ONLINE EXCLUSIVE:
Big Fans Mix It Up in Manufacturing Facilities: Large-diameter, Low-speed Fans Work with HVAC to Increase Efficiency and Comfort

By Erin Hsu

Heating and air conditioning massive manufacturing spaces can be a costly undertaking. Combine the expense with inconsistent air distribution, which leaves hot and cold pockets throughout the facility, and it's no wonder that many manufacturers choose to shiver and sweat it out.

Unlike small ceiling fans that struggle to send air to the floor and only create insignificant pockets of air movement, large-diameter, low-speed fans gently mix air to stabilize air movement without creating a draft in winter.

But there's a better way to both keep your bills low and employees comfortable year round. Large-diameter, low-speed overhead fans aren't only for summer cooling in non-conditioned spaces — they also enhance the effectiveness of HVAC systems, thoroughly mixing air throughout a space to create consistent temperatures from ceiling to floor and wall to wall.

Saving Energy — and Money

In the summer, fans provide an additional boost to air conditioning systems. Because the perceived cooling effect of air movement can make a person feel up to 10 degrees cooler, managers of conditioned buildings can raise their air conditioning setpoint and use energy-efficient fans to make up the difference. Customers and employees will feel the same level of comfort, which the building can maintain with far less energy.

Large fans can be added to many existing structures, where they often are used to help qualify the building for energy-saving incentive programs. In new construction, specifying large fans when the HVAC system is designed can eliminate a significant amount of ductwork, saving on initial building costs before the fans are ever turned on.

In the winter, stratification occurs because hot air is approximately 5 percent to 7 percent lighter than cool air in a space and tends to rise to the ceiling. In the winter, large diameter fans can be used to destratify heat by moving large volumes of warm air off the ceiling without creating a draft. The steady mixing of air creates a uniform temperature throughout the space, which can help the heater to maintain the same thermostat setpoint with less effort. This results in a serious reduction of operating costs.

Unlike small ceiling fans that struggle to send air to the floor and only create insignificant pockets of air movement, large-diameter, low-speed fans gently mix air to stabilize air movement without creating a draft in winter. These larger diameter fans use airfoils and winglets to allow the fan to operate in the forward direction without causing a draft.

Federated Co-operative Ltd. of western Canada used large-diameter, low-speed fans to decrease the rate at which their buildings were shedding heat. “We noticed a pretty significant decrease in natural gas consumption,” said Trevor Carlson, manager of Environmental and Technical Services. “We believe we saved $19,800 in the first year in natural gas consumption as a result of the fans. That’s a payback of approximately three years on the project.”

Year-round Comfort

OSHA standards indicate temperatures of 100.4 degrees Fahrenheit and above are dangerous for workers while air temperatures that exceed 95 degrees significantly increase the heat load on the body. When temperature and humidity levels rise, the body’s natural ability to cool itself decreases.

Discomfort issues have a negative impact on productivity and the bottom line. Research shows that elevated temperatures affect our potential for both mental and physical work. Hot working conditions affect worker morale, absenteeism, turnover, quality of workmanship and the frequency of both accidents and grievances.

This becomes especially important for workers in non-conditioned spaces, such as the DeSoto, Texas, McGraw-Hill textbook distribution center. This warehouse went from 15

heat-related incidents to none after installing large diameter overhead fans — even during a heat wave of 120 days with temperatures over 100 degrees.

“It was an oven in this concrete building, and when workers were hot, they slowed down,” said McGraw-Hill Maintenance Manager Mike Price. “We’ve noticed a big difference.”

In conditioned spaces, large-diameter, low-speed fans are ideal for use with building automation systems, which can turn them on and control their speed based on preset temperature ranges.

“As the building starts to warm up and the temperature climbs, the fans speed up,” explained Andy Hill, preconstruction manager and sustainability specialist with DPR Construction’s net-zero Phoenix Regional headquarters. “All of the system works together until the temperature inside reaches a setpoint around 84 degrees. Then, the windows shut down and the dampers close, but the fans stay on and our mechanical cooling turns on. [The fans] are a huge component to our passive cooling comfort system. It would not work without them.”

Wintertime benefits of big fans aren’t limited to energy savings, either. When New Hampton Metal Fab put an 8,500-square-foot addition on its northeastern Iowa metal fabrication facility, it didn’t expect that a supplemental space with a higher roof would be so uncomfortable.

Pete Gallup, purchasing manager, was looking to save on heating bills and to balance out temperatures during colder months. With 40-foot ceilings, the new space was known to have cold corners where few employees wanted to work.

“All of the heat was going up,” Gallup said. “We’d send somebody up to fix something and they would strip down to their long johns, while the guys on the floor were standing there in Carhartts, basically freezing to death.” As an added concern, wearing so much flammable clothing was a safety issue.

With the addition of an 18-foot diameter fan, the ceiling to floor temperature differential was brought down to less than 1 degree. “Nobody would work back in those corners,” said Gallup. “But now anybody can work pretty much anywhere. The fan has made the temperature uniform all the way up.”

Conclusion

By efficiently moving massive amounts of air, large-diameter, low-speed fans provide summer cooling and winter heat recirculation to provide serious savings and improve comfort all year long.

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