

## 7 Mistakes to Avoid in Holding-Pen Cooling

*What's the hottest place on the farm?*

by Shirley Roenfeldt

Reprinted with permission from *Dairy Herd Management*.  
(Wednesday, February 1, 2006)

The holding pen. And it's also the place where the most mistakes are made or shortcuts taken in terms of cooling cows. In fact, researchers at Kansas State University have followed cows around on several farms, taking temperatures to gauge heat stress. And what they have found is that "the holding pen is definitely a problem," says Mike Brouk, extension dairy specialist at Kansas State. "We have learned a lot about how to keep cows cool, but for some reason there are fewer follow-throughs in the holding pen than in other areas of the farm in terms of combating heat stress." Here's how to overcome the top seven mistakes made in holding-pen cooling.



**Group size grew, but holding-pen size didn't.** Oftentimes, when the dairy grows, the parlor grows also. Then, cow group size becomes bigger in order to match parlor throughput goals, explains Jake Martin, consulting agricultural engineer in Gainesville, Fla. People plan to increase parlor size as they grow, but don't always remember to change the holding-pen size, too.

The holding pen should be sized to allow 15 square feet per cow. So, if your cow group originally was 160 cows, your holding pen was probably 32 feet by 75 feet, or 2,400 square feet. But now, with 200 cows per group, you need 600 more square feet to maintain the goal of 15 square feet per cow. In that scenario, recommended holding-pen size would be 32 feet by 96 feet.

### **Holding pen was expanded, cooling was not.**

When this happens, people usually justify it on the theory that cows won't spend much time in the back part of the holding pen, so it's not necessary to expand the cooling capacity.

However, using the same example cited above of growing from 160 cows to 200 cows, you would add 21 feet to the length of the holding pen. And, assuming that 60% to 70% of the fans and sprinklers were located in the front half of the original holding pen, you now have a large area in the back half of the new larger holding pen that does not have adequate cooling.

For details on the number of fans and sprinklers needed, refer to the charts "Ventilation requirements based on holding-pen capacity" and "Sprinkler nozzle requirements based on holding-pen capacity."

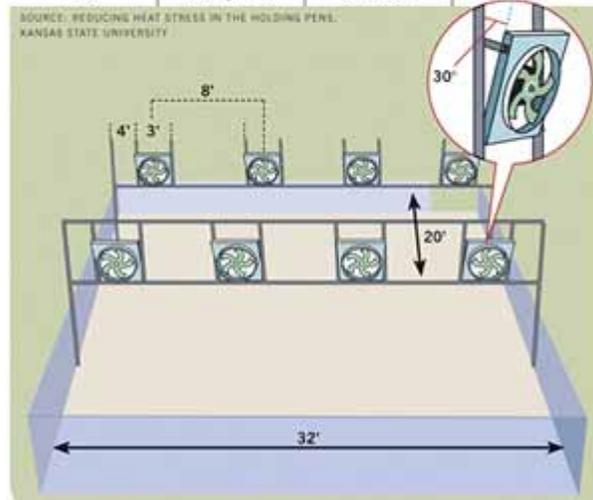
**Failure to use automatic controls to trigger the cooling system.** If you spent the money to install cooling in your holding pen, but didn't install automatic controls to turn the cooling system on and off as conditions change, you probably aren't getting the best return on your investment, says Brouk.

Fans should be set to turn on at 65° F and must run year around as needed. In addition, soakers should be used to wet the cows' skin to take advantage of evaporative cooling.

### Ventilation requirements based on holding-pen capacity

HOLDING PEN SIZE (COWS)	TYPICAL PEN SIZE (FEET BY FEET)	TOTAL FAN CAPACITY (CFM)	NUMBER OF 36-INCH FANS
60	24 by 42	60,000	6
80	24 by 50	80,000	8
100	32 by 48	100,000	10
120	32 by 56	120,000	12
160	32 by 75	160,000	16
200	32 by 96	200,000	20
300	32 by 144	300,000	30

SOURCE: REDUCING HEAT STRESS IN THE HOLDING PEN, KANSAS STATE UNIVERSITY



Soakers should be triggered starting at 68° F to 70° F and set to soak cows every five to six minutes.

In addition, you should invest in a controller that will automatically turn the cooling system back on a few minutes after the manual override has been used to shut it off. That way, if an employee uses the manual override to shut off the cooling system before entering the holding pen to bring cows into the parlor, it doesn't matter if he forgets to turn it back on.

**Failure to make timely repairs to the cooling system.** When the vacuum pump fails, employees race to get it fixed. But when a fan blows out or a sprinkler head in the holding pen quits, it's not viewed as urgent. Then, before you know it, a couple of weeks have passed — or sometimes months — and it's still not fixed, says Martin.

Regular preventative maintenance is needed to keep the cooling system performing as expected. In addition, you need to explain to your employees the value of the cooling system so that they understand the importance of fixing cooling system components promptly.

**Bringing the next group of cows up too soon.** In an effort to meet their parlor-throughput goals, some dairies bring the next group of cows up too soon, explains Brouk. So, you end up with cows waiting outside the holding pen where there is no cooling — and sometimes not even a roof or shade to protect them from the sun. This practice not only heats cows up unnecessarily, but leads to cows spending too much time away from the feedbunk and their beds.

The next group of cows should arrive as the last group of cows in the holding pen enters the parlor. Holding pen time should not exceed two hours per day for any cow. Therefore, on dairies that milk 3X, time spent in the holding pen should not exceed 40 minutes per milking; in 2X herds, it should not exceed 60 minutes.

**Not using exit-lane cooling.** Failure to use exit-lane cooling is a lost opportunity. Soaking cows as they leave the parlor helps keep them cool until they get back to their pens.

In addition to having water troughs for the cows to drink when they leave the parlor, you should install a system to soak cows in the exit lane as they leave.

**Improper design.** A lot of times you go on farm and see producers doing everything right in terms of cooling the cows in the free-stalls. But then you visit the holding pen and find no fans and no sprinklers. Or, you find a holding pen that was just not designed correctly, which makes cooling the cows even more difficult.

Use the following thumb-rules to evaluate your holding-pen cooling. If you do not meet any of the criteria, look at it as an opportunity to improve.

- Sidewalls on holding pens should be at least 12 feet tall and as open as possible.
- Open the ridge to allow hot air to escape through the roof. The ridge opening should be 2 inches wide for every 10 feet of building width. If the ridge can't be opened, use large roof vents or mechanical ventilation to remove hot air trapped beneath the roof.



### Sprinkler nozzle requirements based on holding-pen capacity

HOLDING PEN CAPACITY	TYPICAL PEN SIZE (FEET BY FEET)	WATER REQUIRED (GALLONS) ***	MINIMUM FLOW RATE (GPM)*	NUMBER OF 360° NOZZELS REQUIRED **
60	24 by 42	25	12	20
80	24 by 50	30	15	27
100	32 by 48	40	20	34
120	32 by 56	45	23	40
160	32 by 75	60	30	54
200	32 by 96	80	40	68
300	32 by 144	120	60	102

\*Flow rate based on a two-minute cycle with 10 minutes off.

\*\*Assume nozzels have an 8-foot spray diameter and 0.5 gpm capacity.

\*\*\*Assumes application of 0.025 gallons (0.04) of water per cycle per sq. ft. of pen area.

SOURCE: REDUCING HEAT STRESS IN THE HOLDING PENS, KANSAS STATE UNIVERSITY

- Use a roof with a 4/12 slope and a height of 14 to 16 feet.
- Use trusses built to support the additional weight of your cooling system. Remember, large fans can weigh 100 pounds or more apiece.
- Provide 1,000 cfm/cow. That equates to one 36-inch fan for every 10 to 12 cows.
- Provide a clearance of at least 8 to 9 feet (from the bottom of fans to the floor) so equipment can get by underneath and the crowd gate can reverse to the back of the pen.
- Use a soaker system that wets the cows through to the skin. Irrigation nozzles with 360-degree coverage that provide 0.03 gallons of water per minute per square foot work well.
- Never use a sprinkler system without mechanical ventilation.
- Make sure the electrical system is watertight to prevent safety hazards.

For a more comprehensive explanation of these thumb-rules, check out “Reducing Heat Stress in the Holding Pens” from Kansas State University. You can find it online at: <http://www.oznet.ksu.edu/library/lvstk2/mf2468.pdf>.

**Holding-Pen Cooling Pays** when the temperature exceeds 80° F, cows give off approximately 4,500 BTUs per hour. So, it’s only natural when you locate a lot of cows in a small space, such as the holding-pen, that body temperatures rise. Research shows that a cow’s body temperature will increase by 3° F in 20 minutes in a holding-pen where there’s no cooling. By contrast, a cow’s body temperature will drop by 3.5° F in that same 20 minutes when fans and a soaker system are used. To top it off, research conducted in the early 1980s by Dennis Armstrong at the University of Arizona showed that cooling cows only in the holding pen increased milk production by 1.7 pounds per day in the summertime.