

# Energy Efficient Ventilation and Lighting Systems For Livestock Production Facilities

## PROJECT SUMMARY

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This project focused on demonstrating and documenting improved mechanical ventilation and lighting systems for livestock facilities. Three dairy farms were selected to participate in the study. On each demonstration farm, the ventilation and lighting systems were evaluated according to overall function and efficiency. In all cases, improvements were required. An improved design was developed, and new ventilation and lighting equipment was installed.

For the ventilation systems, the airflow capacity of the existing fans and inlets were compared to recommendations. In all cases, the existing inlet systems were inadequate for the required airflow rates. On two of the farms, the total ventilation capacity was greater than needed. On one of the farms the ventilation capacity of the fans was only a fraction of the recommended value. All except two of the existing fans were old and did not have airflow or efficiency ratings. All of these fans were replaced with the most energy efficient models available. Measurements of the carbon dioxide and ammonia concentrations were taken under minimum airflow conditions and were at or below the target values of 3,000 ppm CO<sub>2</sub> and 10 ppm NH<sub>3</sub>. Electrical energy use and demand were measured for each fan. The results indicated that the energy savings would pay for the difference in price between the most and least efficient fans in 2.2 years or less.

The light levels in the milking, feeding, and animal housing areas were measured and were found to be considerably less than the recommended values. New, state-of-the-art, fluorescent (T8) lighting systems were designed and installed to provide the proper illumination level, uniformity, and color for each task area. Photoperiod control was provided by controlling fixtures in the animal housing area to provide at least 16 hours of light per day. Research has indicated that such supplemental lighting can increase milk production by 5 to 8%. Measurements were taken

for the new lighting systems to verify that the appropriate light levels and uniformity were provided. The annual electrical energy use and demand of each lighting circuit was determined. It was found that photoperiod control accounted for 38 to 67% of the annual energy use for lighting. In addition, the added net milk income from photoperiod control could pay for the installation costs of the lighting system for the entire dairy facility in 2 years or less.

Four on-farm meetings and seminars were held at the project sites for dairy producers, equipment dealers, and veterinarians. The total attendance at these meetings was 150. Results from this project have been presented at international conferences and included in several educational publications.

## **Publications**

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