

# Kansas Agricultural Experiment Station Research Reports

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Volume 0  
Issue 1 *Cattleman's Day (1993-2014)*

Article 1056

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1985

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### Recommended Citation

Murphy, P.; Pope, Ronald V.; Nichols, David A.; and Riley, Jack G. (1985) "Effect of water temperature on cattle performance," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 1. <https://doi.org/10.4148/2378-5977.2459>

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## Effect of water temperature on cattle performance

### Abstract

When average outside air temperature was about 40 F, water temperatures of 40, 60, Of' 80 F had little effect on water intakes of yearling steers and heifers. In addition, there were no significant differences in average daily feed or efficiency. No electrical energy was required to maintain water at 40 F, and it took about twice as much electricity to maintain water at 80 F instead of 60 F.

### Keywords

Cattlemen's Day, 1985; Kansas Agricultural Experiment Station contribution; no. 85-319-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 470; Beef; Temperature; Performance

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## Effect of Water Temperature on Cattle Performance<sup>1</sup>

Dave Nichols, Pat Murphy<sup>2</sup>,  
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### Summary

When average outside air temperature was about 40 F, water temperatures of 40, 60, or 80 F had little effect on water intakes of yearling steers and heifers. In addition, there were no significant differences in average daily feed or efficiency. No electrical energy was required to maintain water at 40 F, and it took about twice as much electricity to maintain water at 80 F instead of 60 F.

### Introduction

Kansas has a feedlot capacity of about 1.4 million head. Assuming 1 waterer per 100 head, that accounts for about 14,000 waterers. Most waterers use an electric element and a thermostat to prevent freezing. Electrical usage of waterers depends on the waterer and insulation, number of cattle watered, temperature of incoming water, outside temperature, and other factors. Since the cost of operation increases as the heated water temperature increases, it is desirable to operate the waterers at the lowest possible water temperature consistent with optimal animal performance. An additional concern must be to prevent freeze damage to the waterer.

When cattle consume large quantities of cold water, heat energy from the animal is needed to raise water up to body temperature. A producer has to decide between two alternatives: 1) warm the water offered to the cattle to reduce feed energy required or 2) allow the animal's feed energy and heat increment to warm the water. If a producer chooses to heat water, he must also decide on an acceptable temperature.

Our study examined the effect of water temperature on animal performance and electricity costs for water heating.

### Experimental Procedures

Twenty four steers and heifers (6 pens of 4 head) were assigned to one of three water temperature treatments: 40 F, 60 F, or 80 F. Cattle averaged 528 lb initially, and were fed an 89% dry matter ration containing milo, alfalfa pellets and cottonseed hulls for a six-week period (1/24 - 3/6/84).

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<sup>1</sup> Appreciation is expressed to Mirco Corp., Grinnell, IA for providing insulated automatic waterers and funding.

<sup>2</sup> Department of Agricultural Engineering.

Water temperature and intake were measured daily. Cattle and feed were weighed weekly to measure feed intake, gain, and feed efficiency. Daily minimum and maximum ambient temperatures were recorded. Water heaters for the 60F and 80F treatments were equipped with electric meters to measure daily electric usage.

### Results and Discussion

No differences were observed in daily water intake, feed intake, daily gain or feed efficiency (Table 19.1). Significantly more electric energy was required to maintain water at 80 F versus 60 F. Thus, heating water above 40 F increased cost of production and failed to improve performance. Water consumption was more highly correlated to daily minimum ambient air temperature than to water temperature.

When buying waterers, choose those that prevent freezing but also minimize electrical use. When several waterers were checked at random, we found water temperatures ranged from a low of 40 F to a high of 100 F. The thermostats in many fountains do a poor job of regulating water temperature. In our study, waterers were highly insulated, with a minimum amount of exposed water surface. The daily energy cost per waterer was 26¢ for the 80 F and 12¢ for the 60 F. Waterers without sufficient insulation and with large open bowls are extremely expensive to operate at high water temperatures during cold weather.

In choosing and installing waterers, several factors must be considered:

1. The waterer should supply adequate clean, fresh water regardless of air temperature.
2. The waterer should be easily accessible to livestock and there should be no hazard of electrical shock. Be sure the unit is properly grounded and installed according to manufacturer's recommendations.
3. The waterer should be well insulated and energy efficient. Replacement of many old waterers could be paid for by energy savings alone.
4. The supply line to the waterer should be insulated to prevent freezing. Shut-off valves should be placed below the frost line to turn off the waterer when not in use.
5. The waterer should be easily drained and cleaned. In addition, floats and valves should be readily accessible.
6. The waterer must be reasonably trouble free. When stock tanks were the primary watering device, breakdowns were less serious. But most waterers today have small reservoirs and cattle can soon become thirsty.
7. Thermostats that lack precise control may lead to freeze-ups or water overheating. Both are expensive. Check thermostats regularly to see that they are working properly.

8. The open surface of the waterer should be minimized. Large open troughs are more expensive to keep unfrozen, unless the water is constantly moving.

Table 19.1. Effects of Water Temperature on Cattle Performance and Electricity Costs

Item	Water Temperature, F		
	40	60	80
Daily Water Consumption, gal/hd	5.8	5.9	6.1
Daily Feed DM Intake, lb	19.4	19.2	20.5
Daily Gain, lb	2.67	2.55	2.95
Feed/Gain, lb	7.27	7.53	6.96
Daily Electric Usage KWH/waterer	—	1.72	3.75
Daily Electric Cost/Waterer <sup>a</sup>	—	\$ .12	\$ .26

<sup>a</sup>At @7¢/KWH.

