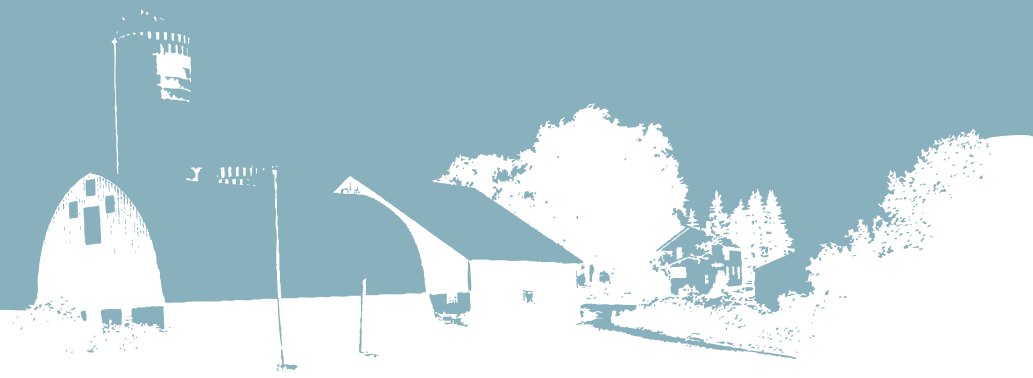
MILK HOUSE WASTE



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Funding for this project was provided to the Bioproducts and Biosystems Engineering Department through two US EPA 319 grants administered by the Minnesota Pollution Control Agency. Additional significant matching funding was provided by other state and local agencies and the cooperating dairy producers. The purpose of the project was to design, install and monitor sixteen milk house wastewater treatment systems in four counties in Minnesota. The results were used to develop design and management guidelines. Additional information can be found at www.manure.umn.edu/applied/milkhouse_waste.html.

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BARK BEDS - A MILK HOUSE WASTEWATER TREATMENT OPTION

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Introduction Milk house wastewater includes residual milk (i.e. milk that remains in the pipeline, milking units, receiver and bulk tank after emptying) and the wash water that cleans them, the miscellaneous equipment, and the milk house floor. This wastewater commonly includes, cleaning chemicals (i.e. detergents, sanitizers and acid rinses) water softener recharge water, and small amounts of manure, bedding, feed grit and dirt. Concentrations of these materials require that this wastewater not be discharged to the environment or discharged to a standard septic system. Several options are currently available to treat and disperse milk house wastewater. Each of these systems has site specific requirements that must be considered in the design, construction and maintenance. This publication provides an overview of the Bark Bed System option.

What is a Bark Bed? A Bark Bed is a soil infiltration area covered with bark or wood shreds. Prior to treatment in this infiltration area, the wastewater flows through a series of one or more septic tanks where some grit, dirt, and other solids, organic material, and milk fat are removed. The last septic tank has an effluent filter to prevent large particles from exiting the septic tanks and getting into the bark bed. Effluent from the septic tanks

is pumped daily or more frequently to a large soil infiltration area and distributed evenly through a pressure distribution system. Distribution pipes, typically 1.5 to 2-inch PVC pipes with small drain holes, are used to distribute the wastewater over the entire infiltration area. The PVC pipes lay either on a bed of gravel or are hung in plastic chambers used commonly in septic system drainfields. Distribution pipes are spaced at 10-foot intervals and can be up to 220 feet long. The entire infiltration area, is then covered with 18 to 24 inches of bark or wood shreds which protects the area from freezing, enhances oxygen transfer to the soil, and aids in the wicking and evaporation of moisture from the system.

Finished bark system

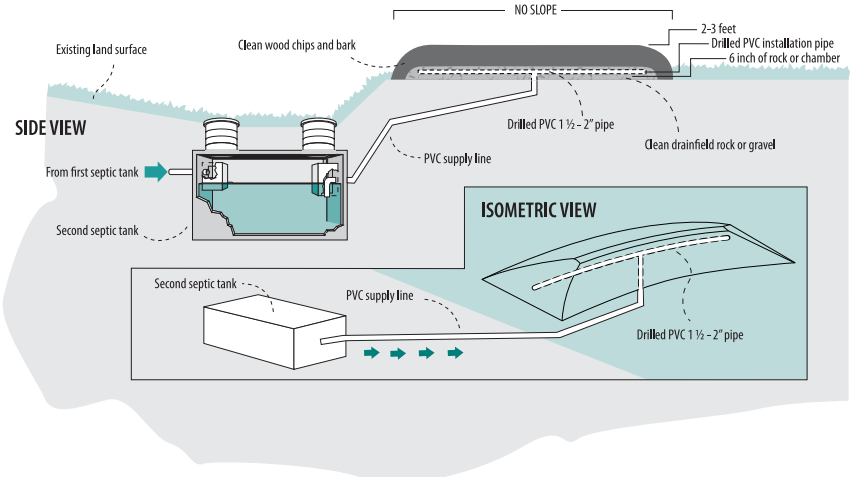
Bark bed installation with gravel spreader

How Big Are the Septic Tanks?

Septic tanks are used for the primary treatment, solids settling and flotatation of fats and oils. Each of the two septic tanks are sized to hold a minimum of three days worth of wastewater from the milk house, or an amount equivalent to the bulk tank. Typically, two 1000-gallon tanks are adequate at most sites although some sites will require more or less septic tank capacity. In addition, a pump tank is required for housing the pump and float controls. This is a smaller tank (500 gallon) or a compartment in a larger tank.

Milk house vs. Parlor Wastewater

This publication does not address milking systems which combine parlor wastewater with milk house wastewater. Treatment systems for these combined wastewaters are more challenging due to the amount of manure and larger volumes of wastewater. Also note that toilet waste cannot be handled with any milk house waste system because they are not designed to handle human pathogens.



Sketch of bark bed system.

How Big Are Bark Beds?

Daily wastewater flow and soil type determine the size of the Bark Bed. Actual wastewater flow data from the farm is best for sizing, but monitoring data in a University of Minnesota study suggest average wastewater generated is about five gallons per cow per day. An infiltration area with loam soil would require about 40 square feet per cow whereas a sandy-loam soil would require 31 square feet per cow, and a clay-loam 75 square feet per cow. Exact sizing of the bark beds is site specific. Detailed design guidelines are available at www.manure.umn.edu/applied/milkhouse_waste.html.

What Other Things Should I Know?

Bark Beds must be constructed on a relatively flat area with a minimum of two feet of separation to the seasonally high water table or bedrock. The recommended maximum width is 30 feet and the maximum length is 220 feet. Beds can be laid out on hillside contours provided the slopes are not greater than 6%. To maintain a level bed the hillside would have to be cut. Diversion of surface water may be needed.

Scarification of infiltration area

Bark Beds work by infiltrating the wastewater into the soil. Microorganisms in the soil surface break down the organic matter. If the bed is overloaded with organic material the soil surface will plug with biomass and the wastewater will not infiltrate into the soil. Because of this, Bark Beds will fail quickly (soil will plug) if milk from fresh or treated cows (colostrum or waste milk) is put into the system. Waste milk must be disposed of some other way such as feeding to other farm animals or applying it to cropland. Alternative provisions must also be made for dumping of a bulk tank due to contamination as this amount of milk would quickly plug the soil infiltration area.

Chamber and pipe installation

How Much Maintenance is Required?

Bark Beds require little maintenance. The pump, float switches, and alarm used to distribute the effluent to the infiltration area may require repair but are generally very reliable. An alarm is located in the pump tank to indicate pump failure.

Septic tanks must be inspected quarterly for solids and scum buildup. Excessive buildup decreases the septic tanks working volume thereby reducing its ability to retain solids, organic matter and fat. This will lead to more loading of the Bark Bed and quicker plugging of the infiltration area. Typically, the septic tanks require pumping (emptying) once per year with the effluent being applied to cropland. Never enter the septic tank for any reason because of the risk of asphyxiation.

The perimeter of the bark bed should be checked quarterly for seepage. It is likely that Bark Beds will continue to treat wastewater for ten-fifteen years. Seepage would indicate either soil plugging or excessive water use.

Over time the bark or wood shreds will decompose and compact. When the depth of bark from the ground surface is less than 12 inches, more bark should be added. Bark or wood shreds from hardwoods will decompose slower than from softwoods. Additions of bark will have to be made approximately every 2-3 years.

Economic Evaluation

In evaluating costs of milk house waste treatment systems it is important to compare the costs of the system to the alternative treatment systems. Is the proposed system cheaper than building long term storage and applying the effluent to cropland using a slurry tank applicator? Manure application costs about $10 per 1000 gallons ($0.01 per gallon). Using average values, each milk cow will produce about 1825 gallons of effluent per year (5 gallons per cow per day). Using this volume, application costs would be $18 per cow per year without any consideration for storage costs. If the useful life of the system is 15 years, the per cost cow is $275. Over 15 years a 50-cow dairy would pay $13,750 ($275 x 50) for mik house waste application. This value should be compared to the cost of the treatment system.

Bark being placed over chamber

Economics

Capital investment for a Bark Bed is split almost evenly between labor and materials. Installed systems costs have ranged from $6,000 to $10,000. This range in cost is somewhat a function of the number of cows and wastewater flow but is also related to the specific site installation such as distance from the milk house to the treatment system. The biggest costs are the labor for installation followed by the cost of the septic tanks, pump and piping, and bark or wood shreds.

Operating cost is estimated at $150 per year which would include the cost of pumping the septic tank and the electrical costs for running the pump.

Additional Information

For additional information visit www.manure.umn.edu/applied/milkhouse_waste.html or contact your local Extension office.