Introduction

A grain farmer may have the returns from much of the year's work stored on the farm for future feeding or sale. To minimize the risk of post-harvest losses, the grain must be placed in storage at the proper moisture content and temperature. It must be aerated, and a regular and accurate method of inspection and sampling followed to maintain the stored grain quality. For additional information concerning sampling procedures refer to the extension publication entitled *Grain Sampling*. Potential problems exist when: 1) damaged and/or high moisture grain is stored; 2) the aeration system is inadequate or improperly used; or 3) the grain bin is incorrectly filled or unloaded. For additional information concerning principles of grain storage, refer to the extension publication entitled *Grain Drying and Storage on Florida Farms*.

Grain is a good insulator; heat loss from grain is relatively slow in comparison to other materials. For this reason, when grain is placed in a bin in the fall, the grain near the center tends to maintain the temperature at which it came from the dryer or field. The grain near the bin wall tends to cool near the average outside temperature. As the outside temperature decreases, the difference in temperature between the grain at the center of the bin and that near the bin wall produces air currents inside the grain mass. The cool air near the bin wall falls since it is more dense, forcing the warmer air up through the center of the grain mass (Figure 1). As the cold air passes through the center of the grain mass, it warms and picks up more moisture. As this air nears the top center surface of grain, it cools to a point where it can no longer hold the moisture it has picked up. This moisture condenses on the surface of the grain, increasing the surface grain's moisture content and creating a local environment that enhances mold or insect growth. This surface moisture change can occur even though the average grain moisture content is at or below recommended levels. The reverse situation occurs during the summer months (Figure 2). In this case, the moisture condenses near the bottom center of the grain mass.

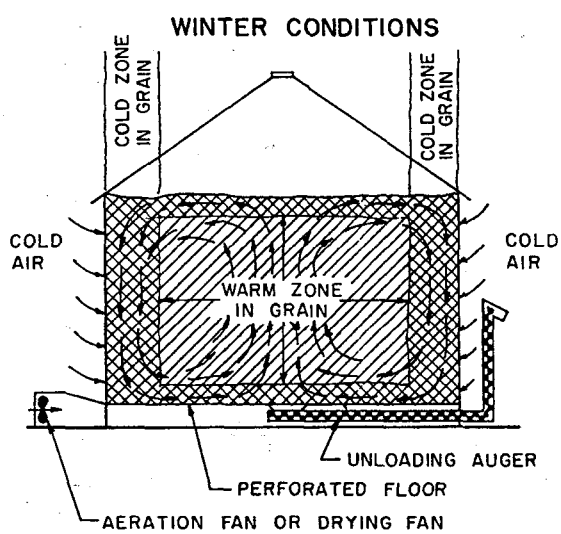

Figure 1. Natural air currents created in bins with inadequate aeration during winter conditions.

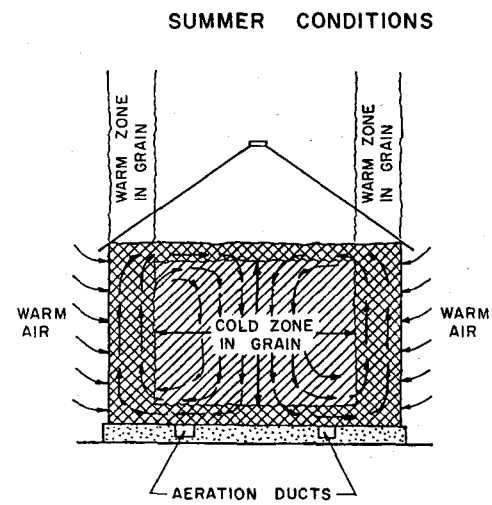

Figure 2. Natural air currents created in bins with inadequate aeration during summer conditions.

Generally, the problem of natural air currents developing within a bin may be minimized by covering fan outlets when not in use and by keeping the grain temperature in the center of the bin within 10°F of the average grain temperature near the bin wall. Temperatures can be maintained in most farm structures by using aeration fans that pull air down through the grain at airflow rates of at least 0.25 cubic feet per minute (cfm) for each bushel of grain in the bin until the temperature of the grain mass is within 10°F of the average monthly temperature. A slightly lower airflow rate may be used in very large farm or commercial structures. However, it is not necessary to lower the temperature of the grain mass below 40°F because fungi that attack stored grain cannot develop below this temperature. Also, the aeration system should not be used to raise the temperature above 60°F because mold and insect growth occur at a much faster rate above this temperature. (For additional information concerning insects refer to the extension publication entitled *Pest Management Strategies for Storing Grain in Florida*.) It takes