

Improving Ventilation in Dairy Cow Barns



College of Agriculture,
Food and Environment
Cooperative Extension Service

By: Selene Reeves and D.M. Amaral-Phillips, Ph.D.

Many health and financial problems associated with increased moisture, odor, and high temperatures can all be greatly reduced by improved ventilation in dairy barns. Increased temperatures are a direct contributor to heat stress. Dairy cows exhibiting heat stress have reduced feed intake, decreased fertility and reduced milk yield. If heat stress is not reduced, major financial losses can ensue. Barn design, including roof design, barn dimensions, proximity of neighboring barns, and the overall orientation, are crucial to maximize natural air flow. The proper use of fans, curtains, and temperature sensors can help further improve ventilation within the barn. Discussed below are specific changes that can be made to improve barn ventilation.

Designing a New Barn

- **Roof Pitch**

The roof pitch allows moisture and gases, from within the barn, a place to quickly move up to the ridge vent. Preferably, the roof pitch should be 4 feet in the vertical direction for every 12 feet in the horizontal direction or 4:12. Roof pitches that are lower or steeper may not be suitable for dairy cows.

- **Ridge Vent**

The ridge vent in combination with a recommended roof pitch allows warmer air to flow out of the top of the barn. The ridge vent should be one-foot wide with an additional three inches for every 10 feet of total barn structure width beyond 40 feet. If a ridge cap is used, the distance between the cap and the roof below should be at least three quarters the width of the ridge vent. For example, the distance between the ridge cap and the roof below for a 1 foot or 12 inch ridge vent should be 9 inches.

- **Sidewall Openings**

On average, there should be a 14 to 16 foot sidewall height for large amounts of air to enter and exit the barn. In combination with a good roof design, a natural cooling effect passes the stale air out at a quicker pace with increases in eave height. Any barn curtains should be raised up for maximum air flow in the summer.

- **Orientation of Barns**

Barn orientation should be in the east/west direction. Because the sun rises in the east and sets in the west, direct sunlight is minimized. Also, in some locations an east/west orientation is in the same direction as natural outside air flow, thus making it easier for air to flow throughout the barn.

- **Closeness of Other Barns**

If adjacent dairy barns are too close in proximity, natural ventilation will be reduced. The minimum space recommended between neighboring barns is 80 feet. The larger the dairy barn, the more distance needs to be between the barns with 100 feet or more recommended for larger dairy barn structures.

Educational programs of Kentucky Cooperative Extension serve all people regardless of race, color, age, sex, religion, disability, or national origin.

Improving Ventilation in Dairy Cow Barns

Improving Barn Ventilation

- **Curtains**

Curtains used as side walls can be adjusted to maximize air flow depending on the season. As mentioned previously, curtains should be fully raised in the summer to maximize air flow. In the winter, the lack of air flow will create condensation resulting in an odorous and humid environment. Curtains should allow an open space at the top of the barn opening one half of the ridge opening width so that air can still flow throughout the barn at a minimum of 4 air exchanges per hour.

- **Fan Placement**

- **High-Volume, Low Speed (HVLS) Fans**

HVLS fans are used to circulate natural air through all areas of the barn. These fans are named due to their large size (8 – 24 feet diameter) and slow moving speeds (45 revolutions per minute for a 24-foot fan). For a 24 foot HVLS fan, there should be 60 feet between each fan if they span down the center of the barn just over the feed alley. If used correctly, moisture, heat, and odor can all be greatly reduced.

- **Box Fans**

Also known as simple circulation fans, box fans are smaller than HVLS fans. These fans can provide improved air circulation if an adequate number are placed strategically around the barn. Commonly, these fans can range anywhere from 36" to 50" and, therefore, should be spaced 30 feet for 36" fans and 40 feet for 48" fans apart at an angle that is below the downstream of the preceding fan. The larger the fan, more space will be required between each. Fan placement should be focused over the cow beds and feed lanes.

Air flow from these fans can be reduced due to poor maintenance. Therefore, upkeep is necessary. Fan blades and grills should be cleaned free of dirt and dust. Regular oiling, realignment, tightening of the fan belts, and the replacement of damaged fans should all be completed before each summer season.

- **Automatic Fan Control**

Fan operation should be dependent on fluctuations of outside temperature in order to prevent heat stress. For example, an increase in outside temperature should prompt an increase in overall fan usage. With an automatic temperature control system, fans should be turned on near 65°F to 68°F and turned off below those temperatures as well.

Even the slightest alterations in dairy barn dimensions can have a large impact on air flow. Therefore, careful considerations of the initial design of the barn can provide maximum ventilation preventing various health and financial problems. In addition to barn design, producers should also take advantage of proper usage of HVLS fans, box fans, and curtains in both old and new barns to help further improve air flow.