Handling Dairy Milk House Wastewater

UNIVERSITY OF MINNESOTA

ONSITE SEWAGE TREATMENT PROGRAM

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Milk House Wastewater

- Residual milk
- Cleaning soap and acids used to clean equipment and kill bacteria
- Manure, dirt, and lime from boots
- Laundry wastewater
- Water softener recharge

Wastewater Impacts

- Five gallons per cow per day
- Nutrients, fat, and organic matter can cause water quality problems

Research and Demonstration of Treatment Options

- Limited options existed for small dairy farms with solid manure handling systems
- Septic tanks and drainfield used in past with limited success
- Two, 319 grants received in 2001 and 2004 to evaluate new and existing treatment options on 16 farms
  - Collect data to monitor performance
  - Develop designs & recommendations

Wastewater Characteristics

TABLE 1. Milk house wastewater characteristics*

	First Tank mg/L (lbs/1000 gal)	Second Tank mg/L (lbs/1000 gal)
BOD_5	1200	750
TSS	450	240
Fats Oils and Grease	220	110
Total Nitrogen	65 (0.54)	55 (0.46)
Total Phosphorus	55 (0.46)	55 (0.46)

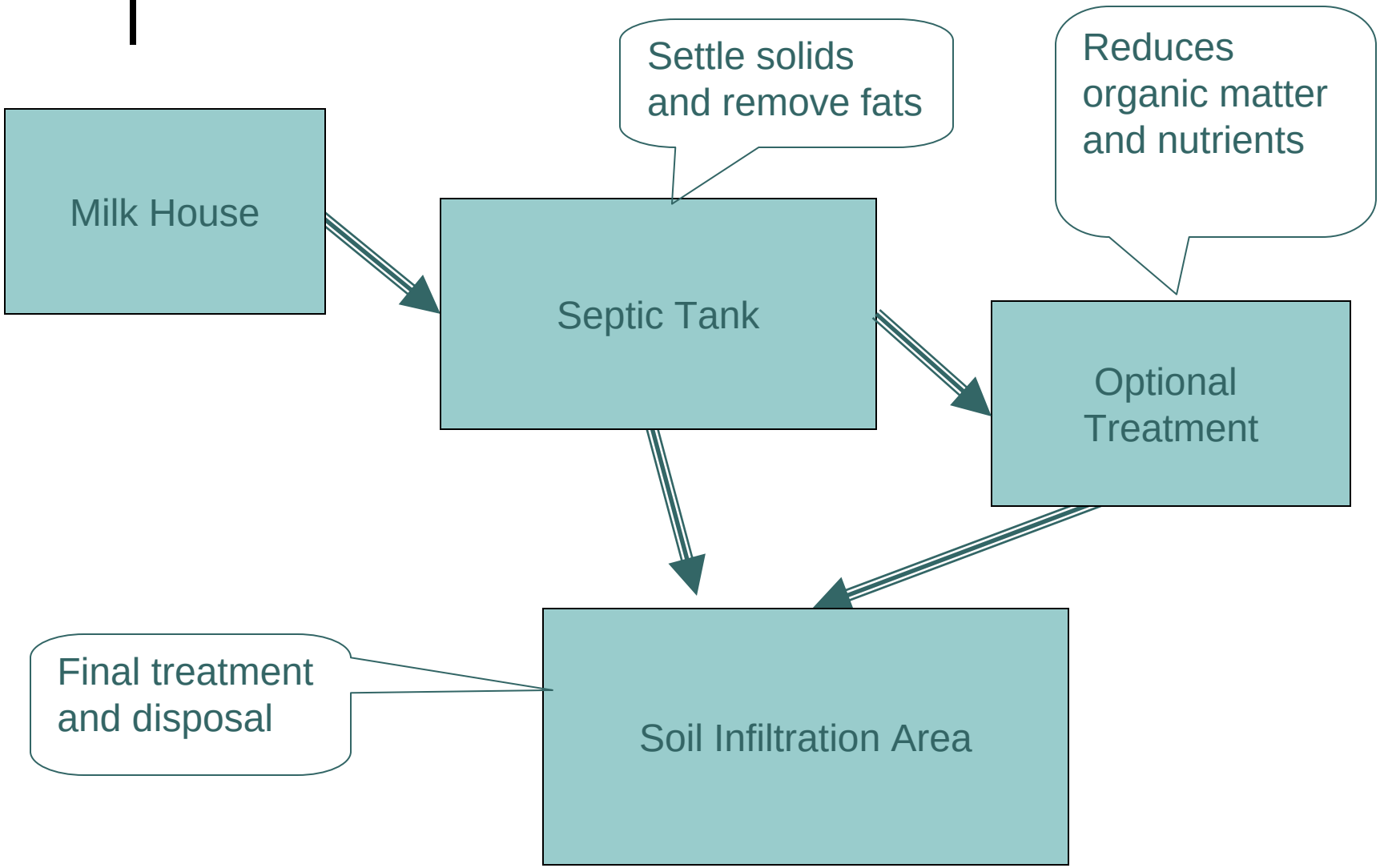
*Average values based on 5 gal per cow per day from unpublished data from the University of Minnesota.

- 1 lb Phosphorous per cow per year
- 15 lbs BOD per cow per year

Options for Handling

- Store in a liquid manure storage unit
- Daily haul with solid manure
- Temporary storage followed by land application
- Treatment followed by soil infiltration

Schematic of Systems



Septic Tanks

- 3-day Hydraulic Retention Time (HRT)
- Removes some solids and fats
- Pumped annually

“Treatment” Systems

- Dosing
- Irrigation
- Bark Bed
- Aerobic
- Chemical

Larger infiltration areas because less treatment

System Restrictions

- Systems handle a limited amount of residual milk
- System cannot handle
  - Waste milk from fresh or treated cows
  - Bulk tank dumps
- Dosing and irrigation systems can handle parlor wastewater

Irrigation

- **Spray wastewater on cropland or pasture throughout the year**
- **Infiltration area size based on agronomic rates**

Irrigation

- **Installed on slopes up to 15%**
- **Sized on crop nutrient removal Requires150 to 800 square feet per cow**

Irrigation

- **Impact head used in summer**
- **150’ diameter spray**

- **Wobbler™ head for winter**
- **50’ diameter spray**

Irrigation

- Minimum of two application zones
  - Winter versus summer
  - Drying before crop harvest
  - Drying before grazing

Brass ball valves in bottom of manhole

Irrigation

- Pump sized according to site flow and pressure requirements
- Pump located in pump tank sized for a minimum of one day of wastewater flow

High Head Effluent Pump

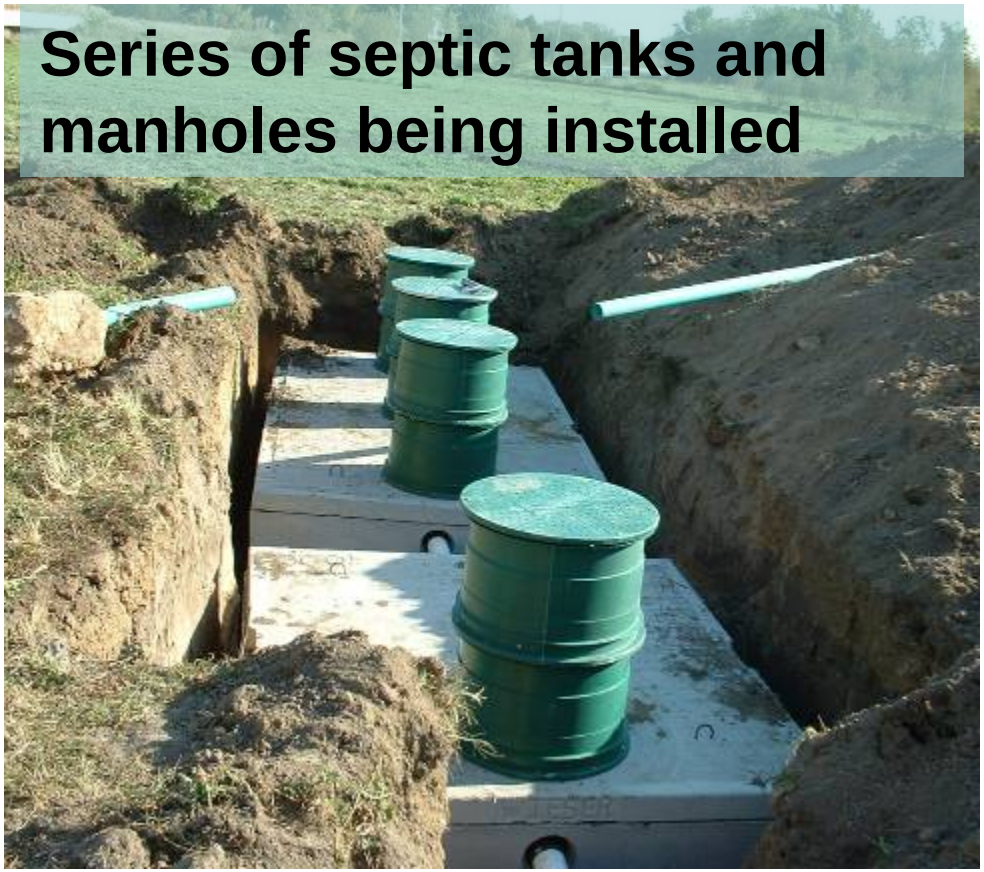
Pump located in bottom of pump tank

Bark Bed

- **Large soil infiltration area covered with bark or wood shreds**

Bark Bed

- Two or more septic tanks to reduce organic load
- Installation allows for drainback of system into septic tanks



Bark Bed

- Constructed with zero slope
- Pressure distribution
- 10-20 feet wide
- 75-100 feet long

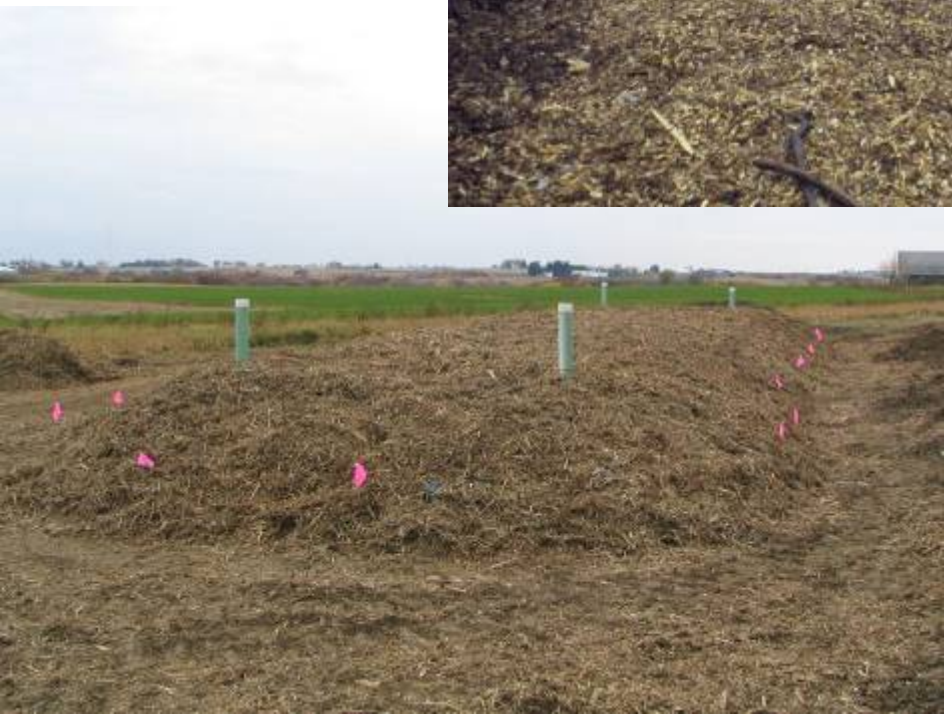
Bark Bed

- Pressure distribution
- Perforated distribution lines
- Hung in chambers or
- Laid on gravel bed

Bark Bed

- **Bark or wood shreds placed to**
  - **Insulate soil area**
  - **Allow good oxygen transfer**

Completed Bark Beds



Aerobic

- Further treatment to reduce organic matter
- Treated effluent can be dispersed in typical drainfield system
- Drainfield size based on amount and strength of wastewater and soil type

Aerobic

- Oxygen added to enhance microbial growth
- Microbes consume organic matter
- Reduce BOD to below 200 mg/L
- Variety of systems to add air (oxygen)

Aerobic

- Several commercial systems available
- Different retention times (treatment times)
- Power requirements from 0.1 to 1.5 hp
- Oxygen (air) delivered through pumps or blowers
- Designs require knowledge of wastewater characteristics and flow

Aerobic

- Treated effluent to standard drainfield system
- Gravity or pressure
- 5 to 10 square feet per cow

Recirculating Media Filter

- Similar to aerobic systems
- Goal to treat wastewater prior to soil infiltration
- Filtration through porous media of sand, gravel, peat or synthetic material
- Circulation adds oxygen and physical filtration
- Media is a fixed area for microbial growth

RMF

- Pump in bottom of tank recirculates effluent through media several times per day

RMF

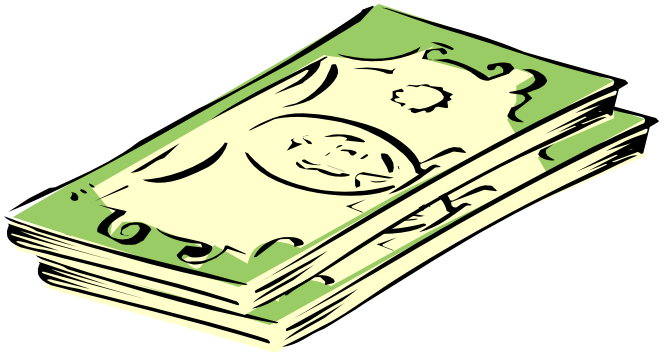
- Sizing based on wastewater flow and characteristics
- Discharges effluent to standard drainfield

Conclusions

- Several options available
- Operation and maintenance requirements on all systems
- System must be selected based on site specific conditions and farmer preferences

Project Cooperators

- Cooperating dairy producers
- Winona & Goodhue County SWCDs, Feedlot Officers
- NRCS, BWSR
- U of M Ag Experiment Station
- U of M Extension Service
- EPA 319 Grants through MPCA



For More Information

http://septic.umn.edu

under Research

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