

# Abstract

High volume low speed (HVLS) fans are configured as large diameter paddle fans with 10 foils (blades). The foils range from 8-12' long. The diameter of the fan is approximately 16-24' diameter. The fan is powered by a 1 hp motor that runs at a maximum speed of approximately 60 rpm. The fans have been used in industrial buildings to mix air. The fans have also been used in poultry and livestock barns to provide supplemental cooling of the animals by increasing velocity of the air in the barn. Velocity data at the cow level was collected on several dairy farms where the HVLS fans have been installed. This information will be used to develop design criteria for other installations to achieve desired velocities. The HVLS fans may be an energy efficient alternative to 4' diameter high speed (HS) fan cooling systems.

## Objectives

1. Determine velocity patterns in freestall dairy barn installations.
2. Determine initial capital cost and energy efficiency of HVLS fans.
3. Determine cost effectiveness of HVLS fan system as compared to HS fan system.

## HVLS Fan



### HVLS Fan Specifications

16' – 24' Diameter Aluminum Ceiling fans  
 $\frac{3}{4}$  - 1 HP – 240/480 VAC – 3 phase motor  
Moves up to 125, 000 cfm of air  
Rotates at 60 rpm at 60Hz  
Variable speed control available  
Power Consumption: 370watts / 20' fan

# Measuring Velocities



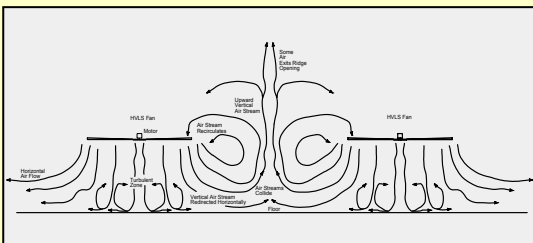
**EQUIPMENT USED:** TSI Rotating Vane Anemometer, Model 8324 VelociCalc Plus.  
**MEASUREMENTS:** Grid pattern at 5' above alley floor and 3.5' above stall platform.  
**READINGS:** Min., Max., and Avg. velocity over 10-sec moving average interval.

## Results

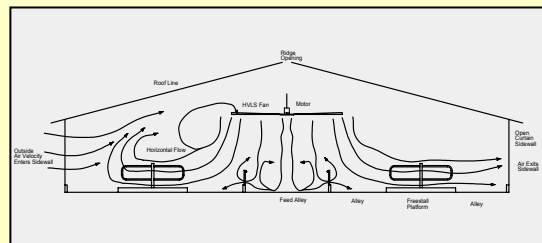
### Fan Cost

Farm	# fans and diameter	Equipment Cost	Labor Cost	Total Installed Cost
Farm #1	10 @ 24ft.	\$41,150	\$8,500	\$49,650
Farm #2	3 @ 20ft.	N/A	N/A	\$12,000
Farm #3	8 @ 20ft.	\$32,000	N/A	\$32,000*
Farm #4	5 @ 24ft.	\$18,500	\$1,500	\$20,000
Farm #5	5 @ 20ft.	\$18,750	N/A	\$18,750*
Average cost per fan		\$3,900		\$4,200 Does not include labor

### Air Flow Visualization



Longitudinal



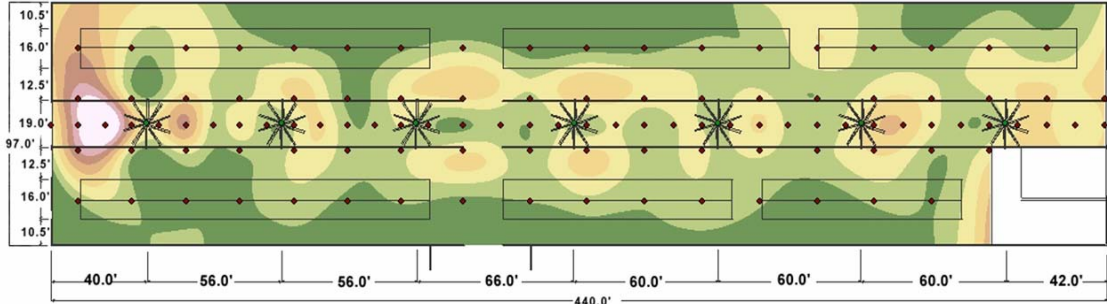
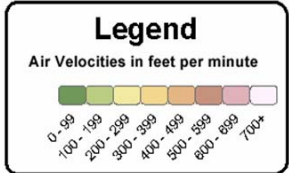
Cross Section

# Results

## Air Velocity Pattern

Case #1

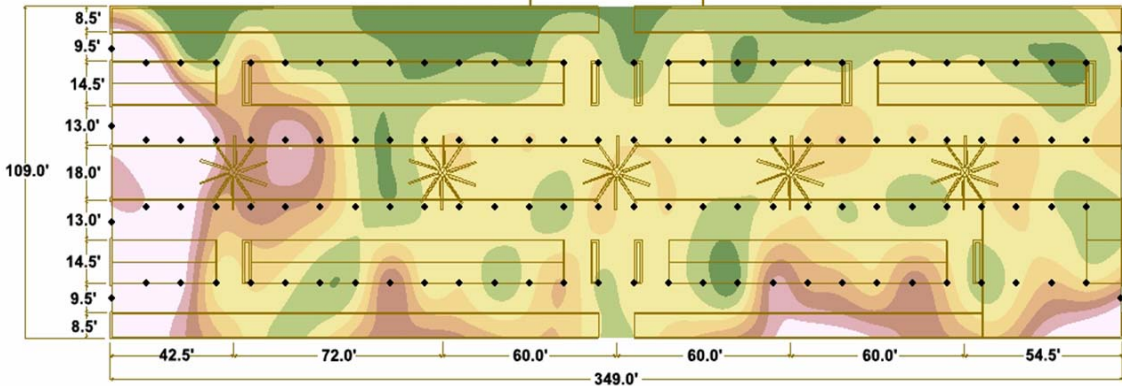
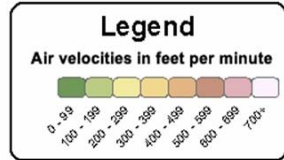
Outside Velocity: 565 - 620 ft/min



## Air Velocity Pattern

Case #2

Outside Velocity: 530 - 785 ft/min



### Research Supported by:

 HVLS

 Wisconsin Public Service Corp.

 Wisconsin Focus on Energy