



CASE STUDY

Waste & Water Treatment

The City of Jacksonville chose Aerovent to upgrade its water production facilities and meet surging demands produced by wildfires and health department inspection requirements.



Water rationing is a way of life in Florida. During hot summer months, watering lawns and washing cars are restricted to minimize demand on municipal water plants, which may often have to deal with large wildfires during peak drought seasons. These challenges, along with the requirement that municipal water production facilities pass a variety of tests and inspections to receive an operating permit, have increased the need for newer and larger water production facilities in the Jacksonville, Florida area.

CHALLENGE: Corrosion

Gases and chemicals present in water and wastewater treatment facilities can cause corrosion, equipment failures, unsafe working conditions (even explosions), plant shutdowns, and increased maintenance and operation costs. Air handling systems and equipment used in these installations must be designed to meet this challenge. Generally, standard commercial grade HVAC equipment is not suitable for these types of corrosive environments.

THE AEROVENT SOLUTION

Aerovent's fiberglass axial TF fans are ideal for forced draft aeration and dilution ventilation for Jacksonville's ground water reservoirs. A 2-million gallon reservoir has six Aerovent 43" TF fans exhausting a total of 120,000 CFM. The TF fans are sized to exhaust one air change per minute, based on average high and low water levels inside the tanks. Fresh air is drawn through screened aerators and overflow vents. Large volumes of fresh air mix with the aeration process to dilute and substantially reduce corrosive gas levels. Fans are staggered to distribute air and eliminate condensation and corrosion on interior tank surfaces.



TF Fiberglass Axial Fan

CASE STUDY

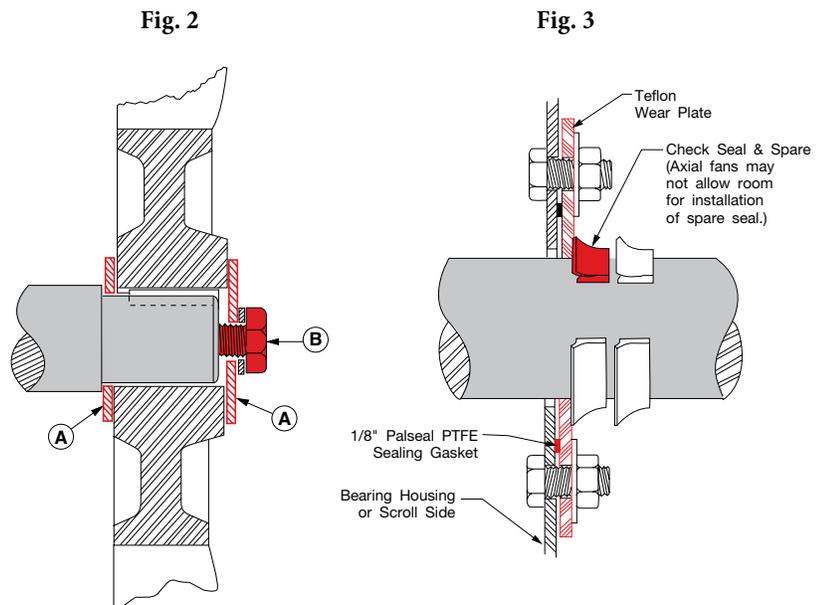
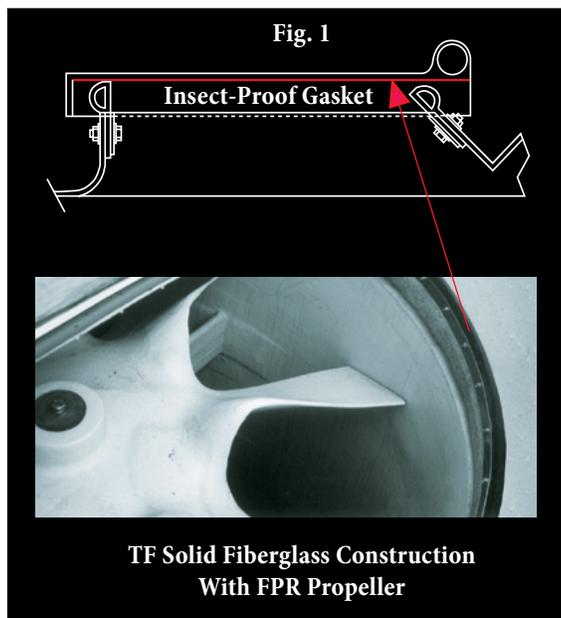
CHALLENGE: Health Hazards (Insects & Rust)

Insects and rust are considered health hazards by the Department of Health, which inspects fans prior to issuing a permit. Insects carry disease so tank vent fans are expected to be of “insect-proof” construction. Fan curb base and exhaust damper specifications require continuous, insect-proof neoprene gaskets mechanically fastened with 316 stainless steel hardware to pass inspection. Adhesives are not acceptable because gaskets have fallen off and into tanks. Improper gaskets will delay issuance of a plant-operating permit until approved by the Department of Health and accepted by the owner.

Rust is also a health hazard for a water production facility. Specifications call for fans with all-fiberglass construction and type 316 stainless steel shaft, motor pedestal, motor slide base, lube lines and hardware inside and out. Coated or encapsulated steel is not acceptable. However, commercial manufacturers often encapsulate a carbon steel bearing plate and cantilever a painted carbon steel motor base on four jack bolts. The painted steel motor bases and standard painted steel motor covers can rust quickly. Rust streaks the tanks and can be seen easily from a distance.

THE AEROVENT SOLUTION

Aerovent’s engineering team designed a special insect-proof gasket arrangement to meet the first health department requirement (Figure 1). Aerovent’s fiberglass fans also meet rust specifications. Fans are molded and the structural integrity is achieved through extra thickness. The one-piece, solid FRP propeller is straight bored and keyed to a stepped 316 stainless steel shaft (Figure 2). Two Type 316 stainless steel collar washers and a 316 stainless steel bolt threaded into the end of the shaft to secure the propeller. This construction facilitates easy propeller removal for access to shaft seals and fan bearings. The shaft seals shown in Figure 3 isolate the bearings from the corrosive exhaust air and maintain “insect-proof” construction.



CHALLENGE: Accessibility

A water treatment facility must have easy access to a fan's propeller, shaft seals and bearings for maintenance and repair. However, many commercial grade product manufacturers coat carbon steel with fiberglass to build strength and lower manufacturing costs. Problems occur because propellers typically have carbon steel hubs coated with fiberglass and are secured to carbon steel fan shafts with taper-lock carbon steel bushings. Bushing tops are resin and gel coated prior to shipment. However, to access the shaft seal and bearings, the resin coating must be cut off or the hub pulled away from the shaft, which can crack the fiberglass. This affects fan balance and corrosion resistance.

THE AEROVENT SOLUTION

Referring again to Figure 2, two Type 316 stainless steel collar washers (A) and a 316 stainless steel bolt threaded into the end of the shaft secure the propeller (B). This type of construction ensures easy propeller removal for access to shaft seals and fan bearings.

CHALLENGE: Belt Tensioning & Alignment

Commercial manufacturers usually encapsulate a carbon steel bearing plate and cantilever a painted carbon steel motor base on four jack bolts. However, belt tensioning and alignment problems can occur with this arrangement. Over time, the weight of the motor, the lever-type force applied from tensioning the belts, and the vibration from the rotating motor and propeller cause the fiberglass and steel plate to separate.

THE AEROVENT SOLUTION

Aerovent's 316 stainless steel motor bases are bolted between two integral FRP fan flanges to form a rigid structure. Fan motors are positioned and mounted for sheave and belt alignment. Belt tension is adjusted by loosening four bolts in slotted stainless steel bases. On larger horsepower motors (or where specified by the owner), 316 stainless steel NEMA motor slide bases are furnished to facilitate easy belt tensioning and replacement.

Special Project Considerations

- ▶ Bearing lubrication lines and grease fittings are typically furnished in copper, brass or bronze, which can be attacked by chlorine. Lube lines and fittings furnished on Aerovent's fans are all 316 stainless steel.
- ▶ The color of Aerovent fans were matched to the building color by pigmenting the fiberglass resin. This also has an advantage over a painted surface: the coloration cannot chip or loosen from the surface, discoloring the fan.
- ▶ FRP curb bases must be anchored to poured-in-place concrete curbs through the side to eliminate leaking. A minimum 4" overlap is specified to keep anchors from cracking the edges of the concrete surfaces. Aerovent fan curb bases are curved to reduce pressure losses and corrosion due to fan inlet velocities. Flanges are turned out so that bolted fan connections are weatherproof and out of the airstream.
- ▶ Aerovent fans run 24 hours per day, 365 days per year. One 20,000 CFM fan handles 1080 tons of corrosive air each day. Fan shafts are 316 stainless steel and bearings are oversized to provide extended operating life. The large 34-degree pitched, seven-bladed FRP propellers provide quiet and stable performance as water levels change and inlet screens become dirty. The vertical upblast design discharges exhaust air into the wind at high velocities to become further diluted.

Conclusion

Aerovent's engineering and manufacturing capabilities and industrial quality products have made them the best solution for the most difficult and demanding ventilation problems presented by water and wastewater treatment facilities. The company's knowledge and expertise in applying the right fan with appropriate modifications to each customer's unique situation has made it a leader in its field and produced its impressive 85 year track record.

Key Learnings:

- ▶ Gases and chemicals in water treatment facilities can cause corrosion and equipment failures. Standard commercial grade HVAC equipment is not suitable for corrosive environments. Aerovent's fiberglass axial TF fans can substantially reduce corrosive gas levels.
- ▶ Insects and rust are health hazards for a water production facility. Aerovent has designed a special insect-proof gasket arrangement to meet this requirement. Aerovent's fiberglass fans also meet rust specifications.
- ▶ A water treatment facility must have easy access to the fan's propeller, shaft seals and bearings for maintenance and repair. Aerovent's stainless steel step shaft and retaining bolt ensure easy propeller removal for access to shaft seals and fan bearings.
- ▶ Belt tensioning and alignment problems can occur with commercial manufacturer's construction. Aerovent's 316 stainless steel motor bases are bolted between fan flanges to form a rigid structure and facilitate easy belt tensioning and replacement.

CASE STUDY



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