HVLS Fans As A Complement to HVAC

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Distribution centers, manufacturing facilities, and other large, open warehouse environments face a host of unique design and maintenance challenges. These challenges include energy costs, temperature control, air quality, and employee safety/comfort issues.

In an effort to mitigate these challenges, more and more facilities are installing high volume, low speed (HVLS) fans as a complement to their HVAC system. HVLS fans can significantly improve employee comfort and health and can save building operators substantial amounts of money by making existing heating and ventilation systems more efficient, while providing additional benefits in buildings with no air conditioning.

Two Common Challenges: SSS and SBS

Sweating Slab Syndrome (SSS) and Sick Building Syndrome (SBS) are two common air quality and employee safety/comfort issues that building managers face.

SSS is a phenomenon that occurs when moisture intermittently develops on the surface of an interior concrete slab, such as a warehouse floor. SSS can increase the slipperiness of the concrete surface and pose a serious risk to the safety of workers and materials handling operations. Dew point condensation is a common cause of this moisture accumulation. This happens when warm, humid air enters the structure through open doorways, windows, and vents. As that warm air diffuses throughout the structure, it will condense on any surface that is at or below dew point temperature, which is often the floor surface. When warm, humid air enters a structure, it takes far less time to change the interior air temperature than it does the temperature of the slab. With such a rapid change in conditions, the slab temperature can easily be found at or below dew point.

Many large facilities provide little air movement and may exhaust interior air through roof vents, creating negative pressure in the building. Negative pressure within a structure quickly allows exterior air and other conditions to enter the building when loading dock doors are open. HVLS ceiling fans can help reduce or eliminate slab sweating by minimizing ceiling-to-floor temperature differentials and increasing the surface evaporation rate. In addition, commercial dehumidification units can alter the interior building environment to help reduce or eliminate SSS.

Sick Building Syndrome (SBS) is a term used to describe situations in which building occupants experience acute health and comfort effects that appear to be linked to time spent in a building, even though specific causes can't be identified. In contrast, the term "Building Related Illness" (BRI) is used when symptoms of diagnosable illness are identified and can be attributed directly to airborne building contaminants. Though the causes of SBS may be unknown, most affected employees have clinically-identifiable symptoms (such as headache, dizziness, nausea) and they typically feel better soon after leaving the building.

There are a variety of causes for SBS, primarily related to stagnant or dead air. These include poor building design, maintenance, and/or operation of the structure's ventilation system. The ventilation system in particular is often found to be at the heart of the problem, and can itself be a source of irritants. In addition, a poor ventilation system can result in a buildup of pollutants within the building, in which case the indoor environment can often have air quality much lower than the outdoor air. Interior design factors, such as the arrangement of individual offices and cubicles, may also interfere with efficient functioning of ventilation systems. Humidity may also be a factor. While high relative humidity may contribute to biological pollutant problems, an unusually low level may worsen the effects of mucosal irritants and may even prove irritating itself. Other contributing elements may include poor lighting and adverse ergonomic conditions, temperature extremes, noise, and psychological stresses that may have both individual and interpersonal impact. The complaints may be localized in a particular area, or may be widespread throughout the building.

Increasing ventilation rates and air distribution often can be a cost effective means of reducing indoor pollutant levels. HVAC systems should be designed to meet ventilation standards in local building codes; however, many systems are not operated or maintained to ensure that these design ventilation rates are provided.

Although SSS and SBS have different causes, they have similar solutions, at least to some degree. In both cases, increasing air movement and ventilation often provides dramatic relief. HVLS fans can help reduce or eliminate slab sweating by minimizing ceiling-to-floor temperature differentials and increasing the surface evaporation rate. For SBS, the increased air movement HVLS fans provide helps dissipate humidity and disperse concentrations of airborne contaminants such as chemical fumes, pollens, bioaerosols, or other volatile organic compounds (VOCs.)

HVLS Versus Other Types of Fans

While high-speed ceiling or floor fans can also help increase air movement, they have several disadvantages when compared to HVLS ceiling fans. HVLS fans can move larger volumes of air than high-speed fans: A single fan can cover areas up to 22,000 square feet and can replace as many as ten to 20 floor fans, or smaller ceiling fans.

High-speed floor fans have other disadvantages versus HVLS. Not only do they create a blast of wind for a relatively small area, but they can be noisy and disruptive, and they use much more energy than HVLS fans. In addition, having multiple floor fans can increase clutter and the chance of mishaps involving equipment and electrical cords. Lastly, the localized, high wind speed they create may contribute to employee fatigue.

HVLS: A Complement to HVAC

In an HVLS fan installation, the extremely long (up to 24-foot total fan diameter) blades spin much more slowly than a traditional ceiling or ventilating fan. The blades are specially designed to capture the maximum amount of air possible and push it softly to the floor.

In the summer, the gentle breezes created by an HVLS fan keep employees cool by quickening the evaporation of sweat. In winter, in a process called destratification, the fans take the warm air created by an HVAC system and pull it down from the ceiling to the floor level, allowing employees to be more comfortable with a lower thermostat setting.

Energy Savings and Employee Relations

HVLS fans are less expensive to operate and more efficient than smaller, high-speed ceiling fans. They are also energy efficient: A 24-foot diameter model uses 1,500 watts per hour for cooling and as little as 100 watts for destratification. This translates to operating costs of as little as a few cents per hour.

During the winter months, HVLS fans can reduce energy consumption by up to 30 percent. When used to supplement air conditioning, the fans help lower the perceived temperature, which means thermostat set-points can be raised. Since energy costs are reduced roughly four percent for every degree the set-point is raised, a three to four degree increase in your set-point can reduce energy consumption by 12 to 16 percent. With year-round use, HVLS fans can pay for themselves very quickly.

While energy savings can be significant and quantifiable, one important benefit companies get from an investment in HVLS fans is hard to put a number on. Creating a more comfortable, healthier workplace clearly signals your organization's willingness to invest in its greatest asset — its people. IMPO