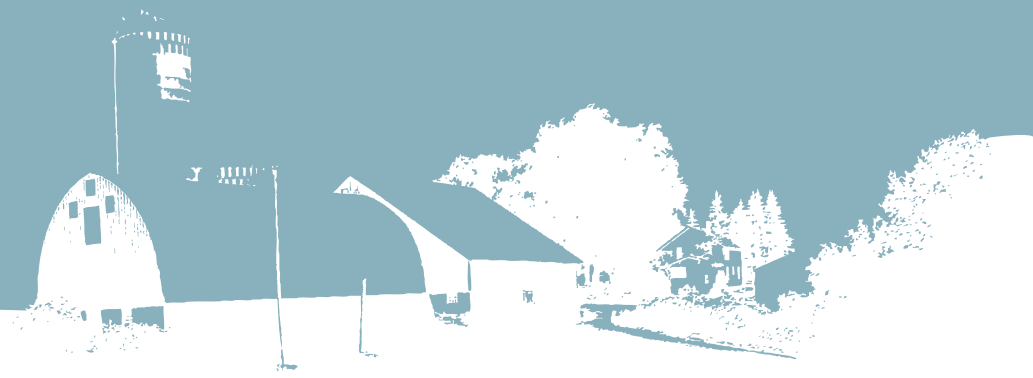
MILK HOUSE WASTE



Publication 1204

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.

This fact sheet was updated September 2007.

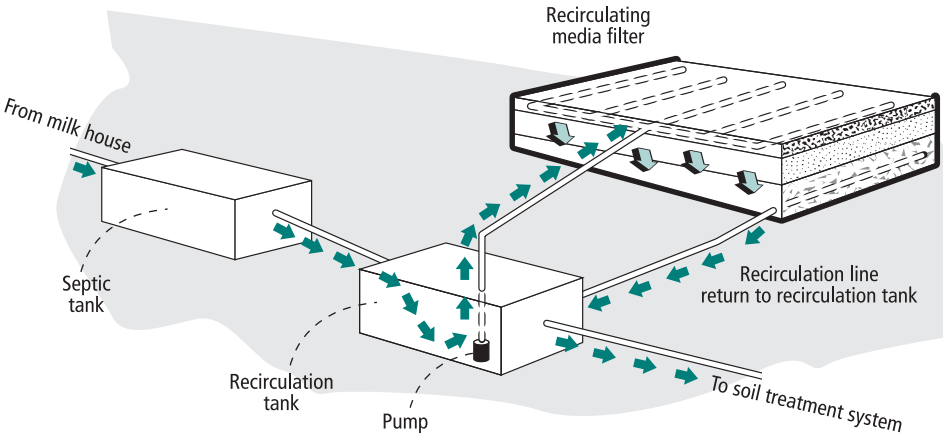
RECIRCULATING MEDIA FILTER - A MILK HOUSE WASTEWATER TREATMENT OPTION

S.H. CHRISTOPHERSON, D.R. SCHMIDT, AND K.A. JANNI

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 this material 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 specific site specific requirement that must be considered in the design, construction and maintenance. This publication provides an overview of the Recirculating Media Filter option.

What is a Recirculating Media Filter (RMF)?

RMF systems are used to provide additional treatment after a septic tank and distribute milk house wastewater into a soil infiltration area, typically a drainfield trench similar to what is used with household septic systems. The RMF reduces the organic material concentration to levels similar to household

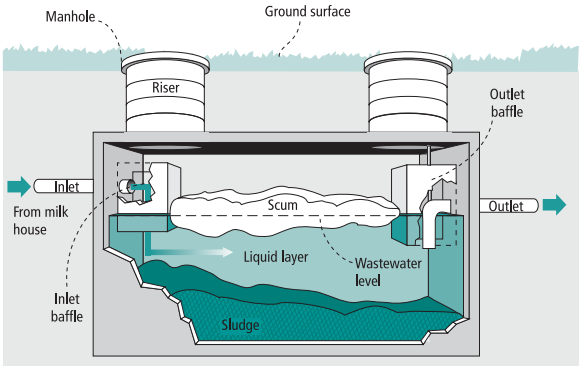


Waste water flow path through recirculating media filter

wastewater which the soil can treat over the long term. If milk house wastewater is directly discharged to a drainfield trench system without treatment the organic material and milk fat in the waste will quickly plug up the soil and restrict infiltration.

Typically two septic tanks in series are used to reach a 3-6 day hydraulic retention time. These tanks allow lime and other heavy materials to settle out and lighter materials to float. Naturally occurring anaerobic bacteria begin to breakdown the organic material in the wastewater. The septic tanks are a critical component of the overall process but this effluent needs additional treatment. A screen or filter on the exit of the septic tank prevents large particles from plugging the media filter.

After the septic tanks, the effluent typically flows by gravity to the RMF recirculation/pump tank. The effluent is then delivered via a pump through a piping system to the top of the media filter. Aerobic (oxygen loving) bacteria live in the media filter and break down the organic material into carbon dioxide and water. After being filtered over the media (gravel or synthetic material) the effluent flows back to the RMF recirculation tank. The effluent is recirculated 5-10 times over the filter media before exiting the recirculation tank and being distributed in a series of drainfield trenches where the organic matter is further broken down, remaining contaminants filtered out



Cross section of septic 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.

and the water recycled back into the environment. RMFs could also be used in combination with bark beds to add longevity or with irrigation systems to reduce solids and odors.

Most of the RMFs are proprietary products and are designed on a site specific basis to account for the wastewater flow (gallons per day) and the strength of organic material to be treated. Organic matter strength is described by the Biochemical Oxygen Demand over 5 days (BOD_5).

Media filter

How Big Are RMF Systems?

Sizing of the RMF system is a function of the volume of wastewater produced and the soil conditions in the infiltration area. The septic tanks and RMF unit generally require about 400 square feet of space while the infiltration area (drainfield) requires about 3,000 square feet with space requirements primarily a function of soil type. The septic tank, RMF and drainfield need to meet state and local setback requirements from buildings, wells, and surface waters. Drainfield trenches must be level and not more than three feet below the soil surface. Trenches can be constructed on hillsides with slopes of up to 25%. Sizing and layout of these trenches is very site specific.

What Other Things Should I Know?

Each type or brand of RMF is designed to handle a specific wastewater flow and amount of organic material. If either of these is exceeded the unit will not effectively treat the wastewater enough before it is distributed to the infiltration area. It is important to fix any water leaks in the milk house and keep waste milk, generated from fresh or treated cows (colostrum or waste milk), out of the system. Waste milk must be disposed of some other way such as feeding to other farm animals or land applying it with the manure. In addition, provisions must be made if the bulk tank needs to be dumped as this amount of milk would plug up the RMF and infiltration area.

Rock Trench System

The subsurface infiltration area must be designed and installed with a minimum of two feet of separation between the bottom of the trench and the seasonally high water table or bedrock. If two feet of separation is not available a raised system (mound) is required. Drainfields are designed and constructed similar to household septic systems.

How Much Maintenance is Required?

Solids and scum buildup in the septic tanks will allow more organic material to enter the RMF. To prevent overwhelming the RMF, septic tanks must be inspected quarterly for solids and scum layer buildup. Septic tanks typically require pumping once per year. The recirculation tank will also build up sludge over time and requires annual pumping. The effluent from the septic and recirculation tank can be applied to cropland. This activity may be performed by a septic system Pumper/Maintainer or the producer. If this effluent is applied on land owned by the producer, it must be applied in accordance with farm's manure management plan.

The life of the drainfield trenches following the RMF is directly related to the amount of treatment achieved in the RMF. Quarterly visual observations of the RMF media and effluent will help indicate the performance of the unit.

It is critical that the RMF recirculation pump perform at all times. All units must have an alarm in the recirculation pump tank to indicate high water levels.

Economics

Capital investment for an RMF system is between $12,000 and $20,000 for flows less than 500 gallons per day. The costs include labor for installation, the septic tanks, RMF, piping and drainfield. Operating cost is estimated at $200 per year which includes the cost of pumping the septic and recirculation pump tanks and the electric cost for running the pump.

Additional Information

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

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.