

Agricultural - Sugar Beets

Despite the natural deep-freeze provided by the frigid upper Midwest winters, outdoor storage of harvested sugar beets still experienced large spoilage rates.



More than half of the sugar produced in the U.S. comes from sugar beets. Annually, more than 25 million tons of sugar beets are produced on 1.5 million acres yielding 4 million tons of refined sugar. Sugar beets flourish in rich soil, with a growing seasons about five months long. In the upper Midwest, harvested beets are stored outdoors where the cold winter months act as a freezer until beets can be processed. But heat can still build up inside the piles and cause excessive spoilage. Looking to reduce spoilage, a major beet processing plant turned to Aerovent for a customized ventilation system that could help it increase production rates, profitability and customer satisfaction.

CHALLENGE: Weather Unpredictability

Beets are harvested in autumn and early winter then transported to a processing plant. They are stored in outdoor piles where cold winter air helps preserve them. In the upper Midwest, sugar beets are processed around the clock between October and April. However, even when stored outdoors in frigid temperatures, the beets can start to ferment and generate heat within the piles, which can quickly rot entire mounds. To reduce spoilage rates, the beet piles need to be cooled down—or ventilated.

THE AEROVENT SOLUTION

To extend the storage life of its sugar beets, a major beet processing plant invested in an extensive cold-air ventilation system. Aerovent engineered a solution using 128 VP Vaneaxial fans. The fans were custom-fit with elbows that connected them to a series of ductwork running through the beet piles. The ductwork, provided by the customer, was set up around the pile site with holes drilled into it to capture the cold air blown by the fans into the interior of each pile.

CASE STUDY

This configuration allowed the plant to deep-freeze entire beet piles (and specifically their centers) by moving cold outdoor air throughout them. By supplying naturally refrigerated air through the fans and ductwork, and directing it throughout the beet piles, the processing plant has been able to keep its sugar beets at a consistent temperature well into the spring months. This gave the plant the capability to process almost the entire harvest over the cold-month season and keep spoilage to a minimum. Once the core of the piles are frozen, the fans are shut off and sealed up with covers custom-designed by Aerovent.



CHALLENGE: Vertical Installation

The Aerovent VP Vaneaxial fan is designed for high-capacity applications requiring straight-line air discharge, such as the sugar beet application. However, the fan is installed vertically while the chilled air must be blown horizontally into the centers of the huge beet piles. In addition, the piles, fans and ductwork are constantly exposed to outdoor elements. There were two challenges: fitting the vertical fan to the horizontal ductwork distributing the air, and making sure the fan—and especially its propeller—could drain properly when exposed to rain and snow.

THE AEROVENT SOLUTION

The VP Vaneaxial fan was recommended by Aerovent to deal with these challenges. First, the propeller in this type of fan works especially well in vertical installations. To fit the vertical fan to the horizontal air-distribution ductwork, Aerovent created a 45-degree elbow that allowed air to be blown out through the horizontal ductwork on the ground. Aerovent drilled holes into the fan propeller's hub to allow for drainage of rain and snow that could cause alignment or other problems (a common modification made in vertical installations). A final customization included the creation of a metal lid that closes up the fans during the off-season to help keep moisture out.

CHALLENGE: Static Pressure

Each type of fan is designed to accommodate a certain amount of air pressure. In most applications, the exact static pressure that will be generated by a system can be easily predicted. But with an outdoor application, uncontrollable factors like beet pile size and air temperature can make it hard to know exactly how much energy is being generated inside the beet pile and can affect the static pressure.

THE AEROVENT SOLUTION

Aerovent's VP Vaneaxial fan was an ideal choice for this specific application. Performance for the VP fan includes airflow from 800 to 102,500 CFM and static pressure to 5" w.g. This gives the fan a high tolerance for pressure variations so it can accommodate a number of unpredictable factors. Specifically, the VP's propeller better accommodates pressure buildup, making it easier to handle the pressure and air performance requirements.

CHALLENGE: Longevity

In any fan application, longevity is a key concern. Industrial fans are assumed to have a long lifespan because of the size and complexity of most installations. In the sugar beet application, once again the unpredictability of the outdoor situation was a key challenge. It was important to select the type of fan that could withstand the outdoor elements of this deep-freeze application and accommodate the variables of this installation.

THE AEROVENT SOLUTION

The challenge was met by Aerovent with one of its most heavy-duty fans. The VP's fan housings for this project were constructed of ¼" plate, and while housing corrosion does not affect fan performance, it can affect aesthetic integrity. In addition, the VP's aluminum propellers are made to prevent corrosion and endure extreme weather conditions.

Special Project Considerations

- ▶ The VP's vertical downblast design blows frigid winter air into a network of perforated ductwork to ventilate beet piles stored outside in cold climates. This exposes the propeller and motor year round to falling rain or snow. Aerovent provided a galvanized steel inlet cover to close off the inlet of the fan to eliminate the build-up of heavy snow and ice on the inside of the fan when not in use.
- ▶ The 29" VP fans were required to fit the customer's existing ductwork design while meeting all necessary performance requirements. Aerovent's standard fan sizes are either 28 or 32 inches so the fans were customized and built specifically to fit the customer's needs.
- ▶ Fan housings were constructed with ¼" plate, instead of the standard 10 gauge material to withstand high winds and severe weather conditions in the upper Midwest.



Aerovent VP Vaneaxial Fans

Conclusion

Aerovent's engineering and manufacturing capabilities and quality industrial products have enabled them to provide the best solution for the most demanding ventilation problems presented by outdoor deep-freeze applications such as sugar beet processing. Aerovent's knowledge and expertise in selecting the right fan and making the appropriate modifications to accommodate each customer's unique situation has made it a leader in its field and produced its impressive 85-year track record.

Key Learnings:

- ▶ Aerovent supplied a major sugar beet processing plant with an extensive cold-air ventilation system using 128 heavy-duty 29" VP Vaneaxial fans to infuse naturally refrigerated air throughout the beet piles, thereby keeping its sugar beets at a consistent temperature longer and crop spoilage to a minimum.
- ▶ Aerovent created a 45-degree elbow that allowed chilled air from the vertically installed fan to be blown out through the horizontal air-distribution ductwork on the ground.
- ▶ Because the fans were constantly exposed to the elements, Aerovent drilled holes into the hub of fan propellers for drainage of rain and snow that could cause alignment or other problems, and created a metal lid that closes up the fan during the off-season.
- ▶ Variable factors inherent in an outdoor application can make it hard to know how much energy is being generated inside the beet pile, which can affect static pressure. The VP Vaneaxial fan features airflow from 800 to 102,500 CFM and static pressure to 5" w.g., giving the fan a high tolerance for pressure variations.
- ▶ Heavy-duty VP Vaneaxial fans feature propellers made of aluminum to prevent corrosion and fan housings constructed of galvanized metal, which ensures corrosion resistance and longevity.

CASE STUDY

The Aerovent logo features the word "Aerovent" in a bold, white, sans-serif font. The letter "o" is replaced by a red circle with a white outline. The logo is set against a dark, high-contrast background of a fan's propeller and housing, with a red light source creating a glow around the fan's center.

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