

## TECHNICAL ARTICLE:

# HVLS FANS WORK IN ANY SEASON

High-volume, low-speed fans have largely been established as energy-efficient and cost effective products to help maintain environmental control in large, open warehouses and manufacturing plants, athletic facilities, and retail/commercial buildings with tall ceilings.

The biggest advantages of HVLS fans are that they can provide a cooling sensation of up to 7 degrees during warmer months and are able to provide consistent ceiling-to-floor temperatures throughout the year by destratifying layers of conditioned air.

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These comfort-based benefits also mean less money is spent on heating and cooling to keep your building comfortable. Typical savings are 20-30 percent of yearly energy costs. These fans have also been shown to help significantly in eliminating pockets of stagnant air that may be higher in humidity or odor. This can help eliminate product spoilage/corrosion or make your gymnasium or locker room smell better.

The results are what drive facility managers to purchasing these fans, but it's science that drives HVLS fan blade and hub design to get those outcomes. Before specifying or purchasing an HVLS fan, it's important to understand

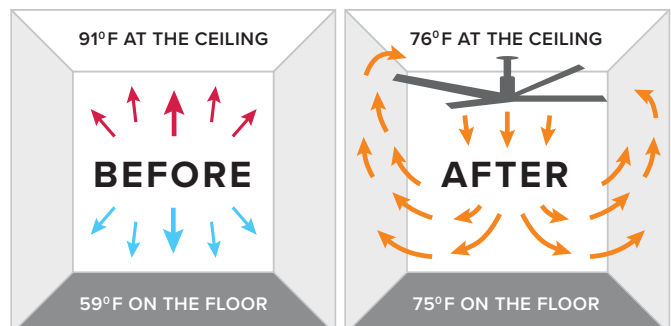
what to look for in relation to the exact application in which it will be used. There isn't a one-size-fits-all HVLS fan for every space that is looking to reap the rewards of temperature control and energy savings.

So how does a facility manager know if they're getting the right fan for the job? Starting with a brief explanation of airflow, let's go through the basics of an effective HVLS fan design.

### Getting uniform airflow

An effective HVLS fan will have two easily observable characteristics. First, its blades will be wider near the hub of the fan where velocity is relatively slow; and will be narrower near the tip of the blade where velocity is much greater. Second, the blade angle will be steeper near the hub and flatten out near the tip.

These two criteria are essential in creating uniform airflow, which is necessary to effectively displace air and minimize the energy needed to power the fan. If the blade doesn't provide the same amount of air movement from hub to tip, the fan will be inefficient. Blades with a static width from the hub to tip will either be too small at the hub or too wide at the tip.



*By destratifying layers of conditioned air, HVLS fans create uniform airflow and help provide consistent ceiling-to-floor temperatures.*

## Getting a proper angle by starting with the hub

The center of the fan can often be overlooked. But the importance of the hub can't be overstated, as it provides a strong connection point for the blades of the fan.

Another observable feature of any fan blade is the angle at which it is attached to the hub and how this angle changes throughout the blade to the tip. The angle of the blade should not remain constant from hub to tip. In fact, it should have a twist to it – starting with a steeper angle at the wide, cambered portion of the blade near the hub and slowly flattening out toward the thin, narrow tip.

This is called an “angle of attack” and it is the key to maximizing air displacement that provides the benefits of an HVLS fan. Without the correct angle – even a small 2- or 3-degree change can significantly change airflow – an HVLS fan will lose effectiveness and efficiency.

## The truth about the number of blades

The number of blades in an HVLS fan carries less functional importance than the design of its blades. The area of the total blade surface at each radius is what really matters. In fact, a fan with two blades can displace just as much air and provide the same benefits as a fan with eight blades, if designed properly.

## Fan speed needs to be balanced with motor torque

The maximum blade speed will be determined by the amount of motor torque that is available. To get the maximum airflow from a fan, you will want to be able to run the motor at its maximum speed. Different fan manufacturers use different size motors on their fans. All may vary in the amount of output torque available to spin the fan blades.

The fan size that is used should be determined by the room size and the area of coverage required. In general, you will get the best performance from the largest fan that can be installed in a particular area, but in many areas, there may be obstructions limiting the maximum size.

## Saving energy

With recent changes in governmental requirements, motors that are 1 HP or larger are required to be premium efficient (IE3). If a fan uses a Variable Frequency Drive to control the motor, this will also help the fan to run safer and more cost effectively.

Another step to reduce energy cost would be to use fan controls that are capable of starting and stopping the fan based on schedule or temperature.



The “angle of attack” on a fan blade (above) is a key design component for creating the most effective and efficient HVLS fan. The angle is much steeper near the hub (top).

## Geared vs. gearless

In recent years several fan companies have introduced fans that do not use a gear case to reduce the motor speed and increase the fan torque. These fans have a highly sensitive motor with a larger number of electrical poles that allow them to run at slower speeds. The energy usage of these motors is essentially the same as IE3 gear motors.

The biggest advantages of gearless motors are that they run quieter and they eliminate the possibility of oil leakage if something goes wrong with the gear case.

## There's an HVLS fan for that

The benefits of HVLS fans are well known. They can provide a low-cost, energy/efficient option to provide temperature, humidity and odor control in a myriad of environments, especially when a building has tall ceilings. Once the specific application and need is understood, the facility manager can zero in on the right hub with the appropriate blade design, blade angle, and RPM. With the right combination, temperature control benefits can be achieved. Talk to your product supplier for more information on what HVLS fan is right for the job.

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