

Liquid-Solids Separation System

PART I – GENERAL

1.01 Summary

Furnish and install the liquid-solids separation system as specified herein.

- A. **Primary Purpose** – The system will remove unwanted solids from a cooling tower sump or remote basin using a centrifugal-action vortex separator. The liquid-solids separation system will help prevent particle fouling of the cooling system's components, reduce maintenance and servicing routines, maintain optimum energy efficiency of the heat exchange process, limit blow down & chemical use practices and control harmful bacteria growth in the basin/sump. Fluid viscosity must be 100 SSU or less.
- B. **For Side Stream Installations** -- Control of solids in the recirculated cooling water system shall be accomplished via a side-stream flow of not less than 10-20% of the full-stream system flow through a completely assembled separation/filtration package. The package's pump shall provide sufficient pressure for the re-introduction of side-stream fluid back into system flow.

1.02 System Performance Requirements

Testing Requirements – Each unit must be tested by the manufacturer prior to shipment to ensure it conforms to stated operating specifications.

- A. **Independent Testing Laboratory** – Performance of said products must be verified by published results from an independent and identified testing laboratory. Standard test protocol of upstream injection, downstream capture, and separator purge recovery is allowed with 50-200 mesh particles to enable effective, repeatable results. Single pass test performance must not be less than 95% removal. Model tested must be of same flow-design as specified unit.
- B. **Identification** – Package system is identified by model number ETCX-0310-SRV and manufactured/assembled/tested by LAKOS, a Division of the Claude Laval Corporation. Flow activity rate shall be 365 (U.S. gpm). Inlet/outlet connections shall be 6/4 inch. Pump horsepower shall be 7.5.

PART II – PRODUCTS

2.01 Performance

Flow Capacity -- Unit shall have a flow capacity of 365 US GPM.

Pressure Loss – Shall be between 3-12 psi (.2 to .8 bar) remaining constant, varying only when the flow rate changes.

A. Solids Removal Effectiveness

All Systems – In a single pass through the separator, given solids with a specific gravity of 2.6 and water at 1.0, performance is expected to be 98% of 74 microns and larger. Additionally, particles finer in size, heavier by specific gravity and some lighter by specific gravity will also be removed, resulting in an appreciable aggregate removal of particles (up to 75%) as fine as 5 microns.

In Recirculating Systems -- 98% performance is predictable to as fine as 40 microns (given solids with a specific gravity of 2.6), with correspondingly higher aggregate performance percentages (up to 90%) of solids as fine as 5 microns.

- B. Maximum working pressure: 150 psi (10.3 bar).
Maximum operating temperature: 100° F (38° C).

2.02 Construction

- A. **The separator package** -- Shall provide for initial pre-straining prior to pump suction (except for side-stream applications), followed by direct pumping through a specific centrifugal-action solids-from-liquid separator. Separated solids shall be continuously bled from the separator's collection chamber into the package's integral solids recovery vessel and solids collection bag. Excess liquid shall pass through the bag and return to system flow via piping connected to the package's pump suction line. Alternatively, the separated solids may be purged periodically to desired disposal with an automatic purge valve.
- B. **Strainer** -- Cast-iron housing; manual-cleaning; 9/32-inch (7 mm) minimum mesh rating; stainless steel basket.
- C. **Pump** -- End-suction, single stage; TEFC motor; cast iron housing; iron impeller; bronze shaft sleeve; silicon carbide mechanical shaft seal; flooded suction required.
- D. **Separator** -- Centrifugal-action design, incorporating a true tangential inlet and mutually tangential Swirlex internal accelerating slots, employed to promote the proper velocity necessary for the removal of the separable solids. The internal accelerating slots shall be spiral-cut for optimum flow transfer, laminar action and particle influence into the separation barrel. The separator's internal vortex shall allow this process to occur without wear to the accelerating slots. Separated particle matter shall spiral downward along the perimeter of the inner separation barrel, in a manner which does not promote wear of the separation barrel, and into the solids collection chamber, located below the vortex deflector plate. The separator shall be of unishell construction with SA-36, SA-53B or equivalent quality carbon steel, minimum thickness of .25 inches (6.35 mm)
- E. **Solids Collection Vessel** -- Housing shall be 304 stainless steel with stainless steel basket and coated carbon steel lid with air pressure relief valve; 25- micron fiber felt solids collection bag. Flow control orifice included. Solids capacity: 360 cubic inches (6 liters).
- F. **Indicator Package** -- Shall identify when the internal bag requires cleaning/replacement by sensing pressure differential through the solids recovery vessel.
Option: Indicator gauge may be supplemented with a dry electric contact in order to operate a light or audible signal when bag servicing is required.
- G. **Optional Automatic Purge Valve** -- In place of the solids recovery vessel, an electrically-actuated valve shall be programmed at appropriate intervals and duration in order to efficiently and regularly purge solids from the separator's collection chamber. Valve body shall be bronze (optional stainless steel also available). Valve ball shall be stainless steel with sealant seat.
- H. **Inlet and Outlet** -- Shall be grooved couplings.
- I. **Purge Outlet** -- Shall be threaded with a screw-on flange.
- J. **Piping** -- Schedule 40 galvanized carbon steel; reinforced rubber hose to solids recovery vessel.
- K. **Electrical Control** -- IEC starter with overload module; HOA selector switch; NEMA-4x enclosure; re-set/disconnect/trip switch; 120 volt, single phase control voltage; CSA-approved. Power requirement: 460 volt, 3 phase, 60 Hz.
- L. **Valves** -- Ball valves on purge line for isolation of solids-handling/purging equipment. Optional inlet/outlet valve kit is available.
- M. **Skid Plate** -- Stainless steel, 3/16-inch (5 mm) minimum thickness, structural steel framework on TCI-0825 and larger units.
- N. **Paint Coating** -- Shall be oil-based enamel

2.03

Purging and Solids Handling

- A. Evacuation of separated solids may be accomplished automatically, employing a motorized ball valve with integrally-equipped programming for controlling the frequency and duration of solids purging.

- B. As an alternative to automatic purging, separated solids may be continuously purged under controlled flow into a Solids Recovery Vessel equipped with a solids collection bag. Excess liquid shall pass through the bag and return to system flow via piping connected to the system pump's suction line. The system shall include an air/pressure relief line for the vessel. System also includes manual isolation valves for use when servicing the collection bag; sightglasses for verification of flow through the vessel; annunciator for indicating when the collector bag needs cleaning/replacement; flow control orifice to minimize fluid volume/velocity through the vessel and collector bag.

2.04 Manufacturers

The separator system shall be manufactured by LAKOS Filtration systems, a division of the Claude Laval Corporation in Fresno, California, USA, or approved equal.

PART III – EXECUTION

3.01 Installation

- A. Coordinate with the installing contractor to ensure equipment is installed in conformance with manufacturer's recommendations and those found in the specification.
- B. If deficiencies are noted by the field service representative, the contractor shall make necessary corrections and the manufacturer's field service personnel will visit the installation site and oversee any corrections or modifications required. A written report shall be filed with the Engineer at each visit.

3.02 Maintenance

The separator shall feature the following access capabilities for either inspection or the removal of unusual solids/debris:

- a. A hand-hole port at the collection chamber (HTX Model Separators Only)
- b. A ½-inch inspection port, located at the lowest point of the upper chamber (HTX Model Separators Only)
- c. A grooved coupling in the upper body to provide full access.