

# **Automatic Turbo-Disc Filter Specification**

## **Project:**

## **Scope of Work:**

### **Manufacturer: Miller-Leaman, Incorporated**

- Furnish all materials for the operation of a side-stream automatic disc filter system, including all valves for automatic operation, flow & backwash pump, a backwash controller, and all related accessories as hereinafter specified - to perform the intended function and achieve a fully integrated and operational filtration system.
- These specifications are intended to give a general description of what is required, but do not cover all details which will vary in accordance with the requirements of the equipment application.

## **Description of System:**

- The contractor shall furnish (X) side-stream skid mounted automatic Turbo-Disc Filter system with the capability of initiating a backwash cycle based on differential pressure, elapsed time, or a manual backwash. The skid mounted automatic Turbo-Disc Filter system shall consist of (X) filter housings (pods) with X" inlet/outlet connections, X" Type 304 stainless steel inlet/outlet manifolds (with X" connections to accept X" inlet/outlet connections on individual filter housings), (X) X" pneumatically-actuated backwash valves, and (X) solenoid valves.
- Filter system and all ancillary equipment, valves, and controls required for automatic operation of the filter system shall be mounted on Type 304 stainless steel skid assembly.

## **Qualifications:**

- To ensure unity of responsibility, the complete filter system and associated controls shall be furnished and coordinated by filter manufacturer. The contractor shall assume full responsibility for the satisfactory installation of the filter system as specified and directed by manufacturer.
- The equipment covered by this specification shall be of proven ability as manufactured by a competent organization having substantial experience in the production of such filtration equipment. The filters furnished shall be designed, constructed and installed in accordance with the best practice and methods, and shall operate satisfactory when installed.

- All equipment furnished under these specifications shall be new and unused and shall be the standard product of manufacturers having a successful record of manufacturing and servicing the equipment and system specified herein for a minimum of ten (12) years.
- Adequate pre-filtration (i.e. strainer) shall be installed upstream of automatic Turbo-Disc Filter system to remove any large debris (i.e. leaves, sticks, etc.) that may be introduced to water stream.

**Filter Operation:**

- All equipment shall be designed for continuous service; however, any bypass piping shall be the responsibility of the contractor. Bypass piping is recommended for isolation of the filtration system in the event maintenance of the Turbo-Disc Filter is necessary.
- Furnish an automatic Turbo-Disc Filter with X” 150-pound stainless steel flanged outlet connection, complete with 3-dimensional XXX-XXX disc media (Filtering down to XX-Micron and smaller); capable of flowing a minimum of XX GPM and a maximum of ~XXX GPM.
- Filter system shall be capable of backwashing based on differential-pressure, elapsed time (or a combination of DP and elapsed time) - or manually by the operator.
- Operating conditions are as follows:

Filter System Inlet/Outlet Pipe Diameter Size:	X Inch
Minimum Flow Rate:	X-GPM
Maximum Flow Rate:	X-GPM – Reference Pump
Minimum Operating Temperature (water):	35 degrees F
Maximum Operating Temperature (water):	120 degrees F
Minimum Operating Pressure (PSI):	X PSI
Maximum Operating Pressure (PSI):	X PSI
Power:	X-V/3ph/60hz
<b>Design Flow:</b>	<b>X-GPM</b>

**Filter Construction:**

- Filter system shall consist of four (X) X” filter housings (pods), manifolded together with X” Type 304 stainless steel inlet/outlet manifolds. Each filter housing shall be injection-molded of Polyamide with EPDM internal gasket material. System shall be fully assembled at factory using Victaulic couplings.
- Filter disc cartridges shall be comprised of a compressed stack of vertically stacked injection-molded Polypropylene 3-dimensional discs.
- Each individual disc shall be 5.125 inches in outside diameter and 4.010 inches in inside diameter.

- Each disc cartridge shall have an external filter surface area of 228 square inches minimum and a volume of 113 cubic inches minimum. Filter components shall not be supplied separately but in an all-inclusive skid mounted system.
- Intrinsic to the design, during filtration mode, filter shall incorporate a fluid spinning turbine mechanism inside filter housing at the base of each disc cartridge, generating a centrifugal effect. This centrifugal effect shall spin heavier particles (i.e. sediment) to the outer wall of filter housing, away from the disc stack located in the inner portion of housing. The purpose of the centrifugal action is to minimize loading of the disc media; therefore, minimizing backwash frequency – ultimately minimizing overall backwash water volume.

### **Flow & Backwash Booster Pump:**

- The filter manufacturer shall be responsible for sizing and furnishing the main-flow and backwash booster pump. The 3-HP centrifugal main-flow pump is a close-coupled pump manufactured by Berkeley or approved equal and will draw dirty cooling tower water from the sump and direct it to the automatic turbo-disc filter. The 2-HP centrifugal booster pump is manufactured by Goulds or approved equal and will draw filtered water from the outlet manifold and direct it through the booster manifold to produce adequate pressure for the backwash cycle. In addition, compressed air shall be injected into the top of each filter housing during the backflush cycle to help facilitate an evacuation of the dirty water out of each filter housing (air override).
- The flow and booster pump shall be rated for X-VAC, 3 phase, 60 Hz, and the motors shall be TEFC.
- A differential-pressure switch shall be provided with the filter system integrated with the backwash controller, sensing the differential-pressure across the inlet and outlet manifold of the filter system, capable of initiating a backwash cycle based on a preset (but adjustable) differential-pressure.
- Filter system shall be furnished with an air-override feature, enabling compressed air to be injected into the top of each filter housing during the backwash cycle, facilitating the evacuation of the dirty water out of each filter housing prior to backwash. The air-override feature accelerates the backwash cycle; therefore, minimizing backwash water volume.
- Filter housings shall sequentially backwash, accomplished by 3-way backwash valves installed on the inlet side of each filter housing. Actuation of 3-way backwash valves is controlled by solenoid valves furnished with system. Backwash water flow direction shall be from the inside of the of the disc media - to the outside. During backwash, the disc media is decompressed causing disc media to be free-floating. Simultaneously with the decompressing of the disc media, clean water from the outlet manifold of the filter is introduced from the inner diameter of the disc stack. The backwash spray is introduced tangentially to the disc media, causing a high velocity spinning action of the disc media.

- The backwash spray shall be applied via (X) rigid backwash columns/posts (which include X spray nozzles in each column), focusing the spray at fixed indexed heights uniformly throughout the disc stack.
- The backwash manifold of the filter system shall be a 2" NPT connection. Contractor shall furnish 2" piping from filter flush manifold to floor drain.
- The backwash water flow rate shall not exceed 45 GPM; average backwash duration (per housing) should be 20-35 seconds but is adjustable based on water quality of application.

### **Backwash Controller:**

- Filter manufacturer shall furnish the backwash control system.
- Controller shall consist of (1) MAXIM (model M8) Controller equipped with sufficient memory and I/O's, to control all critical functions of filter operation; including monitoring the differential-pressure switch, and controlling valve operation.
- Filter controller shall be programmed to be capable of automatically controlling and monitoring the filter system and capable of the following:
  - Real-time system status on LCD display
  - Elapsed time since last backwash (and display reason for last backwash)
  - Adjustable dwell time, duration of backwash, and air-override
  - Trip and life backwash counter (including a trip reset)
  - Additional I/O's
  - Output Voltage 24VDC
- Controller shall be in a NEMA 4X enclosure, UL and CUL approved.
- Controller shall include an auto-resetting surge suppression device.
- Controller shall include an EEPROM (memory chip for future upgrades)

### **Compressed Air:**

- Air compressor is NOT furnished with filtration system.
- Contractor shall be responsible for installing sufficient piping/tubing from an air compressor to the filtration system using a minimum of 3/4" pipe/tubing.
- Filtration system shall be furnished with sufficient quantities of pneumatic solenoids for distributing air to actuate backwash valves and provide air for air-override feature during the sequential backwash sequence.

**Product Storage and Handling:**

- Filtration system shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is complete and the equipment is ready for startup and operation.

**Installation and Operating Instructions:**

- Installation shall be in accordance with the manufacturer's instructions and recommendations.
- Operation and Maintenance manuals shall be furnished in accordance with this specification. The manuals shall be prepared specific to this installation and shall include all required drawings, descriptions that are required to instruct operation and maintenance personnel unfamiliar with such equipment.

**Warranty:**

- In order to ensure the proper performance and compatibility of all equipment supplied within the intent of this specification shall be warranted by the same supplier.
- The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced and system shall be restored to service.
- Filter manufacturer shall warrant the automatic Turbo-Disc Filter against defects in workmanship and materials for (12) months from the ship date of the system.