Milking Facility Wash Water: Facts and Figures

Wash water use varies greatly among Michigan dairies. This is because farm size, facilities, management practices and other factors affect how much water is used in a farm. The Michigan dairy industry uses at least several hundred million gallons of water per year in milking facilities. This use is estimated to amount to approximately 2 to 5% of total operations costs on a farm. It is important for dairy producers to be aware of their wash water use and associated costs. Researchers are looking for ways to make that use more efficient.

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Milking facility wash water is generated from washing the bulk tank, pipelines, and equipment, preparing cows for milking, and flushing the milk house, parlor, and holding area floors. The quantity of water used greatly depends on the specific dairy farm and the size of the herd. The Livestock Waste Facilities Handbook states typical values range from 2.9 to 9.9 gal/cow per day (1). The Northeast Dairy Practices Council has multiple estimates depending on the size of the farm. Their guidance for a farm with over 150 cows is 2 to 4 gal/cow per day (2). A more recent article by Wright and Graves, 1998, estimates the volume is 3.5 to 11 gal/cow per day (3). According to the USDA National Agricultural Statistics Service, in 2006 Michigan had a total of 2,700 dairy farms with a total of 320,800 dairy cows (4). As a result, the state dairy industry uses somewhere between about 409 million gallons to 1.28 billion gallons of water a year in the milking facility.

Use Determined by Practice

Milking facility wash water characteristics vary greatly depending on the specific practices of the dairy including the technique to remove feces and urine from the facility, cow milking preparation procedures, chemicals used as cleaners, and the method to cool the milk. In general, the biochemical oxygen demand (BOD) is higher than domestic wastewater, total suspended solids (TSS) is about 5 times higher, and the nutrient concentrations are over twice as high. Cleaners accumulating in the wash water include sodium hypochlorite, sulfuric acid, and phosphoric acid (5).

In Michigan, the standard practice is to dispose of this wash water in liquid manure storage. The volume of wash water can occupy 25 to 50% of the liquid manure storage (1). This wash water adds little fertilizer nutrient value and if not properly land applied, increases the potential for manure runoff into surface water and/or groundwater.
Where Costs Come From

The total cost of wash water includes water supply equipment and maintenance, water treatment, if required, storage of the waste wash water, transportation of the wash water to crops, and land application. Supply costs depend on the source. Electrical costs for well pumps can be substantial, easily reaching several thousands of dollars annually. This cost is dependent on the depth of the well, pump size, the pump efficiency, pump capacity, amount of water used in the milking facility, and the unit cost of electricity. Hauling costs from the lagoon vary greatly depending on the farm and the location of the fields but typically average $0.01 to $0.03 per gallon (6, 7). Further considerations include the capital investment to handle the extra water such as a larger liquid manure storage and hauling equipment. Accounting for the economical benefits of drier manure, including flexibility in land application and the reduced chance of nutrient flow across land and through tiles is difficult. When the expenses are compared to the total cost of operation, approximately $13.32/cwt (8), milking facility wash water is estimated to be in the 2 to 5% range of the total operational costs.

Handling Regulations

In Michigan, the only standardized method of handling milking facility wastewater is to dispose of it in the liquid manure storage. Minnesota Feedlot Rules 7020 specifically clarifies requirements for treating all milking facility wash water so it can be land applied (9). Ongoing research in Minnesota has examined advanced treatment units (ATUs), common for human generated on site wastewater treatment, to treat the wash water before disposing of it by direct discharge or in a leach field. A current project, conducted by the US Department of Agriculture, Michigan Department of Environmental Quality (MDEQ), and Michigan State University Department of Biosystems and Agricultural Engineering (MSU) is examining wash water pretreatment through a microbiological contact bed containing either organic or inorganic media before allowing the water to percolate into the ground.

Conclusions

Recent publications were not found on water reuse systems at the milking facilities. The concept however, is not new, especially to flush floors. In the Livestock Waste Facilities Handbook (1), it is stated “all but toilet water may be reused as flush water for free stall alley flushing.” However, efficient treatment is desired before reuse to remove objectionable odors, solids, and pathogens. MSU is currently conducting research on the use of ATUs to treat the milking facility wash water so it can be reused within the milking facility for non-contact applications such as floor washing. Partners in this research include MDEQ, Consolidated Treatment Systems, Inc., and Sara Christopherson, Biosystems and Agricultural Engineering at the University of Minnesota.

References