MEL Filter Systems (MFS ™)

Available from: Manz Engineering Ltd.
2703 Cannon Rd. NW, Calgary, AB, Canada, T2L 1C5.
Tel: (403) 889-4562 Email: manzmel@shaw.ca
Web site: www.manzwaterinfo.ca

MFS's may be used to treat:

- Surface water (direct filtration and substitute for traditional slow sand filtration.)
- Ground water (substitute for multi-media and greensand filters).
- Ground water under direct influence of surface water GWUDI (direct filtration and substitute for traditional slow sand filtration).
- Pretreatment for membrane, EDR and other processes requiring feed water with low SDI.
- Municipal wastewater that has been treated to tertiary (perhaps secondary) standards.
- Rainwater.
- Storm water.

Variations of the MFS:

- MEL Polishing Filter (MEL-PF ™) when treating water for removal of suspended solids.
- MEL Biological Filter (MEL-BF ™) when treating water for removal of pathogens as well as suspended solids.
- MEL Carbon Filter (MEL-CF ™) for removal of dissolved organics.
- MEL Roughing Filter (MEL-RF ™) for removal of larger suspended solids.

MEL Filter - 4m x 4m x 2m stainless steel body.

Manz Engineering Ltd.

Applications of the MFS include:

- Pathogen removal without/with disinfection.
- Sand and silt removal with or without pre treatment.
- Colloidal particle removal (organic or inorganic) with pre treatment using very limited coagulant addition and contact time.
- Algae removal with or without pre treatment.
- Oxidized iron and manganese removal.
- Iron and sulphur reducing bacteria removal.
- Co-precipitation of arsenic and uranium and other heavy metals.
- Turbidity reduction associated with removal of particulates.
- Colour reduction associated with removal of particulates.
- TOC reduction associated with removal of particulates.

Note that bench scale and pilot scale evaluations are considered essential to guarantee performance and are always recommended.

Advantages of the MFS include:

- Effectiveness (guaranteed performance when piloted).
- Low capital cost.
- Simplicity of operation.
- Flexibility of design.
- Compact compared to standard designs of traditional slow sand filters.
- Low operating pressure at raw water inlet.
- Operated on demand basis.
- Backwash (fluidize) entire single layer filter bed with filtered water at low flow rate and pressure.
- No air scour.
- Elimination of air-binding.
- Elimination of media compaction problems.
- Easily used in multi-barrier treatment systems.
- Minimum operating costs.
- Minimum operation training.
- Minimum operator attention.
- Minimum maintenance requirements.
- Minimum use of chemicals.
- Minimum energy requirements.
- Minimum production of wastewater.
- Fixed or mobile installations.

Independent Performance Evaluation

4 log removal Cryptosporidium & Giardia

Bench Scale Filter

Pilot Scale Filters



MEL Filter - 2m x 4m x 2m stainless steel body.

General Specifications: (Detailed engineering specifications available on request.)

1. Standard tank dimensions using tanks manufactured from stainless-steel vary from 1m x 1m to 4m x 4m. The 8m x 8m and 16m x 16m filters would normally use cast-in-place concrete tanks. Alternative dimensions, materials and geometries are available on request.
2. Several tanks may be used to achieve desired capacity (minimum of two recommended). All filters operate completely independent of each other.
3. Filters may be mounted on skids or other mobile platforms.
4. Filter footprint including piping in front of filter including raw water inlet, filtered water outlet, wastewater outlet and backwash water inlet is similar to basic plan dimensions plus 1.5 meter at the front of filter and 1.5 meter around perimeter of filter assembly.
5. Tanks may be cast-in-place, stainless steel, marine grade aluminum, polyethylene or fiber glass. All components used are NSF 61 certified.
6. Filter media meets AWWA B-100 standards and is NSF 61 certified.
7. Filtering media depth may vary from 15 cm to 80 cm as required. (Note that the 35 cm depth meets the minimum requirements for slow sand filters recommended by the AWWA and a 45 cm depth meets the Ten State Requirements.)
8. Average maximum operating weight of filter, media and water is 2,250 kg/m^2 of filter surface area (depends on the exact depth of media used).
9. Manual control of raw water inflow, filtered water outflow, backwash, filter-to-waste and wastewater evacuation is standard.
10. Flow into filter varies with application and regulatory requirements. Preferred pressure at the filter inlet is 5m head (after control valves and flow meter).
11. Flow into filter is controlled using manual valves, flow meter at the filter and mechanical float valves inside filter.
12. Backwash flow rate as low as 4 L/s/m^2 (capacity to use 8 to 12 L/s/m^2 recommended). Pressure of 6 m required at underdrain.
13. Backwash is manually controlled and is monitored using a flow meter
14. Control of raw water inflow, filtered water outflow, backwash, filter-to-waste and wastewater evacuation may be automated as required.
15. All piping, including the underdrain, is normally constructed using schedule 80 PVC. Other materials may be used.

MEL-PF Implementation Guidelines

1. Surface loading rates and media design are optimized and verified by bench and pilot scale testing.
2. Surface loading rates can be more than 1,000 L/h/m^2. Should be determined using bench scale or pilot scale studies.
3. Basic filter design is based on AWWA guidelines for gravity slow sand filtration design and construction. Modifications to this design may be made as required or requested.
4. Filter operation may be stopped and started as required. Practicality should be determined by pilot scale study.
5. Filters may be cleaned using a backwash process using filtered water. Backwash flow should be between 8 and 12 L/s/m^2. with a pressure head of 6m. Backwash flow should be verified during pilot studies. (Typical volume of waste water produced per backwash is 1 m^3 per m^2 of filter surface.)
6. Frequency of backwash depends on method of cleaning and the type and concentration of suspended sediment. Periodic manual removal of the captured material not able to be removed by backwash may be required. If the top surface of the filter media is removed it must be replaced and a backwash performed before placing the filter back into operation.
7. A brief filter-to-waste after backwash may be required and should be confirmed using pilot studies. Regulatory agencies may require a filter-to-waste procedure.

MEL-BF Implementation Guidelines

1. When MEL-BF's are used as a substitute for traditional slow sand filters the media bed design, media material and filter operation meets AWWA recommended specifications and local construction and operation guidelines. (Use of the MEL-BF as a substitute for a slow sand filter is subject to regulatory approval if operated and cleaned using procedures different from traditional slow sand filtration.)
2. Surface loading rates of the MEL-BF are similar to that for a traditional slow sand filter - up to 400 L/h/m^2 depending on results of pilot studies and regulatory constraints.
3. Filters may be demand operated (subject to pilot testing and regulatory approval).
4. Filters may be cleaned by scraping similar to traditional slow sand filtration, harrowing or by backwash (subject to regulatory approval). If the top surface of the filter media is removed it must be replaced and a backwash performed before placing the filter back into operation.
5. Frequency of backwash depends on method of cleaning and concentration of suspended sediment See Note 6 MEL-PF.
6. Filters may be cleaned using a backwash process using unchlorinated filtered water. Backwash flow should be 8 to 12 L/s/m^2. with a pressure head of 6m. Backwash flow may be less if verified during pilot studies. Typical volume of waste water produced per backwash is 1 m^3 per m^2 of filter surface.
7. A brief filter-to-waste after backwash may be required and should be confirmed during pilot studies. Regulatory agencies may require a filter-to-waste procedure.
8. Note that if scraping and harrowing techniques are used it is recommended that provision be made for filter bed degassing between cleaning operations and brief filter-to-waste procedures.

Comments:

1. In cold regions the media bed of slow sand filters will become air bound. Cleaning using scraping or harrowing will not eliminate the problem. It is necessary to degas the media bed using a backwash procedure (at the minimum a reverse flow that does not fluidize the media) using filtered unchlorinated water to eliminate the trapped gases. Any disturbance of the filter bed, including a degassing procedure, will require a filter-to-waste procedure.
2. Demand operation of slow sand filters has been thoroughly evaluated and proven not to degrade filter ability to remove pathogens. The obvious advantage of demand operation is the elimination of the need to operate the filter once treated water storage is full and production is wasted. However, the use of the MEL-BF technology does not require use of demand operation. MEL-BF's may be operated in exactly the same manner as traditional slow sand filtration.
3. Practical use of slow sand filtration is limited by the concentration of suspended solids in the water being treated and the method used to clean the filter. Traditional slow sand filters are limited to treating water with very low concentration of suspended solids (turbidity less than 20 NTU and preferably less than 5 NTU). MEL-BF's cleaned using a backwash procedure may treat water with significant concentration of suspended solids (greater than 5 mg/L) with application limited only by the practical considerations associated with frequency of cleaning. It is strongly recommended that pilot studies be conducted to determine the effectiveness and practicality of the technology if the application seems extreme.
4. MEL-PF and MEL-BF performance may be enhanced if water is pre treated with coagulants and/or roughing filter. These treatments must be verified using pilot testing and are subject to regulatory approval.