**Section 370.1130 Low Rate Intermittent or Periodically Dosed Sand Filters**

a) Applicability

1) Intermittent sand filters may be used to polish secondary effluents. The process removes residual suspended solids and soluble biochemical oxygen demand and converts ammonia to nitrate. (See Section 370.1210(b).)

2) Cold weather operational problems may preclude the use of this process unless the influent temperature to the filter is adequate to allow efficient filter operation necessary to meet the applicable effluent standards.

3) Because of manual labor necessary to clean, maintain and replace sand on the filters, the application is usually limited to small waste treatment plants.

b) Design Criteria

 The criteria of Section 370.940(b), (c), and (f)(3), are generally applicable to intermittent sand filters used as tertiary filtration units.

1) Dosing Volumes

 The dosing facilities shall be sized to provide for a 12-hour dosing cycle for each bed.

2) Siphon or Pump Capacity

 Siphons (at minimum head) or pumps shall have a discharge capacity at least 100 percent in excess of the maximum rate of inflow to the dosing tank, including recirculation, and at average head, at least 90 gallons per minute per 1,000 square feet being dosed.

3) Recirculation

 Provision for recirculation of filter effluent may be included to improve process flexibility.

A) Rate

 A recirculation rate of up to 100% of design average flow to the filter may be provided.

B) Variability

 Capability for varying the recirculation rate shall be provided.

4) Loading Rates

 The hydraulic load of secondary wastewater applied to supplemental intermittent sand filters shall not exceed 15 gallons per day (gpd)/sq. ft. More conservative application rates should be provided for low quality filter influents. Refer to subsection (d)(3) below.

c) Construction Details

 The criteria of Section 370.940(g) are generally applicable to tertiary intermittent sand filters. Also, refer to subsection (d).

d) Special Design Considerations in Lagoon Systems

1) General

 Low rate sand filter systems that are intermittently or periodically dosed may be used to reduce suspended solids from multicell aerated or nonaerated sewage lagoon treatment plants.

2) Cold Weather Design

 Lagoons which have sand filters shall be designed to provide storage of flows received during cold weather when the filter is expected to be inoperable.

3) Hydraulic Loading

A) The filter area design considerations must include the following:

i) The total annual flow volume to be treated (Section 370.520(c)(1)) including wet weather flows if the lagoons are to be used for wet weather storage.

ii) The effective net days annually for filter operation excluding cold weather shut-down and filter maintenance time.

iii) Lagoon effluent quality.

iv) Extent and reliability of flow data from the sewer system.

B) Where sewer system conditions are not favorable or industrial waste loadings are expected to increase algae blooms, the loading rate should be limited to 10 gal./ft.(2)/day.

4) Dosing Considerations

A) Methods of Operation

 The design should include allowance for periodic dosing of varied volumes onto the filter while the filter discharge is shut off, then to be followed by a filtration period to completely empty the filter at a controlled rate.

B) Depth

 The filter shall be designed for flexibility of dosing depth from 6 inches to 2 feet.

C) Valving, Piping, Flow Measurement

i) The filter shall be provided with valving to allow shutting off and controlling rate of flow both onto and from the filter. A flow measurement weir or flume shall be provided both on the inlet and outlet of the filter for operator control of the dosing and filtration rates under the falling head conditions.

ii) The outlet valving, piping and flow measurement shall be designed to allow complete drainage of the filter underdrains at the end of the filter cycle to insure aerobic conditions in the filter during the rest period.

D) Dosing Inlet Structures

 The dosing inlet structures shall be designed to dissipate inlet velocity and prevent sand scouring during the dosing period at the high dose rates. The inlet structures should be arranged to not interfere with maintenance of the sand surface.

5) Filter Containment Structure

 The filter containment may be of vertical concrete walls on three sides (refer to subsection (d)(6) below) or sloped earthen berms with impervious lining, constructed to insure that no ground surface runoff or silts get onto the sand surface. A freeboard of 1 foot above the maximum design dosing depth should be provided.

6) Access Ramps

 The filter should be designed with a ramp on one end sloped and surfaced for access to the edge of the bed by wheeled vehicle to facilitate removing and replacement of sand. For larger filters, concrete tracks at the level of the sand surface may be desirable to reduce distance sand must be handled.

(Source: Amended at 21 Ill. Reg. 12444, effective August 28, 1997)