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Reducing phosphorus levels in wastewater

This fact sheet is part of a series for dairy farmers and others in the dairy industry concerned about managing wastewater generated from milking activities. The series introduces practices and devices that help conserve water, energy and cleaning chemicals. Ways to treat and dispose of milking center wastewater are also discussed. The goal is to help dairy farmers operate in a more profitable and environmentally-sound manner.

The information presented here reflects state-of-the-art concepts in milking center resource conservation and wastewater disposal. As research into new technologies goes forward, advances in milking center wastewater management will continue.

Titles in this series include:

*Controlling Milking Center Wastewater:
An Overview (A3608)*

*Estimating the Volume of Wastewater
(A3609)*

Managing Waste Milk (A3610)

*Treating and Disposing of Wastewater
(A3611)*

*Reducing Phosphorus Levels in Wastewater
(A3612)*

*Conserving Water in the Milking Center
(A3613)*

This series was developed by the University of Wisconsin–Extension with cooperation and financial assistance from the Water Quality Demonstration Project–East River.

Milking center wastewater contains certain substances which can pose environmental problems when they are disposed of improperly. One such substance is phosphorus. When a waste treatment system malfunctions or performs inadequately, phosphorus may escape to surface waters and degrade the environment.

Phosphorus enters wastewater from pipeline cleaning chemicals, waste milk and manure. When phosphorus is treated and disposed of properly, it is absorbed by the soil and plants. If your treatment system is inadequate, however, phosphorus can accumulate in surface waters where it creates favorable conditions for algae and aquatic plants. Excess vegetation and decaying organic matter can choke a lake and interfere with recreational uses. Respiring and decaying vegetation also consume oxygen, and may cause fish kills.

This fact sheet suggests practices and devices to help you reduce the phosphorus content of milking center wastewater. Many of the ideas presented here can also help you reduce hot water and chemical cleaner costs, as well as lower the risk of environmental damage.

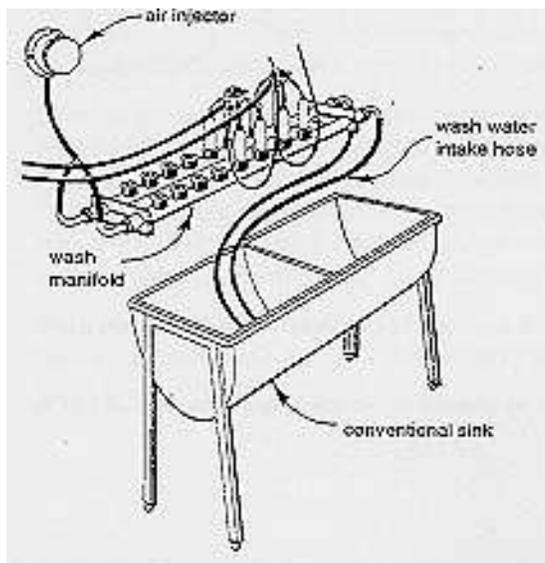
Reducing phosphorus from cleaning chemicals

Clean the milking system more efficiently

Pipeline milking systems are usually cleaned by partially immersing the milking units in a round-bottomed milkhouse sink. Cleaning solutions in the sink are drawn through the teat cup ends; they then pass through the pipeline, and return to the sink. Because of the sink's design and the tendency for inflations to float or spread out, you often need a fairly high level of cleaning solution to keep the unit immersed. This excess solution has been identified as a source of chemical cleaner and water waste—particularly with larger sinks.

Milking unit wash manifolds (figure 1) and conservation sinks (figure 2) are devices that, when properly adjusted, deliver the minimum amount of water and chemical cleaner needed for cleaning. To increase cleaning efficiency, you may construct a stainless steel rack for the milking units and place it into a round-bottomed sink (figure 3). In parlor milking systems, unit washers (essentially individual milking unit wash manifolds) can be installed at each station. All these devices can provide significant savings in water and chemical cleaners. For more information, see *Conserving Water in the Milking Center* (A3613).

Figure 1. A milking unit wash manifold with milking units in place for cleaning.



Install a water softener or increase softening time

Water in Wisconsin tends to be hard, meaning it contains substantial amounts of dissolved calcium, magnesium and iron. As water hardness increases, detergent's effectiveness decreases, and you need more detergent to get the cleaning job done. Water softeners work by replacing magnesium, calcium and iron with sodium. Softening the water used in the milking center reduces the amount of detergent required for cleaning. It also reduces mineral buildup (scaling) on water heater surfaces, so water heaters become more energy efficient and last longer.

Water hardness is reported as grains per gallon (gpg) or mg/l of calcium carbonate. One gpg is equivalent to the hardness produced by 17.1 milligrams of calcium carbonate per liter (mg/l). Detergents used to clean milking equipment work well at a hardness of 20 gpg or less, so a water softener is useful for conserving detergents when water contains more than 20 gpg of hardness. It is essential to service softeners regularly to keep them functioning properly.

Figure 2. Cross-section of a water-saving (conservation) sink with a milking unit in place for cleaning.

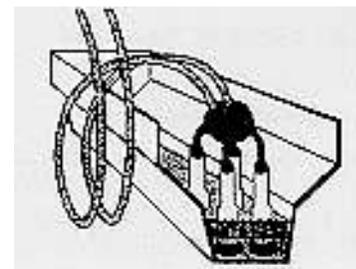
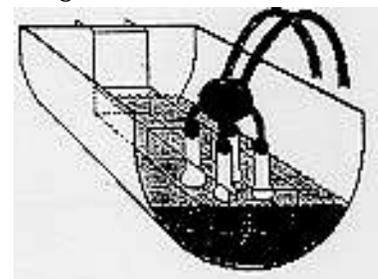


Figure 3. A stainless steel rack inserted into a milkhouse sink to hold milking units during cleaning.



Iron stains plumbing fixtures and contributes to water hardness. An iron content of more than 10 mg/l (0.6 gpg) may foul your water softener. It is advisable to conduct a water test and consult with a professional to find out whether to be concerned about iron content. If iron is a problem, you can correct it by fitting a filter to the water system.

To obtain the full benefits of a water softener and iron filter, reduce the amount of cleaning chemicals you use.

Use low-phosphorous cleaning chemicals

It is a good idea to purchase detergents and acid rinses with low phosphorus to clean milking equipment. Many of these products contain half as much phosphorus as traditional chemical cleaners but are just as effective if the washwater is softened adequately (20 gpg or less).

Consult your milking equipment technician before you change your cleaning regimen. New chemical cleaners should initially be subjected to a trial period of milk quality tests (for example, plate loop counts) to evaluate their effectiveness.

Install an automatic, programmable clean-in-place sanitation system

Automating milking system cleaning with a modern, clean-in-place (CIP) system gives you consistent control over water use, chemical cleaner concentration and cleaning cycle timing. Savings in water and detergent use and improved overall sanitation are possible with a CIP. Such a system requires periodic maintenance to ensure optimal performance and accurate dispensation of chemicals.

You can enhance CIP system performance by installing and properly tuning air injectors (see *Conserving Water in the Milking Center* (A3613)).

Reducing phosphorus from milk and manure

Practices that prevent milk and manure from entering milking center drains also help reduce phosphorus levels. These practices are discussed in detail in *Managing Waste Milk* (A3610) and *Conserving Water in the Milking Center* (A3613), and will simply be listed here.

Reduce the waste milk content of milking center wastewater

- Prerinse milking units, pipelines and the bulk tank before cleaning, and keep the rinsate. Feed this milky solution to calves or hogs, or spread it on land.
- Feed colostrum and transitional milk to calves or hogs (if possible), or land spread.
- Improve herd health management to decrease mastitic and antibiotic-contaminated milk. Feed such milk to calves or hogs if at least one milking has taken place since the animal was treated with antibiotics, the milk appears normal, and it does not come from a cow with a fever. If the milk is not fed to animals, it should be land spread.
- Collect spilled milk and remove it from treatment systems if necessary. Land spread milk from spills, bulk tank failures and rejected bulk tank loads.

Reduce the manure content of milking center wastewater

- Scrape milking parlor and holding area floors to remove manure and hoof dirt prior to hosing. Deliver collected solids to manure storage for eventual application to fields.
- Do not feed grain in the milking parlor.
- Handle cows gently.
- Use a crowd gate.
- Keep cows clean in the housing area.

For more information

For a more detailed discussion of milking center wastewater management, see *Pollution Control Guide for Milking Center Wastewater Management (A3592)* by R. E. Springman, D. C. Payer and B. J. Holmes, available from your county Extension office or from Cooperative Extension Publications at the address listed below. You may also obtain more information from:

- University of Wisconsin-Extension county agents.
- your local county land conservation department.
- Soil Conservation Service field offices.
- dairy plant representatives.
- Department of Natural Resources district offices.

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