Dairy Agents Keep Learning

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understood in order to advise and help plan for a retrofitted or anticipated ventilation system.

In addition to better preparing the agents for the questions they may get during the course of their work, attendance at such seminars is considered favorable within the Extension promotion system.

Though perhaps not regularly considered, dairy agents compete for advance promotions, and are rewarded based on performance of service to the community, continuing education to support that service, and other considerations.

The purpose for such incentives is to be able to provide the quality of service that the program was intended to provide in exchange for favorable consideration from the state.

However, agents generally attend out of a desire to be of help in spreading beneficial information.

The ventilation course was taught by Robert Graves, of the Penn State Agricultural and Biological Engineering Department; Dan McFarland, a Penn State multicounty agricultural engineer; Eileen Wheeler, also with the engineering department; and John Tyson, a new Erie County extension agent who has worked for Graves in the engineering department.

Graves provided an introduction to ventilation and the physical principals of air flow. McFarland talked about inlets, their construction, and air distribution.

Wheeler discussed fans, what they do, how to plan for them, what makes a good fan setup for performance and efficiency, and how to understand the industry and academic research-based ratings on fans.

John Tyson gave a presentation on tunnel ventilation and how to calculate the fan power and opening sizes needed to create a desired flow. It was explained that air flow, though invisible, acts in a fluid manner, such as water.

A number of forces can act on air to create movement. The sun's energy more or less charges air particles, causing them to expand as molecular electromagnetic forces increase with the absorption of energy from the sun.

Thermal air movements are caused by sunlight striking a surface that reflects light, causing the air to be exposed to more energy from the sun, relative to nearby places where sunlight is absorbed, such as areas with dense plants.

The differences in energy are reflected in different measurements of temperature. The more energized air, which is the higher temperature air, becomes lighter than surrounding air and rises.

There are also mechanical forces which act upon air, such as the rotation of the earth, wave action, and the surface structures (air moves faster above trees than through them.)

And fans.

When considering the flow of air through a barn, the goal should be to create an environment most favorable for the animal. Through research, that rate of flow has been fairly well established, depending on the livestock being considered.

The core of the issue is being able to remove undesirable moisture, gases, heat, and potentially disease-bearing exhaled air, and to provide the animal with the proper humidity, cooling and fresh air to gain maximum performance.

Several other things must be considered: The dimensions and layout of the barn, the prevailing winds, the behavior of the animal (how it lies, stands, etc.), internal structures, and three seasons, in this temperate climate.

The three seasons experienced by Pennsylvania dairy farmers calls for a complete ventilation system to address the three different general conditions. In the winter, the goal is to remove exhaled air and moisture while retaining enough heat to keep the environment within the comfort level of the animal. In these cases, a negative pressure system is called for.

A negative pressure system creates a slight vacuum in the building by having the force of the exhaust fans stronger than what the air inlets will allow to enter without resistance.

In order to create an equal amount of ventilation to the animals, a series of inlet portals are constructed around the walls of the building of a size and height that corresponds to the desired air flow and fan strength.

Because they most favor the cow, conditions in the spring and fall don't requirer the negative pressure system of winter. In spring and fall, either a positive/negative pressure system - which is basically fans blowing air in, while other fans exhaust air - or natural ventilation, perhaps assisted with fans, could be an example of how to achieve a peak environment for cow performance under conditions that can vary during the day.

In the summer, many have turned to tunnel ventilation, which is more of a factor of moving air to speed by which it cools the cow by removing heat. A properly designed tunnel ventilation system moves air through the barn at a speed of about 220 feet per minute, which has been described as the pace of a brisk walk.

After spending the morning and early afternoon in the classroom going over the concepts and principles of ventilation, the group of dairy agents went to the Nelson Martin dairy farm near Prescott.

At the Martin farm, the group broke down into four subgroups and reviewed the ventilation sys-

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Eileen Wheeler, Penn State agricultural engineer, holds an anemometer to detect the force, or speed, of wind in the barn, as part of a demonstration to educate county dairy agents about barn ventilation.