Tunnel Ventilation Benefits Dairy Cows

By Bonnie Coblentz

The heat of Mississippi summers presents a challenge to dairy farmers trying to keep their cows cool enough to produce abundant milk.

Traditional dairy barns are built with high ceilings so heat will rise and open sides that allow the free movement of air. Fans and water spray are used to cool the cattle.

Research recently turned to an innovation from the poultry industry that producers use to keep chicken houses cool. Three researchers with the Mississippi Agricultural and Forestry Experiment Station are studying the operation and efficiency of tunnel ventilation for dairy barns.

Tunnel-ventilation barns are built with low roofs, enclosed sides and fans on one end that pull air through the house. Some use cooling cells to further lower temperatures.

MAFES dairy science researchers Angelica Chapa, Terry Smith and Scott Willard studied tunnel ventilation at Mississippi State University's 20-cow tunnel-ventilated barn at the Dairy Research Unit in Holly Springs. Trials were run testing the performance of lactating Holsteins in the tunnel-ventilated barn compared with 20 similar cows in a traditional, freestall barn.

"Heat stress has a dramatic effect on dairy cows, decreasing feed intake, milk production and reproductive efficiency while increasing the incidence of mastitis," Smith said.

A 10-week trial showed the tunnel ventilation reduced heat stress in the cows it housed compared with those cooled by shade and fans alone.

Cows housed in the tunnel barn had peak body temperatures of 1.2 degrees lower than the cows housed in the traditional barn. The cows in the tunnel barn had a slower respiration rate by nearly 16 breaths a minute than those cows in the traditional barn.

"This increment in cooling improved feed consumption within the tunnel barn an average of 4 pounds of feed per cow per day," Smith said. "Additionally, the cows in the tunnel-ventilated barn produced an average of nearly 6 pounds of milk per day per cow more than the cows cooled by shade and fans alone."

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TERRY SMITH

Dairyman Quinton Mills, left, and area extension dairy specialist Wesley Farmer with one of the animals from Mills' 400-head Forest County dairy herd.

Photos by Marco Nicovich

Smith is convinced that tunnel ventilation can solve much of the heat stress problem cattle face in the hot Southeast.

"Cows housed in the tunnel barn received less exposure to conditions of heat stress during the study than did cows housed in the adjacent traditional barn," Smith said. "Tunnel ventilation cooling of dairy cows can have a significant impact on milk production in the summer months on dairies in the southeastern United States."

Quinton Mills owns a 400-head dairy farm in Forest. He recently built a tunnel-ventilated, freestall barn for his herd, the first commercial barn of its kind in the state.

"We designed the tunnel ventilation system ourselves, bought all the pieces and put it together," Mills said.

Mills saw a tunnel-ventilated dairy barn in operation at North Florida Holsteins in Bell, Fla., and decided to design his farm in a similar fashion. His barn has a low roof, 32 fans on one end and curtains on the sides. The fans pull air all the way through the house, cooling the cows as the air passes over them. His system uses no cooling cells.

Chapa studied air quality issues in dairy houses. Gases, dust, odors and microbes can lower air quality within improperly ventilated, enclosed animal quarters.

"Freestall barns are open on all sides, and fresh air circulation prevents the buildup of ammonia and dust," Chapa said.

"Tunnel-ventilated barns pull air through the facility using fans. The continuous air exchange results in a cooler environment."

Chapa monitored the levels of environmental ammonia, hydrogen sulfide and other chemical substances to determine the air quality inside the two test barns.

"Over the entire 10-week study, environmental measurements show that the air quality compared favorably to what Occupational Safety and Health Administration standards have determined is appropriate for animal and human health," Chapa said.

Final results suggest that tunnel ventilation offers great potential to decrease the exposure to and effects of heat stress in dairy cows in the Southeast.