values selected. The air-selection process is linked to the size of the aeration system without feedback sensing by entering some basic system parameters during installation of the controller. Some results are presented of two trials carried out in different locations in Australia for drying and cooling actions. Results to date illustrate that the method is effective. Commercial licences with 3 companies are being pursued for manufacture of the control method.