

Cooling Ponds for Dairy Cattle¹

D. R. Bray²

Introduction

Cattle have used water for cooling probably for as long as there have been cattle. The last survey done in Florida reported that 30% of the dairies had cooling ponds. The reader should be aware that cooling ponds, if not maintained properly, could harbor infectious diseases such as Leptospirosis and many mastitis organisms. The water usage is very high to fill and keep full. Environmental concerns that must be addressed are the run-off from ponds and ground seepage. Every state seems to have many regulations that must be addressed before building cooling ponds. Again, this paper will deal with the benefits of cooling ponds and some suggestions on building and maintaining them. It is the dairymen's responsibility to use them properly and to be aware that ponds can harbor diseases and the pond water must be dealt with according to state and local laws.

What is a cooling pond for dairy cattle? For this discussion they are a man made hole in the ground with a constant inflow of clean fresh water. Usually the ponds drain or overflow from the top. If a series of ponds is used, the overflow water may be run into a retention pond to be irrigated on crops or enter the waste management system. Cooling ponds may also be fed from springs or artesian wells. So cooling

ponds for dairy cattle should have constant fresh water in and a constant outflow of water to some place for proper disposal.

Cement ponds may also be built. These may drain from the bottom and can be used to flush feed lanes or barns. Bottom draining will help remove some of the solids that have settled to the bottom of the pond. Care must be taken on the entrance and exit to cement ponds. These may be very slippery if the cement is not cross-grooved. A stagnant pond without fresh water entering, a lagoon, a wallow, and a mudhole do not classify as a cooling pond for dairy cattle.

Site Selection

A site near the feed and drinking water, ideally with some form of shade for cows, is best. The idea is for cows to cool, leave the pond and go eat and drink, lay down in the shade and then do it all over again. If cows do not have feed and drinking water near, they will stay in the pond and not eat and you will have cool wrinkled cows that do not give much milk.

Cooling ponds should be located close to a water supply as fresh water needs to enter the ponds constantly.

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2. David R. Bray, Extension Agent IV, Animal Sciences. Animal Sciences Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.

There must be a way to dispose of runoff water properly. This will vary by areas of the country. Some slope from the ponds to the waste management area would be helpful, so pumps need not to be used.

Cooling ponds should not be too far from the milking parlor as long walks in the sun increase heat stress. Exit lane sprinklers help make the long walk more comfortable.

Basic Considerations For a Pond

Sandy soil bottoms in Florida cooling ponds seem to seal themselves. Most soils would probably do this, however, I have no idea as far as feet going into the clay. There should be no sharp rocks to injure feet in the ponds or on the exit or entrance to the ponds.

If feet stick in the mud in the bottom of the ponds or in the entrance or exit lanes of the ponds, cow carpet can be used to cover the pond bottom and its entrance and exit. Carpet usually comes in 20 foot widths and can be sewn together to make a wide area that will protect cows feet from going any further than the carpet surface. This carpet can also be used in cow lanes. It costs about \$1.00 a square yard. There are many suppliers of cow carpet or road underlayment cloth.

Concrete Ponds

Concrete ponds will work and have been used but they are expensive to build. However, they are easier to maintain, as the entrances and exits do not have to be rebuilt. The finish of the concrete on exit and entrance slopes should be cross-grooved to prevent cows from falling. A 1:8 slope would be a safe slope if concrete ponds are constructed.

Sizing Cooling Ponds

There is no official listing for cooling pond size. If a holding area requires $15/\text{ft}^2$ / cow and cows are driven into a pond and taken out as a group then $15/\text{ft}^2$ / cow might be adequate. If $50/\text{ft}^2$ / cow is recommended for most general animal space, then this might be the correct figure for a cooling pond. This amount of space would allow cows to enter and exit the pond at all times when all cows were not

using the pond at the same time. If $50/\text{ft}^2$ / cow for a pond is used, then $5000/\text{ft}^2$ is then needed for the 100 cow group.

Pond Shapes and Depths

Using the sample of $5000/\text{ft}^2$ /100 cows a pond could be 50' wide X 100' long, or a circle 80' in diameter ($A=(\text{Pi}) r^2$; $A= 3.14 \times 40 = 5024\text{ft}^2$). If a 50' X 100' pond is used and the sides are fenced so the cows can only enter or exit at each end of the pond, the amount of dirt falling into the pond will be reduced. If a circular pond is made, cow carpet should be used to eliminate the problem of dirt falling in the pond. As cows can swim, pond depth is not a problem. Deeper ponds may allow the settling of organic matter on the bottom of the pond. This organic matter may not be disturbed by cows walking through it as they will swim over the top of it. Preference should be given to depths of 3' or 4' as it seems to cool the cows and let them stand and walk in and out at will. While deep ponds allow cows to submerge, they do not seem to like to float too long so they go to where they can stand and may block cow traffic. A circular pond that is deep in the middle lets cows dunk themselves while others enter and exit the pond at will.

Water Usage

A 100 cow group with $50/\text{ft}^2$ / cow could have a 50' wide X 100' long X 3' deep cooling pond (it may be 4' in the middle and slope in and out). A cooling pond 50' wide X 100' long X an average 3' deep= $15000/\text{ft}^3$. There are 7.48 gallons/ ft^3 , thus the pond requires 112,200 gallons of water.

The pond must be filled and then kept fresh with running water at all times while in use. A 1" pipe 300 ft. long and water pressure at 35psi will result in a flow rate of about 23.5 gpm. At this rate it would then take 80 hours to fill the pond initially.

The dairy water usage would then be 1,410 gph X 24 hours or 33,840 gallons of water per day. This fresh water must be pumped into the pond and there is going to be close to that amount of run off water that will exit the pond for disposal.

Water Run-off

Disposal of run-off water must be in accordance with whatever local, state, and federal laws that apply. Many dairies run the water into the waste management system, while others add it to retention ponds to be used for irrigation.

Shading Over Ponds

Experience has led to discontinued use of shade over ponds as the cows never leave the ponds. Remember, the object of this exercise is to increase dry matter intake and cows will not eat much soaking in the pond.

Pond Maintenance

At least once a year, usually during the winter, the pond should be fenced and the water removed by pumping. The mud and manure on the bottom of the pond should be removed and the pond left empty for the sun to shine on it.

In the spring, the pond should be filled again and the fences removed. Some people just fence the pond in the winter, dig a new pond and fill in the old one with new pond's dirt.

Mycoplasma mastitis is often cultured in water from cooling ponds. This is a real problem if pulsators do not work well resulting in damaged teat ends. Many herds with mycoplasma positive ponds, have no mycoplasma in the bulk tank. If the water is filthy, cows should not be permitted in the ponds and the ponds should be pumped dry. The sludge should be cleaned and the ponds filled with water again. Both the sludge and the water should be removed from cow areas.

Cooling Ponds to Reduce Body Temperature

In the summer of 1986, an experiment was conducted at a North Florida dairy that was using man-made cooling ponds. Ten early lactation Holstein cows were fitted with radio transmitters that transmitted inner ear temperatures every five minutes to a radio receiver and data logger. Data were collected over a four-day period in mid-August. The

cows' activities were also monitored during this time. Entering and exiting the ponds, eating, drinking and laying were recorded.

The cooling ponds lowered the cows' temperature by 1-2°F depending on the time of day they entered the cooling ponds. The average length per stay in the pond was 18 minutes for events from midnight to noon and 12 minutes per visit from noon to midnight. It was obvious that cooling ponds cooled cows.

Pond Water Quality

In 1987, samples were taken from a dairy's man-made earthen ponds. The ponds were sampled weekly from May 19, 1987 to September 28, 1987. Six to ten ponds were sampled each week.

Total bacteria counts (TBC), varied greatly from week to week. This may have been due to no water entering the ponds. There did not seem to be any great increase in total bacteria counts or coliform counts as time progressed. The total bacteria count averaged 3,133,700 CFU/ml for all ponds for the 20 weeks. The coliform counts averaged 14,340 CFU/ml for the same period.

Cooling Ponds and Their Effect on Milk Quality

In a previous study on a dairy in Florida with man-made cooling ponds, it was reported that cows exposed to cooling ponds did not experience more clinical mastitis than cows that did not have access to cooling ponds. In fact, cows exposed to cooling ponds during the trial period were only half as likely to develop a case of clinical mastitis as cows not exposed to cooling ponds (Table 1).

Clinical Mastitis Organisms

The same dairy had provided its clinical mastitis records for several years. The total number of clinical mastitis cases was high in the first quarter of the year and then declined sharply about the time hot weather came and the cows started using the ponds. The incidence stayed low, even in the last quarter of the year when the ponds were not in use. This can be explained many ways. The first quarter of the year

was an extremely wet period. The cows were quite dirty and the cow wash system was available to one-half of the herd. This may explain some of the variation, even though one-half of the herd had never had a cow wash. Another confounding variable was that this herd switched to Clorox for pre- post-teat dipping in April of that year. It had previously pre- and post-dipped with a Chlorhexidine product. From this it could be concluded that Clorox caused the reduction of clinical mastitis. However, there were no controls in this study, one could conclude nothing except that the ponds did not increase clinical mastitis.

This herd was on a lactation treatment study during the summer of 1987 (Table 2). A total of 40 cows were sampled and treated. There were no unusual organisms treated. These 40 cows were not all the cows treated for clinical mastitis during the period the cows had access to the ponds, but the results were encouraging.

Statewide Effects of Ponds on Milk Quality

Regulatory samples for all the herds in Florida were obtained from the Division of Dairy Industry for the year of 1987 and were analyzed for the effects of no ponds, man-made ponds and natural ponds. The numbers presented are least squares estimates of Standard Plate Counts (SPC) and Direct Microscope Somatic Cell Counts (DMSCC) for each month. The data are not biased by different numbers of dairies with no ponds, natural, or man-made ponds. The data were analyzed by herds whose milking cows had access to ponds as indicated on the survey.

The data indicated that milking cows with access to man-made cooling ponds had lower SPC and DMSCC counts than other herds in the state with no access to ponds and that herds with natural ponds were higher in both categories. From these data it could be argued that people who built man-made ponds were better managers and thus had higher milk quality.

Summary

From the data collected on cooling ponds it can be concluded that cooling ponds are effective in cooling cows. There are 32 percent of the dairies in Florida with cooling ponds and more will most likely be built. Man-made cooling ponds don't seem to increase clinical mastitis and herds with man-made cooling ponds have higher quality milk as measured by standard plate count and somatic cell count. Herds with natural cooling ponds have decreased milk quality compared to herds with man-made ponds or herds with no cooling ponds.

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Table 1. Incidence of Clinical Mastitis - 1986. (a differs from b (p- less than- .01))

Group	# Cows	# (%) Cows clinical	# Qtrs.	# (%) Qtrs. clinical
Ponds	817	79 (9.8)a	3268	95 (2.9)a
No Ponds	375	70 (18.6)b	1500	96 (6.4)b

Table 2. Lactation Treatment Study (Summer 1987) (40 cows were sampled)

Organism	Staph. Aureus	Staph. Species	Strep. Ag	Strep. Dys.	Strep Uberis	E. Coli	Other Gram Neg.	C. Pyo.	C. Bovis	Nocardia	No Growth
#	3	2	0	4	9	4	3	1	1	3	10