MODELING HEAT TRANSFER IN A VERTICAL SILO

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Abstract

The temperature measuring system in vertical silos for storing agricultural seeds can monitor the temperature at a limited number of points along its height. In addition, if some of the sensors fail during seed storage, this leads to no seed temperature data over a period of time. Missing temperature data or malfunctioning of the temperature measuring system is not conducive to proper monitoring of seed storage conditions. This paper aims to use CFD (Computational Fluid Dynamics) simulation to determine the temperature fields in various sections of the silo, using a limited amount of temperature sensor data. The results show that by using CFD simulation to obtain colour thermal fields in the sunflower seed layer in the silo, measures can be taken to combat thermal distribution non-uniformity in the seed mass. This provides a theoretical basis for detecting seed storage condition when grain temperature data are intermittently missing. Periodic analysis of temperature fields and high-temperature surfaces is extremely useful from a technological point of view, as it can accurately estimate the times when seed coat aeration should be started in order to keep the seed safe and avoid seed spoilage.

Key words: heat transfer, sunflower seed, silo