

# Predictive Controller that Optimizes Energy and Water Used to Cool Livestock

Tech ID: 31764 / UC Case 2020-003-2

## ABSTRACT

Researchers at the University of California, Davis have developed a controller that applies environmental data to optimizing operations of livestock cooling equipment.

## FULL DESCRIPTION

Heat stress in dairy cows causes multiple detrimental effects. It reduces milk production, decreases reproductive efficiency and can cause premature deaths of the cows. These concerns have led to increased interest in developing improved methods for identifying and addressing conditions likely to produce such heat stress. Current methods of controlling bovine heat stress include water spraying, as well as fans to increase air circulation. Existing controllers for fans and sprayers are based primarily on temperature indications, with some technologies also incorporating humidity measurements. However, the computational basis behind many of the algorithms built into these controllers remain unsophisticated (with many field programmed based on subjective human observations). Thus, there is a need for a sophisticated controller that can optimize the operation of cooling equipment based on real-time changes in ambient environmental factors.

Researchers at the University of California, Davis have developed a controller that adjusts water rates and fan conditions based on environmental data fed to a predictive heat transfer model. The model assesses animal heat transfer rates based on correlations in the model that have been specifically developed for livestock. This technology can be applied either to currently-existing cooling systems or integrated into the development of new systems. Moreover, this technology - developed and implemented originally for dairy cows - can also be adapted to optimize cooling processes for other livestock.

## APPLICATIONS

- ▶ Optimizes cooling methods for dairy cows and other livestock
- ▶ Can either be adapted to existing systems or integrated into new systems

## FEATURES/BENEFITS

- ▶ Relatively inexpensive when compared to other, less-sophisticated, heat stress management systems for livestock
- ▶ Can calculate cumulative heat stress impacts in livestock
- ▶ Uses sophisticated weather data as inputs into optimization algorithms
- ▶ Reduces electricity and water usage
- ▶ Can be adapted for multiple types of livestock

## PATENT STATUS

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## OTHER INFORMATION

### KEYWORDS

Dairy cows, Livestock  
 heat stress, Controllers,  
 Energy savings,  
 Algorithm, Water usage,  
 Cooling system

### CATEGORIZED AS

- ▶ **Agriculture & Animal Science**
  - ▶ Animal Science
  - ▶ Devices
- ▶ **Computer**
  - ▶ Hardware
  - ▶ Software
- ▶ **Environment**
  - ▶ Sensing

Country	Type	Number	Dated	Case
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United States Of America	Issued Patent	<a href="#">12,137,666</a>	11/12/2024	2020-003
Patent Cooperation Treaty	Published Application	<a href="#">2021/055995</a>	03/25/2021	2020-003

- ▶ **Sensors & Instrumentation**
  - ▶ Environmental Sensors
  - ▶ Process Control
- ▶ **Engineering**
  - ▶ Robotics and Automation

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2020-003-2

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