Aerovent

CASE STUDY

Power Generation

One of the cleanest power plants ever built, a hybrid energy facility, chose Aerovent to provide durable, low maintenance roof ventilators for the turbine, boiler and coal-bunker buildings.

Power generation is a complex process. It takes an act of congress (figuratively and literally) to build, operate and maintain a power generation facility. Ventilation fans should not add to this complexity. Rather, the fans should be tough enough to avoid operational failure and to minimize installation and repair work. The rugged, high-performance ventilation fans Aerovent provided to a state-of-the-art hybrid energy center in Virginia, were ideal for the task. Aerovent was chosen for this project because of their reputation for building large custom fans for demanding industrial applications.

CHALLENGE: Reliability and Longer Lifespan

The energy center's primary requirement was that its chosen vendor be able to design and build a set of the most rugged, efficient roof ventilators within budget. Most roof ventilator fans last between 10 and 20 years when properly maintained. Because of the permits and cost involved in performing maintenance work on the roof of a power plant, they wanted their fans to have a longer life span (up to 40 years). This lifespan requirement meant that the fans had to be engineered and constructed using only the best industrial grade materials and components available.

THE AEROVENT SOLUTION

Aerovent's solution was to build twenty-six 96" diameter Tu-Way roof ventilators, driven by premium-efficient IEEE-841 severe-duty motors. The motors were supplied with cast-iron frames, INPRO™ seals and a 2-part epoxy coating, making them some of the most durable on the market. Aerovent is the only fan company in the U.S. that can provide the 96" diameter, heavy-duty, 100% reversible propellers required for this application. The energy center wanted the larger-diameter fans to reduce the total number of roof openings, thereby reducing construction costs.

CASE STUDY

Aerovent's extensive experience constructing fans out of various materials was put to use. The skin of each fan was made out of Galvaneal, a weldable and paintable galvanized steel, for corrosion resistance. The hood design incorporates modular ribbed panels, also made of Galvaneal. This design is both light-weight and incredibly sturdy compared to traditional sheet-steel hoods. Each hood was split into two pieces in order to make on-site unloading easier and to save on freight costs. A hard flexible coating, like the kind on steel bridge structures, was applied over the Galvaneal surface to make the corrosion resistant fan body.

96" diameter Tu-Way roof ventilators with 30HP premium-efficiency severe-duty motors

CHALLENGE: Exhaust and Supply Modes Required

Another important requirement of the power company was to achieve 128,000 CFM exhaust flow, along with the ability to run the fans in supply mode as well. The high CFM was required to keep the cavernous turbine and boiler buildings tolerable for workers during the summer months. In the event of air contamination or another hazard, the power plant needs to be able to reverse the fans in a hurry in order to supply fresh air into the buildings.

THE AEROVENT SOLUTION

Aerovent was able to meet this challenge because its fan propellers were designed to provide equal airflow in both directions, a feature not commonly offered by other fan companies. Aerovent's fan blades are symmetrical in section, which allows for the same amount of airflow in or out. Most fan manufacturers only provide a uni-directional exhaust propeller, which may only produce 40 percent flow when run backwards in the supply mode. Additionally, Aerovent uses a smooth, double-spun housing orifice to increase exhaust/supply efficiency.

The energy center also wanted an easy way to switch the fans between exhaust and supply modes. Aerovent worked with the facility engineers to provide an electrical control panel on each fan that links with the central motor control panel. The Aerovent control panel features an onboard combination starter-disconnect switch in a heavy-duty NEMA 4 enclosure. The starter lengthens the life of the motor and the disconnect switch ensures that the unit is powered off during maintenance.

CHALLENGE: Fire Safety

Fire safety is a challenge in any environment––and especially so in a power plant. In case of a fire, the first priority is to ensure the safety of employees. Another goal is to be able to salvage expensive equipment in the building. With roof ventilator fans, it is beneficial for the dampers to automatically fail in the "open" position so smoke can naturally escape.

THE AEROVENT SOLUTION

Aerovent's expertise in custom-building fans for complex applications, like the energy center, allowed them to design and construct a special fire damper for the fans. When the motorized damper is activated, a metal linkage arm attached to the damper blades moves to open or close the damper. Aerovent's custom-made damper features a fusible linkage arm with a "soft metal" section in the link. When temperatures reach 212 degrees (as in the case of a fire), the soft metal plate fails, breaking the linkage, and a heavy counter weight swings the damper into the "open" position.

CHALLENGE: Noise Reduction

The turbine, boiler, and coal-bunker buildings are massive, steel structures that can enhance sound power levels. This can pose a hazard to workers' hearing. When several powerful roof ventilators operate at once, the effect can be compounding. The facility engineers had an 85 dBA requirement (at five feet away from the fan), which Aerovent was able to meet.

THE AEROVENT SOLUTION

Aerovent met this challenge by insulating the main body of the fan, including hoods and plenums, with fiberglass batting then encasing the batting with a perforated galvanized sheet. This drastically reduced the sound power levels produced by each fan. This custom-designed feature is not common to most heavy-duty fans of this type and allowed Aerovent to easily meet and exceed the customer's 85 dBA requirement.

Special Project Considerations

- Aerovent's large diameter propeller handles more air and reduces the number of fans that need be mounted, saving on installation and routine maintenance time.
- All fan hardware and adjustable components (such as the motor slide base) were made of 316 stainless steel to avoid corrosion and ensure adjustability after years of service.
- Noise and the resultant permanent hearing losses are main health concerns in industrial work places. Aerovent's efficient propellers and insulated housings help protect workers hearing at the power plant over the course of their careers.
- Precise control of air moving equipment can significantly lower operating costs of any building. The electrical control panel provided by Aerovent allows facility engineers to start, stop and reverse only the fans that they need from either the central control panel or locally at the fan.
- Well designed roof ventilators not only provide comfort and temperature control, but also function as an insurance policy for valuable equipment in the instance of a fire. Aerovent's specially designed fire dampers provide a mechanical fail-safe to help prevent damage to the facility from smoke and high heat.

Conclusion

Aerovent is one of the only manufacturers with the engineering capability and fabrication resources to accommodate this type of demanding ventilating project. In addition to the demand for high-performance fans, this project also included significant documentation requirements such as weld certifications, dye penetrate testing of the propellers, damper fail tests, and witness testing of the fans. From design to shipment, all work was performed on schedule and the customer was impressed with the construction and installation. Aerovent's knowledge and expertise in accommodating each customer's unique situation has made it a leader in its field and produced its impressive 85-year track record.

Key Learnings:

- Aerovent custom-built twenty-six Tu-Way 96" diameter roof ventilators with 30HP premium-efficient severe-duty motors to meet the customer's requirement for rugged roof ventilators designed to give 40 years of service with minimal maintenance.

- The large fan diameter (96" propellers) allowed for reduction of the total number of fans that had to be placed on the roof. Hoods and plenums were insulated with fiberglass batting then covered with a perforated galvanized sheet to keep sound power at a healthy level for workers.

- The fan body was made out of Galvaneal, a special form of galvanized steel that can be painted. The combination of galvanized steel with a cutting-edge industrial coating produced extremely corrosion-resistant fans that can stand up to the elements.

- Aerovent's unique reversible fan propellers provide 100 percent airflow in both exhaust and supply modes. An integrated electrical control system was also supplied, complete with onboard starter-disconnect switch.

- A specially designed fire damper with fusible linkage ensures that in the event of fire, the dampers will automatically fail in the "open" position, allowing smoke to escape.

CASE STUDY

Aerovent

5959 Trenton Lane N.
Minneapolis, MN 55442
www.aerovent.com