# Milking Center Wastewater Treatment (No.) 796

**DEFINITION**

The mechanical, chemical, or biological treatment of milking center wastewater.

**PURPOSE**

To use mechanical, chemical, or biological treatment facilities and/processes as part of an agricultural waste management system:

- To improve ground and surface water quality by reducing the nutrient content, organic strength, and/or pathogen levels of milking center wastewater.
- To improve air quality by reducing odors and gaseous emissions.
- To facilitate desirable waste handling, storage, or land application alternatives.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies where:

- The form and characteristics of milking center wastewater make it difficult to manage so as to prevent it from becoming a nuisance or hazard.
- Conventional waste management alternatives are deemed ineffective for the milking center wastewater generated on the farm.
- Odors and/or gaseous emissions from livestock production facilities and waste storage/treatment system components must be reduced.
- Site conditions are suitable for construction, operation, and maintenance of the facility.

**CRITERIA**

**General Criteria**

Design, construction, and siting of milking center wastewater treatment shall comply with all Federal, State, local, and tribal laws and regulations.

No human waste shall be included in the wastewater.

**Michigan Filter Mound**

The Michigan Filter Mound is a soil infiltration area covered with 3 feet of shredded bark. Effluent is distributed to the soil infiltration area through a pressure distribution system. Filter mounds shall be designed and constructed as recommended by the most recent "Design Guide: Michigan Filter Mound for Treating Milking Center Wastewater" developed by the Michigan Livestock Wastewater Treatment Workgroup.

Applicability of this practice standard is limited to farms with daily milking center wastewater production of no more than 1,500 gallons per day.

All pipelines shall be designed to avoid freezing.

A sanitary trap or air gap is required to prevent gasses from flowing into the milking center from the treatment system.

All riser joints, access openings, and pipe connections shall be installed watertight.

Additional criteria are provided below.

**Soils.** Conduct a subsurface investigation to classify the soil at the proposed site to depth of at least 3 feet. Identification of any compaction or restrictive layer must be documented as part of the subsurface investigation. The USDA soil classification is preferred because it more closely correlates to the hydraulic loading rates in the table below. The loading rates assume a soil surface slope of 2 percent or less and at least 2 pretreatment settling tanks. Be sure to use the most restrictive soil in the upper 2 feet of the soil profile for determining the maximum hydraulic loading rate for the design.

| Hydraulic Loading Rates | |
|---|---|
| **Soil Texture** | **Loading Rate ($gpd/ft^2$)** |
| Coarse sand, medium sand, and loamy sand | 0.32 |
| Fine sand, sandy loam or loam | 0.16 |
| Silt loam, silt, or clay loam | 0.12 |

When conducting the subsurface investigation, also determine the seasonal high water table. The soil for at least 2 feet below the filter mound must not be saturated. Artificially lowering the seasonal high water table with a subsurface drainage system would be acceptable under the following conditions:

- The artificial drainage system is at least 20 feet from the toe of the filter mounds
- The drawdown is analyzed to illustrate the modified seasonal high water table provides the required 2 feet of unsaturated soil below the mounds.

**Location.** Locate filter mounds outside any established rights-of-way such as roads, legal drains, utilities, and pipelines. Check with the appropriate officials for required setbacks associated with any nearby rights-of-way.

To minimize the potential for contamination of surface water, filter mounds should be located outside of floodplains. However, if site restrictions require location within a floodplain, they shall be protected from inundation or damage from a 25-year flood event, or larger if required by laws, rules, and regulations.

Do not locate filter mounds in areas designated as wetlands.

| Setback Distances | |
|---|---|
| **Feature** | **Setback (feet)** |
| Property line | 10 |
| Private well | 50 |
| Pubic well – Type IIb and III | 75 |
| Public well – Type I and IIa | 200 |
| Surface water | 100 |

Offsite surface water shall be excluded from the filter mound area.

Filter mounds should be placed on sites where the natural ground slope is less than 2 percent. Some land leveling within the area of the filter mound may be used to decrease the ground slope. However, since the natural topsoil is an integral part of the treatment process, land leveling should not be done to an extent where more than half of the natural topsoil layer is removed.

**Pretreatment.** Wastewater shall be pretreated in settling tanks. All tanks shall meet the structural requirements for ASTM C 1227, Standard Specification for Precast Concrete Septic Tanks. Tanks shall be installed with a minimum of 2 feet of soil cover over the top to protect from freezing. .

1. Install settling tanks with a total capacity of at least 4 times the daily wastewater volume. At least two tanks should be used rather than one large tank. Use tanks without internal wall-type baffles. Include quick-release manhole covers for the settling tanks to accommodate easy access for maintenance.
2. If there are more than 2 settling tanks, install a pipe baffle at the end of the tanks that do not have effluent filters. The effluent filters described next, should be installed in the tanks hydraulically immediately prior to the pump chamber.
3. Include a slit type (maximum 1/16 inch width), commercial size effluent filter at the exit to the second settling tank hydraulically prior to the pump chamber. Use a filter with a daily flow rate at least 2 times the design daily wastewater production volume.
4. Include a commercial size effluent filter with maximum 1/16 inch circular holes at the exit to the settling tank located hydraulically immediately prior to the pump chamber. Use a filter with a daily flow rate at least 2 times the design daily wastewater production volume.
5. Include a screen filter (maximum 3/32 inch holes) immediately after the pump in the pressure line from the pump to the sequencing valve.

**Distribution System.** A pump pressurized distribution system shall be used to uniformly distribute the wastewater to the filter mound. Gravity distribution to the filter mound is not allowed. The transfer pipe from the pump to the sequencing valve shall have a minimum diameter of 2 inches and be free draining with a minimum slope of 1 percent preferably flowing back to the pump chamber. Pump sizing shall result in a pressure of at least 3 feet at the end of the distribution pipe. The pump chamber shall be sized for 1 day of wastewater production or 500 gallons, whichever is greater.

Bark material should have large pore spaces (high porosity) to allow good oxygen transfer to the soil. Hardwood bark is required.

Distribution pipes shall be laid on top of 3 feet of compacted shredded bark. Cover all the distribution pipes with a septic system chamber designed specifically for wastewater distribution. Cover the chambers with approximately 12 inches of shredded bark.

Use a minimum of 2 distribution sections. Include additional distribution sections as determined by the desired rest time between dosing individual areas of the soil receiving effluent. Each section should consist of four lines of 1.5 inch diameter Schedule 40 PVC pipes with 3/16 inch holes at 2.5 feet on-center and the holes pointing up. All distribution pipes are placed at the same elevation and equally spaced horizontally across the width of the mound.

Use a pressure controlled sequencing valve to equally distribute the wastewater to each section of distribution pipes.

Do not include more than 4 parallel distribution pipes within a distribution section and the lines should be no more than 100 feet long. Include a manifold pipe at the upstream end of each section. Distribution pipes within a section should be placed 18 inches apart. It is preferred to locate filter mound sections linearly. Where filter mound sections will be located parallel to each other, maintain a minimum of 10 feet of open ground surface between the toes of adjacent mounds. This open ground surface will provide room for maintenance activities and will minimize the potential for seepage from one mound section to adjacent downslope mound sections.

Pumping is controlled by a timer programmed to operate on set intervals based on the design daily flow volume. Include a low water float switch to prevent pumping when there is insufficient wastewater to pump. Also include a high water float controlled alarm to provide an alert when the pumping chamber is full.

**CONSIDERATIONS**

Consider the potential effects of installation and operation of milking center wastewater treatment on the cultural, archeological, historic, and economic resources.

**Location.** The milking center wastewater treatment facility should be located as near the source of wastewater as practicable and as far from neighboring dwellings or public areas as possible. Proper location should also consider slope, distance of waste transmission, vehicle access, wind direction, proximity of streams and flood plains, and visibility.

In determining the location of the facility, consider elevation and distance from various components to take advantage of gravity flow, where possible.

**Wastewater Characteristics.** Milking center wastewater treatment may require specific total solids and nutrient contents of the waste stream. Additional pretreatment options such as dilution or installing a sump in the milk parlor could be used to adjust the solids content before entering the treatment facility.

**Visual Screening.** The visual impact of the waste treatment facility or process should be evaluated within the overall landscape context. Screening with vegetative plantings, landforms, or other measures may be implemented to alleviate a negative impact or enhance the view.

**Traffic patterns.** Consider the following factors regarding traffic patterns and vehicular access for normal farm operations and for construction when locating a site:

- Minimize locations where the pipes will go below roadways and other traffic areas that are kept open all winter.
- Vehicular access will be needed for construction of the filter mound and for maintenance associated with replacement of the bark media.
- Vehicular access will be needed for installation of the settling tanks and pump chamber and for maintenance associated with periodic pumping of the tanks.

**PLANS AND SPECIFICATIONS**

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended use.

Support data documentation requirements are as follows:

- Inventory and evaluation records
  - Assistance notes or special report
- Survey notes, where applicable
  - Design survey
  - Construction layout survey
  - Construction check survey
- Design records
  - Physical data, functional requirements and site constraints, where applicable
  - Soils/subsurface investigation report, where applicable
- Design and quantity calculations
- Construction drawings/specifications with:
  - Location map
  - Designed by" and "Checked by" names or initials
  - Approval signature
  - Job class designation
  - Initials from preconstruction conference
  - As-built notes
- Construction inspection records
  - Assistance notes or separate inspection records
  - Construction approval signature
- Record of any variances and well isolation distance deviations approved, where applicable
- Record of approvals of in-field changes affecting function and/or job class, where applicable

**OPERATION AND MAINTENANCE**

An Operation and Maintenance (O&M) plan shall be developed for this practice. The O&M plan shall be consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for the design.

**REFERENCES**

ASTM C 1227, Standard Specification for Precast Concrete Septic Tanks.

Design Guide: Michigan Filter Mound for Treating Milking Center Wastewater. Michigan Livestock Wastewater Treatment Workgroup. 2012.

Schmidt, D.R., K.A. Janni, S.H. Christopherson, 2008. Milk House Wastewater Design Guide. M1207. University of Minnesota-Extension.