**HYDROCYCLONE SEPARATOR PACKAGE RECOVERY SYSTEM**

**SECTION \_\_\_\_\_**

# PART I – GENERAL

* 1. **Summary**

Furnish and install a Puroflux Hydrocyclone Separator system.

**Primary Purpose:** To remove unwanted solids from the cooling tower water by utilizing a hydrocyclone separator. A fully assembled separator package system shall be supplied to prevent the accumulation of troublesome solids in the tower sump. The flow of water through the separator package shall be continuous and without interruption during the periodic purging of separated solids.

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, reduce chemical usage, and aid in the control of harmful bacterial growth.

**1.02 Separator Performance Requirements**

1. Independent Testing Laboratory – Performance of the separator must be verified by published results from an independent third party 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.
2. 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 as fine as 5 microns, heavier by specific gravity and some lighter by specific gravity will also be removed.
3. In Recirculating Systems - 98% performance is predictable to as fine as 40 microns (given solids with a specific gravity of heavier than the carrying fluid). Additionally, particles as fine as 5 microns, heavier by specific gravity and some lighter by specific gravity will also be removed.

**PART II – EQUIPMENT**

* 1. **Design Criteria**
1. Identification – Hydrocyclone separator package is a model PF-63-\_\_\_\_\_\_\_\_\_\_ and is manufactured, assembled, and tested by Puroflux Corporation.
	1. Flow rate shall be \_\_\_\_\_\_\_\_ (U.S. GPM / m3/hr).
	2. Pressure loss shall be between 3-12 psi (.2 to .8 bar) remaining constant and only varying when the flow rate changes.
	3. Maximum working pressure: 150 psi (10.3 bar).
	4. Maximum operating temperature: 100°F (38º C).
	5. **Construction**

**Package** - A complete factory assembled pump package with: PF-61 series separator, pump and motor, pre-strainer, skid, interconnecting face piping, control panel, and recovery system.

1. **Separator** - The Puroflux PF-61 hydrocyclone separator shall incorporate a true tangential inlet and dumbbell body design. As the pressurized process carrying fluid enters tangentially into the entrance chamber of the separator, it starts a downward helical flow. This downward spiral motion, in conjunction with the reduced body diameter, causes high centrifugal forces to act on the carrying fluid. The solids in suspension are forced to the wall of the separator body, and then downward into the accumulation chamber at the bottom of the separator. The clean process fluid (inner vortex) then reverses its axial direction and moves upward in a helical flow exiting via the separator outlet.

Purging is necessary to eliminate the high concentration of solids build-up in the separator’s accumulation chamber and can be performed while the separator remains on-line. The purge is set at a constant flow to the recovery system. The purged waste is concentrated in the recovery system while the clean fluid is drawn back into the system flow. The level of solids contamination in the system will dictate the frequency of recovery system bag changing and/or cleaning.

* 1. The separator’s design shall not require additional devices, such as external pressure lines or accelerating slots, to ensure maximum particle removal at any flow.
	2. The separator’s design shall allow for passage of (at a minimum) 1/2”diameter particles to the accumulation chamber without the need for physical access to the separator interior.
	3. The separator’s design shall allow for self ventilation of air. Manual air vent shall be included for timely start-up.
	4. All separators with inlet/outlet connections 4” and larger shall feature a hand-hole at the collection chamber access for either inspection or the removal of unusual debris.
	5. To prevent the buildup of unnecessary particulate within the separator, purge location shall be at the lowest point of the separator accumulation chamber.
1. **Pump** **& Motor** - Cast iron bronze fitted, close coupled end-suction (flooded suction required).
	1. Design conditions: \_\_\_\_\_\_ GPM @ \_\_\_’ TDH.
	2. \_\_\_\_ H.P., energy efficiency TEFC motor.
	3. Pre-strainer: flanged cast-iron housing; 1/8-inch minimum perforated stainless steel basket, and flange removable lid.
2. **Connections**
	1. (PF-63-025 unit and smaller) \_\_\_\_\_” 150-lb flange inlet and \_\_\_\_\_” mpt outlet.
	2. (PF-63-030 unit and larger) \_\_\_\_\_” 150-lb flange inlet and \_\_\_\_\_” 150-lb flange outlet.

1. **Solids Collection Vessel** - Constructed of 304-stainless steel and includes: stainless steel basket, manual air pressure relief valve, flow control orifice and two 25- micron fiber-felt solids collection bags.
	1. Design conditions: Solids capacity 360 cubic inches (6 liters).
	2. Indicator package - Recovery vessel shall be equipped with pressure differential gauge to identify when the internal bag requires cleaning/replacement.
2. **Piping** - Schedule 80 PVC
3. **Electrical Control** – UL listed and labeled NEMA type 4X polycarbonate enclosure with door disconnect switch, motor starter with short-circuit/overload protection, 120V step-down transformer, and pump Hand-Off-Auto (H-O-A) switch.
	1. Power requirement: 208/230/460V, 3-phase, 60 Hz.
	2. Consult factory for voltages not listed.
4. **Structural Skid** - Structural steel framework shall be constructed of carbon steel for maximum rigidity. (Channel or plate skids are not acceptable.)
5. **Coating** - UV resistant fusion bonded polyester coated separator body and skid. (Enamel based paint is not acceptable.)
6. **Options** – Available upon request
	1. NEMA premium efficiency TEFC motor
	2. Inlet / outlet isolation valves
	3. Schedule 40 carbon steel interconnecting face piping with Schedule 80 PVC to solids recovery vessel
	4. Recovery vessel dirty bag alarm - The indicator gauge may be supplemented with a dry contact in order to provide remote signal and/or local indicating light (120V) when bag servicing is required.
	5. **Manufacturers**

The separator system shall be manufactured by Puroflux Corporation in Simi Valley, California, USA. Specific model designation is PF-63-\_\_\_\_\_\_\_\_\_\_

# PART III – EXECUTION

**3.01 Installation**

1. Coordinate with the installing contractor to ensure equipment is installed in conformance with manufacturer’s recommendations and those found in the specification.
2. Start up and commissioning shall be performed by factory authorized representatives.