

# Technology takes heat stress into account

This state-of-the-art controller helps improve cow comfort and energy use by assessing more than air temperature

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Dairy facilities typically use simple thermostats or conventional stage controllers to automatically control barn ventilation and cow cooling equipment. These methods use the current inside temperature value and a manager-defined target temperature to determine which stage of ventilating and/or cooling equipment to activate.

Conventional controls merely react to air temperature changes; they don't recognize accumulated heat stress.

A Time Integrated Variable (TIV) controller overcomes that shortcoming. Like a conventional staging controller, it makes decisions based on the barn air temperature and the target temperature. But the TIV goes a step further: it uses a quantity referred to as the inside temperature TIV to slightly modify its control decisions when cow heat stress is perceived.

The TIV value is the average inside temperature for the last 12 hours, or a 12-hour rolling temperature average, and is an indication of the cumulative heat stress that animals have been subjected to. The controller operates the ventilation and cooling systems longer to remove accumulated heat stress and elevated body temperature, compared to a conventional stage controller. In effect, the TIV controller tries to over-cool animals once heat stress has occurred to compensate for periodic heat stress.

## How TIV works

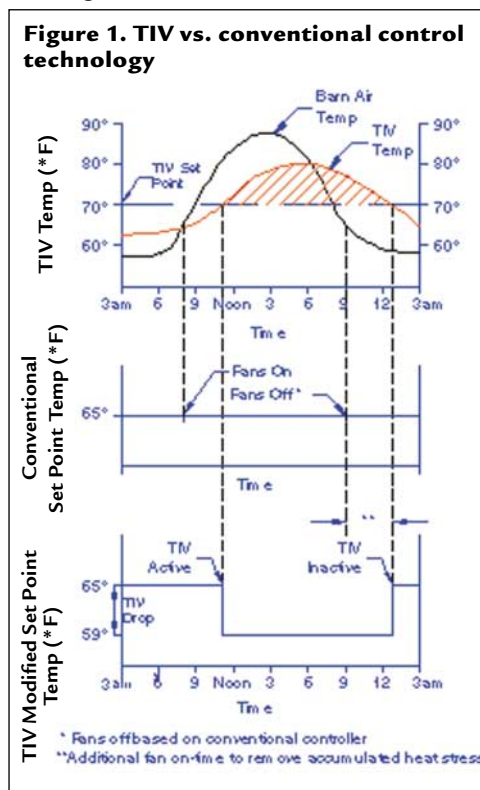
A TIV controller is a microcontroller-based staging temperature controller designed to interface with ventilation and cooling equipment. It calculates and maintains a running record of the average inside temperature for the last 24 hours of operation and compares an instantaneous 12-hour TIV value to a user-selected target TIV value.

Based on field research, we recommend starting with a setting of 65 degrees. If the instantaneous 12-hour TIV value is greater than the TIV set point temperature, the TIV

controller switches to the TIV-active mode.

When TIV is active, the staging controller operates as if the target temperature was 6 degrees lower than the value the barn manager actually selected. This increases the time that each bank of fans and evaporative cooling equipment operate before they turn off. (Figure 1)

**Figure 1. TIV vs. conventional control technology**



## Using a TIV controller

The technology can be used in freestall and tiestall barns with mechanical (tunnel) ventilation, natural (curtain) ventilation and supplemental cooling systems that use fans, misters or sprinklers. It can switch between natural and tunnel ventilation systems to ensure a quality environment at the most efficient energy costs.

Research done in the summer of 2001  
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## FYI

■ Thevco Electronics, Quebec, has licensed the rights for manufacturing TIV controllers. Contact the company at (450) 926-2780. Its equipment is also available through Northeast distributors such as Aerotech. Tel: (800) 227-2376.

■ For more on TIV technology, see the new PRO-DAIRY facilities program web page: [www.prodairyfacilities.cornell.edu](http://www.prodairyfacilities.cornell.edu). Check out these articles:

■ Time Integrated Value Environmental Control Technology: Step Up to the Times

■ Tunnel Ventilation for Freestall Barns

■ Economics of Tunnel Ventilation for Freestall Barns

■ Heat Stress Relief for Dairy Cows

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