

HIGH VOLUME LOW SPEED FANS

Increasing Cow Comfort

Cow comfort is critical to a profitable dairy farm. Wetting down cows is the quickest, most cost-effective way to cool them, according to UW experts. Sprinklers should be an integrated part of a complete cow cooling system, which could include high-speed or HVLS fans. Fans increase the air velocity over the wet cow to increase evaporation, which further cools the cow.

What's the optimal air velocity for cow comfort? There's no definitive answer, although air velocity in the 2–4 mph range is effective for most operations. Air velocity above 6 mph provides no additional value, according to UW experts.

High volume low speed (HVLS) fans are the newest ventilation option available to dairy and livestock farmers. These large fans, which range in size from 16 to 24 feet, provide energy-efficient air movement throughout the barn at a fraction of the energy cost of high-speed fans.

Advantages of HVLS

The main advantage of an HVLS fan is its energy efficiency. One 20-foot fan typically moves approximately 125,000 cfm of air. It takes six–seven standard alley fans to provide similar air volume. Most HVLS fans have a 1 HP motor, moving the same volume of air for approximately one-third of the energy cost of six high-speed fans. According to a recent University of Wisconsin (UW) study, an HVLS fan costs approximately \$1 per day to operate (14.5 kWh per day at \$.07/kWh).¹

HVLS fans move large columns of air at a slow velocity, about 3 mph (260–280 fpm). The UW study showed that HVLS systems provide more widespread air movement throughout the barn. Although high-speed fans provide more velocity, each unit impacts a small, focused area, leaving more "dead" air in the barn.

High-speed fans are good for managing extreme heat, although they can cause your energy bills to increase significantly in the summer. HVLS systems are sometimes used year-round. In summer, HVLS fans provide essential cooling; in winter, the fans move drier air from ceiling to floor level and may result in a healthier environment for livestock. HVLS fans are virtually noiseless and may discourage bird and fly activity in the barn. In general, dairy farmers with HVLS systems told UW researchers they like the fans. Cows appear to be comfortable and don't bunch up. However, additional research is necessary to determine if HVLS fans have any impact on milk production.

Is HVLS Right for You?

Because of their size, HVLS fans may not be appropriate for older, trussed freestall barns and stall barns with low ceiling heights. For post-and-rafter facilities with posts spaced at least 20–30 feet apart, HVLS fans work well. Examples include freestall barns, holding areas and industrial-type spaces.

Ideally, HVLS fans should be mounted 16–18 feet from the ceiling and 50–60 feet apart (measure from the center of the motor) over free stalls or the feed lane. The fans tend to wobble in the wind, so make sure the installed fans are adequately braced and provide plenty of leeway. Mounting a 24-foot fan in a 25-foot opening could eventually cause blade damage.

HVLS fans cost approximately \$4,200–\$5,000 each, including installation. While this is a large upfront investment, keep in mind that you'll need six to seven high-speed fans at \$200-\$300 each to move the same volume of air. Energy savings over a high-speed fan system should make up the cost difference within two to three years. Barns with



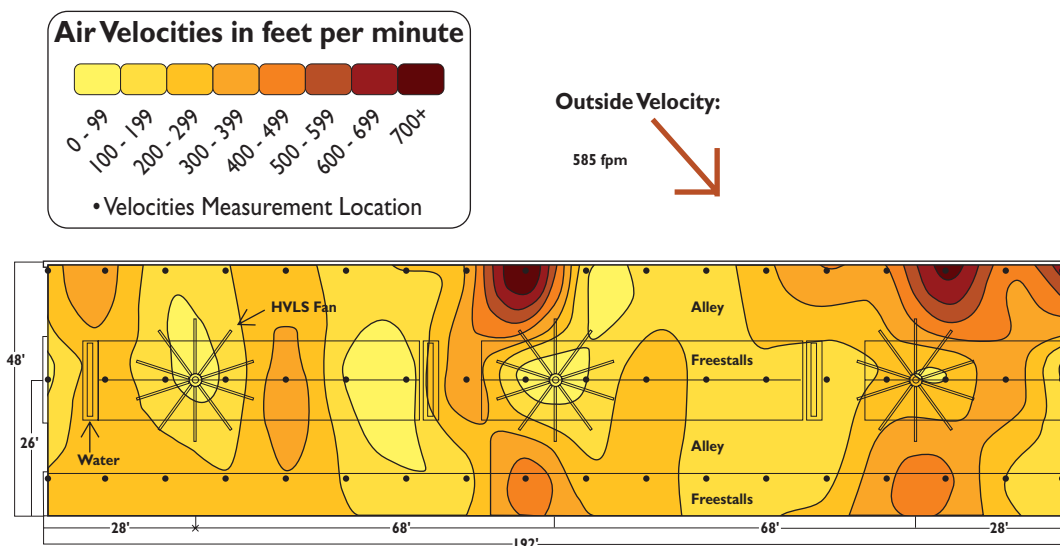
A well-placed HVLS fan is approximately 16 feet off the floor in an area that isn't obstructed by a post, preferably a freestall barn or holding area. Fans should be placed approximately 60 feet apart.



The University of Kentucky College of Agriculture offers online calculators to estimate your return on investment and the number of HVLS fans your facility will need. Visit the Web site at www.ca.uky.edu and type “HVLS fan” into the search engine.

100–200 amp electrical service may be able to install an HVLS system without rewiring. In addition, manufacturers claim that HVLS fans won't have to be replaced for at least 10 years. Because high-speed fans operate at a higher RPM, their motors could need to be replaced more quickly.

Installing your HVLS fan with a control unit enables variable-speed operation, which allows you to run the fans at a slower speed on cooler days. It also reduces torque at start-up, providing a “softer” start that's easier on the fan's motor. Control units are available for a variety of voltage requirements and can run one, three or five fans. The most common error farmers make while installing an HVLS system is to use fewer fans than recommended to save money. Spacing the fans too far apart will significantly diminish the system's benefits. Installation can be done in phases to manage the cost, but the planning needs to be done upfront so that the final system is effective.



HVLS fans create air movement (typically 2–3 mph) throughout the barn. By contrast, high-speed fans produce higher velocities in the area directly surrounding each fan, leaving large areas of dead air. The above velocity map shows the more even distribution of air in a barn served by three HVLS fans. The dark areas on the graph reflect the outdoor air coming in from the sidewalls and openings.



For More Information

To learn more about which ventilation system can help you reduce energy costs and improve your herd's health and comfort, call Wisconsin Public Service at 1-877-444-0888. Our agricultural consultants can help you determine if an HVLS system is right for your operation.

UW researchers used smoke and soap bubbles to visualize the airflow in barns using HVLS fans.



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'David W. Kammel, et al., "Design of High Volume Low Speed Fan Supplemental Cooling System in Freestall Barns."
For a full copy of the research, visit www.wisconsinpublicservice.com.