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Farmnote

Aeration - for preserving grain quality

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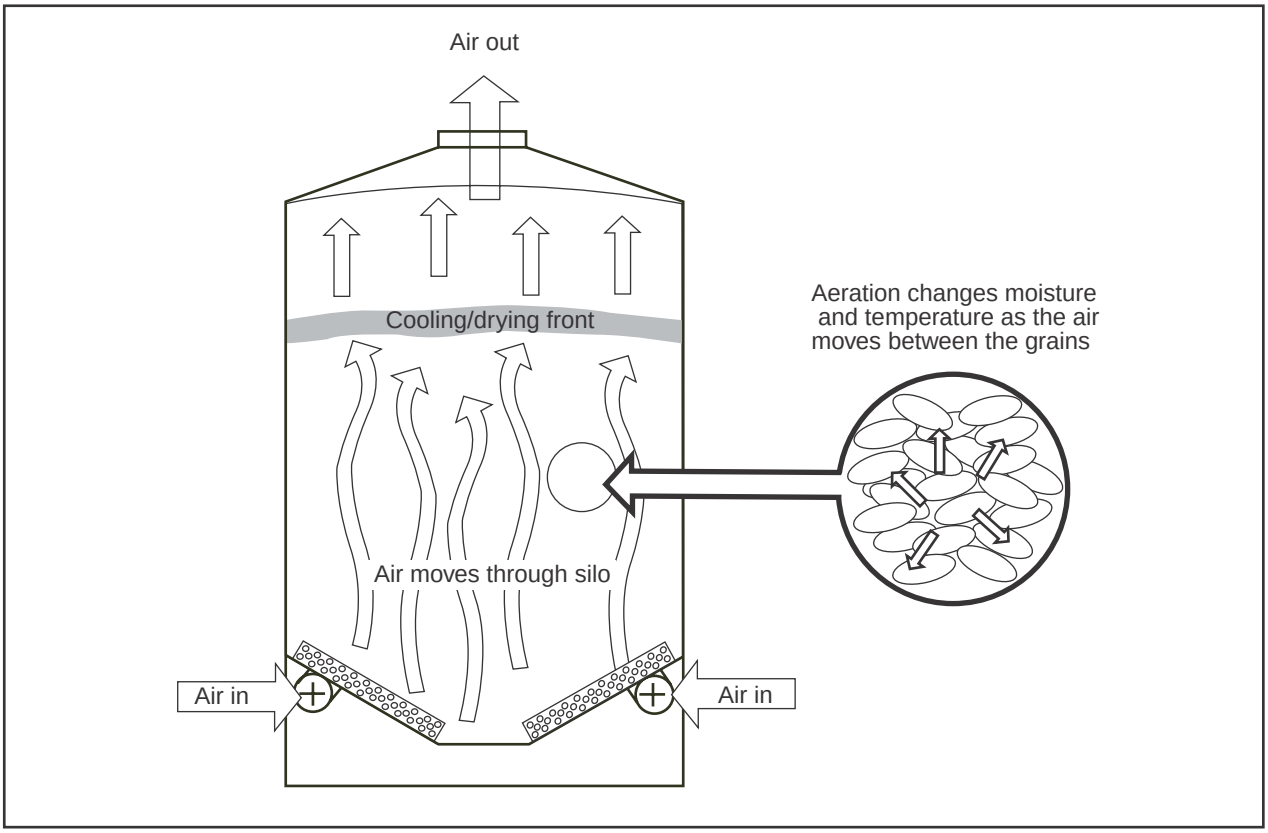
Aeration preserves the quality of stored grain by keeping an even and cool temperature, and is a valuable tool for managing grain quality at harvest and in storage. Grain stored under aeration can be held safely at a higher moisture content and retain its viability and vigour longer.

The advantages of aeration

- Extends the harvesting window of grain and seed crops reducing delays from rain at harvest and the downgrading of premium grain due to weather damage.
- Minimises colour deterioration from delayed harvest of premium products that are paid on the basis of colour, such as shochu barley or pulses.
- Equalises the silo temperature to minimise hot spots, which directly affect grain quality and provide favourable conditions for insect and mould contamination.
- Protects high moisture grain from developing moulds in storage.
- Cools the grain and reduces damage from insect populations in high throughput storage, typically lot feed operations, where the grain is fed to stock and there are limited opportunities for fumigation.
- Provides opportunities to supply wheat to millers or manufacturers throughout the year. Wheat milled for flour retains its baking qualities longer when stored cool.

The aeration process

Aeration passes ambient (unheated) air through bulk grain. If the air passing through has a relative humidity (RH) that is different to the air surrounding the grain, then moisture moves either from the grain or to the grain until equilibrium is reached.



The aeration process

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Long term storage of low moisture grain

Low airflow aeration

Low flow aeration protects the quality of low moisture grain for many months in storage and has the added advantage of slowing the development of insect populations.

To hold low moisture grain in a safe condition for long storage, a fan capacity of about two litres per second per tonne (l/s/t) is usually adequate. Exhaust air must be able to escape freely from the top of the storage. We recommend an opening of at least 0.1 m^2 for each 500 litres per second of air delivered to the storage. (As a guide, a hole 30 cm by 30 cm is approximately 0.1 m^2). Exhaust vents must be designed to prevent water entering the silo.

We recommend temperature monitoring and automatic fan control systems for long-term storage. The controllers select the best quantity and quality of air for use in the system and some controller models prevent high humidity air entering the grain bulk.

Short-term storage of high moisture grain

Medium airflow aeration

Harvesting barley and other grains at high moisture levels, above those suitable for delivery and storage, optimises quality and minimises the risk of fungal staining and sprouting and losses due to wet harvest conditions. Medium airflow aeration is needed to preserve the quality of high moisture grain before it is dried in a heated air dryer.

Under aeration, the moisture content and temperature of the grain is equalised in the stack. This has the advantage of providing a consistent feedstock for the dryer and reduces the need for frequent changes to the dryer speed and heat settings. The airflow rate depends on the grain moisture content but is typically in the 4 to 10 l/s/t range. To hold the grain in a safe condition, aim for a temperature of 20°C at a maximum moisture content of 15 per cent.

When harvesting in the early morning or late evenings the moisture content of each grain may be raised by moisture on or close to the grain surface. An airflow of 4 to 10 l/s/t will remove moisture from the surface region of each grain.

Grain drying

High airflow aeration

Aeration drying is characterised by higher airflows and lower ingoing RH to speed moisture removal.

The success of aeration drying depends on uniform distribution of air through the grain bulk and a suitable ducting system must be designed and installed. This form of drying is less predictable and much slower than heated air drying. It does, however, reduce the risk of damage to grain quality, particularly malting barley.

The flow of air should be upwards, so that the upper levels of grain in storage are the last to dry. This allows grain to be checked more easily by the operator. The airflow must be sufficient to move the drying front through the grain before spoilage occurs in the upper layers of the grain mass. The removed moisture is carried out of the silo with the air, through an open hatch or exhaust vents.

As a rule of thumb, moist grain will need airflows in the range of 10 to 20 l/s/t to provide reasonable opportunities for removing moisture. Moisture from inside each grain takes longer to remove because the moisture must travel to the grain surface to be evaporated.

The success of aeration drying depends on the availability of low RH air that is suitable for removing moisture from the grain. During periods of prolonged rainfall or high humidity, even high airflow aeration will have little chance of removing moisture.

Aeration presents many opportunities for producers to increase the profitability of grain production. If you are planning to set up an aeration system, we recommend discussing your plans with an equipment manufacturer or the Department of Agriculture to work out the best strategies for your grain operation.

Aeration equipment suppliers

Customvac Australia Pty Ltd:
24 Molloy St.Toowoomba, Qld 4350
101 Hopkinson Rd, Darling Downs, WA 6122
Ph: 08 9497 5065 (WA) or 1800 242 699

Agridry Rimik Pty Ltd:
14 Molloy St. Toowoomba, Qld 4350
Ph: (07) 4631 4300

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