



# Types of Aeration Systems: Which Type is Right for You?

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Depending on the grain bin configuration and the structure use, the aeration system must be designed to move air through grain in the most effective and efficient way possible. Knowing the options for aeration system designs will help you make wise decisions when building a new bin or retrofitting existing bins for aeration. With proper design and management practices, aeration systems can help maintain the quality of your grain.

There are nine different types of aeration systems. Two are quite common, two are a little less common and the remainder are found in "specific" applications.

## Most common aeration types

### Positive pressure (push) systems

It is speculated that these are the most often used aeration systems, particularly in new steel bin installations in the U.S. Positive pressure or push systems consist of fans blowing air into the bin at the bottom, either through ductwork or a perforated false floor. The air is then exhausted with power exhaust fans on the roof, with passive venting on the roof or with a combination of power exhaust fans and passive vents or space in the roof (Figure 1). Air will heat a few degrees from friction as it goes through the grain bulk, compared to negative pressure (see below) systems. But hot air rises and the positive pressure system takes advantage of that natural warm air movement. It is important to have the exhaust fans

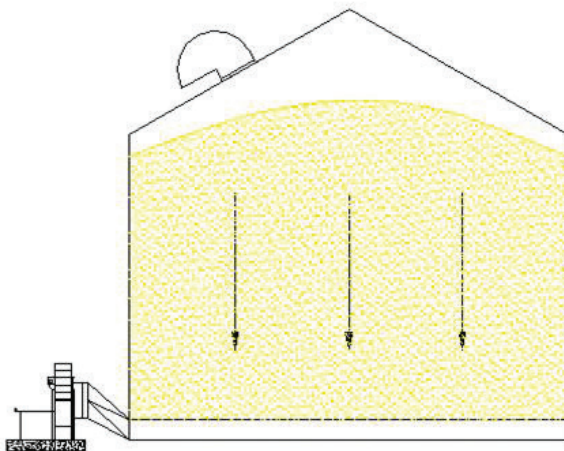


Figure 1. Positive pressure aeration system.

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and the aeration fans wired separately so the exhaust fans come on before the aeration fans. This helps reduce chances of damaging the roof with differences in pressure.

### Negative pressure (pull down) systems

For the negative pressure system, fans are located at the bottom and pull air down through the grain bulk (Figure 2). No power exhausters are required, but proper design of the passive vents is extremely important. Not having enough vents to let air into the bin can cause a roof collapse. Maintenance of vents is extremely important in a negative pressure system for the same reason. Adequate air intake is essential for a negative pressure system to work correctly. Some experts report problems, such as condensation at the top of the grain mass, is pulled down through the entire grain bulk to the bottom. Therefore, managers must pay close attention to run time of the fans so all of this extra moisture is moved completely through the grain and out of the bin at the bottom. Also, small seeds, such as canola can pack more with a negative pressure system and fine material and smaller seeds can be pulled through the perforated flooring into the space below the floor. An advantage to a negative pressure system is that the exhaust air can be easily monitored for temperature and CO<sub>2</sub> at the ground level, which makes determining if temperature fronts have been moved through the grain much easier.

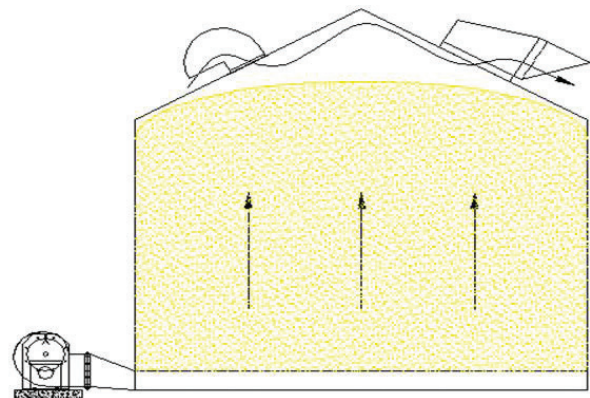


Figure 2. Negative pressure aeration system.

## Less common aeration types

### Pull-up systems

This system is commonly used on concrete tanks. The fans are located on top of the structure and they pull air up through the bin (Figure 3). This system does not require exhaust fans on the top but proper design of venting and duct work at the bottom of the bin is important because this is where the air must enter the bin. Extra reinforcement is necessary on the roof of the structure to accommodate the extra equipment weight. One advantage to this system is that it is quieter than most aeration systems, which can be a big plus in populated areas.

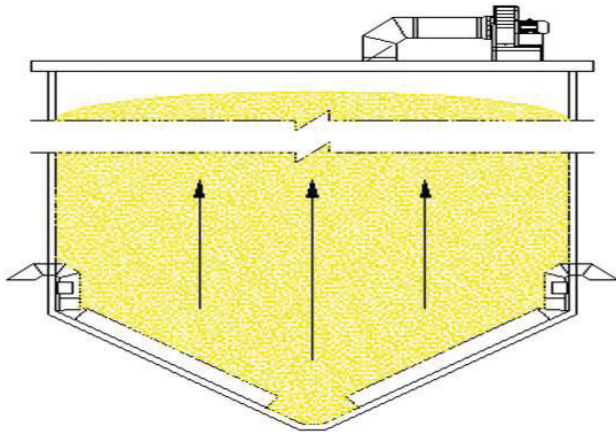


Figure 3. Pull-up aeration system.

### Push-Pull (high air) systems

For this system, fans are located both at the top and the bottom of the bin (Figure 4). This application is for concrete tanks that have reinforced roofs much like that designed for a pull-up system. This system can be especially helpful when storing high-moisture grain. Static pressure is cut in half when compared to a negative or positive pressure system. The amount of air provided by the fans can be much higher than in other system designs.

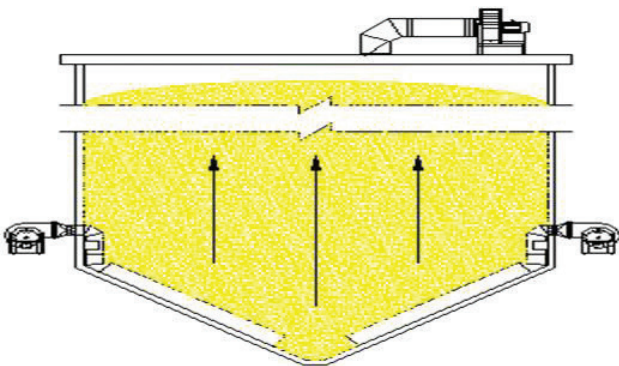


Figure 4. Push-Pull aeration system.

## Specific Aeration Design Applications

### Turbocharged systems

Sometimes these positive pressure systems are considered “in-line” fan systems or centrifugal fans in an in-line axial fan configuration. Contact fan manufacturers about their company designs of this type of fan. Two fans are placed “in series” and can increase pressure with the same capacity when needed. The exhaust from one fan blows directly into the intake of another fan. Powered exhaust fans on the roof are needed for these systems to remove moisture. These systems are more expensive, but allow for higher moisture grain to be stored. They can be used in either concrete or steel tanks.

### Manifold systems

These systems use fans pushing air through manifolds in multiple bins (Figure 5). There are fewer fans to maintain, which can save money, but the management of the system is more difficult and the air distribution is harder to control.

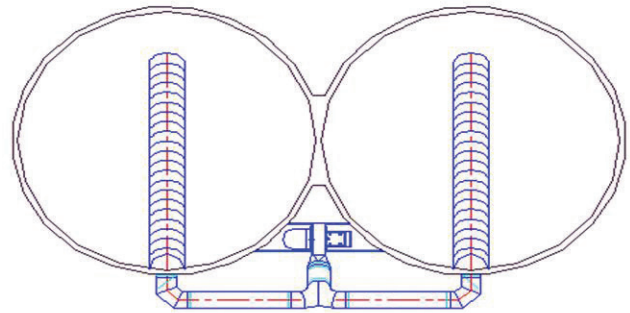


Figure 5. Manifold aeration system on two bins.

### Cross flow systems

Cross flow aeration systems (Figure 6) move air from one wall of the bin through the grain bulk to the center of the bin or to the other side of the bin. Ducts run vertically on the walls of a bin and air is blown sideways. The static pressure and the horsepower of the fans are less in this design. However, the initial installation cost of these systems is higher and maintenance of the equipment is more difficult.

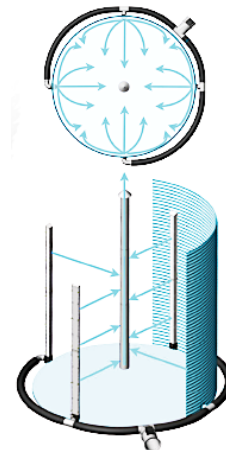


Figure 6. Cross flow aeration system.

### Air-assisted unloading (Kanal®) systems

These aeration systems are designed so they also aid in unloading the tank. The floor has concrete channels that route the grain into the sump (Figure 7). Air assists the grain along these channels, guiding it into the reclaim system.

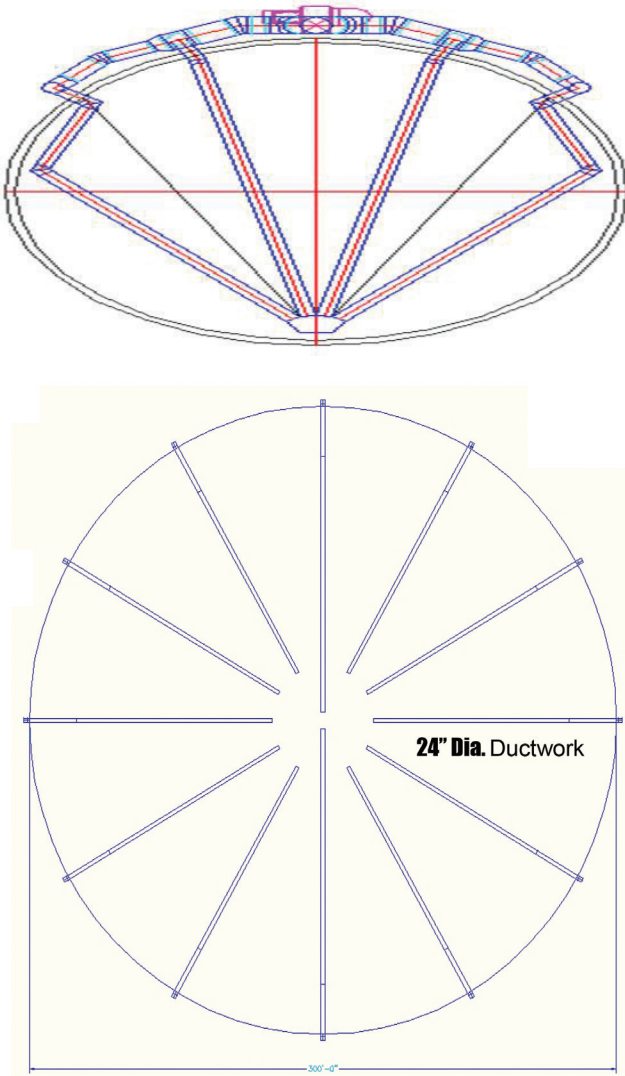


Figure 7. Kanal® or air-assisted unloading aeration system.

### Temporary Storage Aeration systems

Temporary storage of grain can take on many different configurations. For aeration to be used in most of these configurations, ductwork is necessary. Flat storage structures are in this category as well as outdoor piles. The most common type of aeration in temporary outdoor piles uses ductwork around the sidewall perimeter. Some outdoor piles have a center fill tower. Air can be pulled through the grain pile and up through these towers by fans located on top of the towers. Aeration is almost always negative pressure for outdoor piles and can be either positive or negative pressure for flat storage. In the case of outdoor piles, negative pressure aeration not only provides air movement through the grain, but also holds tarps on the piles.

### Important considerations

Aeration equipment design is rather complex and must be considered as a “system.” An aeration system includes the fans, the ductwork or perforated flooring, the passive and/or powered vents, the grain, the air being moved through the grain and the controls (either electronic or manually operated). Careful attention must be paid not only to the design of this system, but also to the proper timing and control of the aeration system. Contacting a reputable aeration system contractor may be the best choice for purchasing and installing new aeration systems.

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