

# Installation, Operation, and Maintenance Manual



## eTCX Series High Efficiency Separators

**LAKOS**  
Separators and Filtration Solutions

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# eTCX High Efficiency Tower Clean/Side Stream Clean Installation & Operations Manual

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## I. INTRODUCTION

The LAKOS eTCX High Efficiency Tower Clean Systems are compact filtration packages for the removal of grit, airborne particles and scale from cooling tower water in order to avoid system fouling.

Featuring the next generation centrifugal-action high efficiency performance LAKOS “e” Separator, the packages combine reduced pump horsepower, better quality, improved reliability and newly engineered separator with performance efficiencies (up to 98% of 25 micron particulates of 2.6 specific gravity or higher in a recirculated pass) to control the accumulation of a greater range of troublesome solids in a heat transfer system. This control leads to a reduction in tower cleaning, system shutdown, maintenance & servicing costs, blowdown and water/chemical loss. You will enjoy the energy/operating savings of reduced solids fouling.

One unique feature of the LAKOS eTCX High Efficiency system is that the same system can be applied to basin cleaning, full stream, or side stream applications. The Tower Clean System continuously recirculates the tower basin water, where appropriate using the LAKOS “e” Series HydroBoosters to provide the necessary directed turbulence and to prevent not only solids accumulation in the basin, but also help protect the entire system from solids fouling. The same system can be installed as a side stream system off of a pump discharge in a main water line.

## **II. WARRANTY INFORMATION**

All products manufactured and marketed by this corporation are warranted to be free of defects in material and workmanship for a period of at least one-year from the date of delivery. Extended warranty or no coverage applies as follows:

\*\*All LAKOS eTCX separators---five year warranty

\*\*Pump seals are not covered under warranty

All other components and coatings: 12 months from the date of installation; if installed 6 month or more after ship date, warranty shall be a maximum of 18 months from ship date.

If a fault develops, notify us or your local representative, giving a complete description of the alleged malfunction. Include the model numbers(s), date of delivery and operating conditions of subject products(s). We will subsequently review this information and, at our option, supply you with either servicing data or shipping instructions with a returned materials authorization number. Upon prepaid receipt of subject product(s) at the instructed destination, we will perform such necessary product repairs or replace such product(s) at our expense. This limited warranty does not cover any products, damages or injuries resulting from misuse, misapplication, neglect, normal expected wear, chemically-caused corrosion, improper installation or operation contrary to factory recommendation. Nor does it cover equipment that has been modified, tampered with or altered without authorization.

No other extended liabilities are stated or implied and this warranty in no event covers incidental or consequential damages, injuries or cost resulting from any such defective products(s).

This warranty supersedes any and all previous warranties provided by LAKOS/ Claude Laval Corporation.

### III. PRE-ASSEMBLY/PRE-START-UP CHECK LIST

1. A licensed and/or trained/experienced plant electrician and millwright-pipe fitter should install this packaged system.
2. Ensure that the concrete pad is level and structurally sound to accommodate the weight of the system, including liquid.
3. To firmly position this unit, appropriate size anchor bolts are necessary.
4. To minimize pipe strain to the separator, suction and discharge pipes should be supported independently.
5. The pump suction line should be sized for about 5 ft/sec. regardless of the actual pump suction size. Minimize suction lengths (no more than 30') and restrictions such as elbows. These practices will minimize friction losses and help extend pump seal life. Exceptions may apply if a qualified individual calculates NPSHA and NPSHR for the pump.
6. The threads of the pipe fittings screwed into the pump must be sealed with pipe sealants, tape, R.T.V. or other sealing materials approved for pipe threads. In case of flanged connections, rubber gaskets should be used.
7. Tighten pump and pipe fittings only as much as required to avoid leaks and air intrusion. Air entrapment into the pump may affect its efficiency and result in cavitation. **DO NOT OVER-TIGHTEN.**
8. The control panel must be wired for the proper voltage and rotation of the pump (see wiring diagram in control box door). All wiring should be done by a licensed electrician in accordance with local codes.

Motor nameplates indicate voltage, amperage draw, cycles, phase, speed and other motor information.

9. **Allow water to enter the pump**, jog-start the pump to verify correct rotation as indicated in the pump's housing. Reverse terminal leads as necessary.

## **IV. START-UP AND OPERATION**

### **1. FLOODED SUCTION REQUIRED !!**

The pump suction diffuser needs to be filled with water before starting the pump. Partially close (approximately 25%) the discharge valve and make sure that the suction valve is fully open. Start the pump and observe the pressure gauge which reads the discharge pressure of the pump at the inlet of the separator. The needle of the gauges might flicker for a few seconds and will they should settle, indicating that any air in the system is being bled off naturally. If it continuously flickers and the pump cavitates for more than a minute, bleed-off air from the system.

Once pressure has reached 20 psi or more slowly open the discharge valve to ensure proper pump operation. If the valve cannot be fully opened without the pump cavitating, be sure there are the correct number of HydroBoosters installed downstream of the Tower Clean System. In a Side Stream System application the valve may need to be adjusted to ensure proper back-pressure on the pump. This is normal.

**NOTE:** Make sure that all suction valves (from the source of water to the pump intake) are fully opened when the pump is running. Operating the system with a partially closed suction valve can damage the pump and/or affect the system's performance. Each model requires a minimum liquid submergence level (above the pump intake) to meet the pump's Net Positive Suction Head Required (NPSHR) to avoid air intrusion or cavitation (vortexing at point of source). See appropriate pump curve included with this manual. This is also very important when LAKOS HydroBoosters are in use.

Entrapped air will always seek the highest elevation in the system. A valve in the system outlet will be at the highest elevation. When partially opened during start-up, it will help relieve air from the system.

The Solids Recovery System (SRV), if installed with your system, must also be primed and vented at the solids collection vessel. Please see SRV operating procedure.

**DO NOT DRY-RUN THE PUMP:** All standard end suction style pumps provided on the LAKOS systems require a wet/primed suction before starting, using water as a lubricant for their seals. Mechanical seals can wear out in less than 20 seconds of dry operation. It only takes a small amount of water to lubricate the seal, and it vaporizes during pump operation. Also, when replacing the seals, avoid touching the mechanical seal faces. Oils, moisture, and dirt from your fingers escalate seal wear.

2. **FOR NEGATIVE SUCTION (LIFT)**

If the water level of the sump is lower than the centerline of the pump inlet, the use of a self-priming pump or vertical turbine pumps is required. Consult the factory for systems requiring suction lift.

3. **WINTERIZING**

In areas where the equipment may be subject to outdoor freezing winter temperatures, you will need to protect the separator, suction diffuser, pump, interconnecting/purge piping, and SRV. Heat tracing and/or pipe insulation or an insulated “dog house” type structure can be used (please contact your local supplier of these types of products to ensure proper usage).

If the systems will not be operated during the winter season you can simply remove the drain plugs on the various components and drain out any water. You can use low pressure compressed air to remove any water trapped in the components, or flush the system with antifreeze. Do not replace the plugs, dry them out and place them in a bag in the system control panel so they are not lost.

## **V. MAINTENANCE**

1. A System START-UP FORM is included in this manual. Record all readings (inlet and outlet pressures, motor amperage draw and liquid flow rate) during start-up as reference point. Please complete the required information and return this form to your local representative as soon as possible. You may want to keep a copy for your records.
2. Record and compare these readings whenever periodic check-up and maintenance is done. These records would be helpful in troubleshooting the system when a problem occurs during the operational life of the system.

### **A. SUCTION DIFFUSER**

The suction diffuser is sized to allow a maximum pressure drop of 1-1.5 psi at the specified flow rate. It will protect the pump, separator, flow control valves and other equipment from becoming plugged by dirt and debris 1/4" in size and greater. The suction diffuser must be periodically opened and inspected based on the system operating conditions and the following items checked:

- Clean debris from strainer basket and inspect for holes. Replace as needed.
- Inspect stabilizing vanes for wear, scale or contaminants. Clean with wire brush as necessary.
- Inspect the "O" ring for damage. Replace as needed.

This can be done by isolating the diffuser by closing the isolation valves installed before the pump and after the separator outlet. These are not provided as a standard option by LAKOS, but are available if a valve kit is ordered. Loosen the bolts and remove the cover and perform inspection as noted above. Replace the cover and tighten the bolts.

***NOTE:*** *The suction diffuser is provided with a temporary "fine" mesh outer strainer that is used for initial start-up. This should be removed and discarded after the initial system circulation is complete.*

### **B. PUMP AND MOTOR**

Make sure there are no leaks in the pump housing. If leaks occur at the back of the volute casing, you may have a damaged seal (pump seals are not covered under warranty) and/or loose bolts. Replace and/or tighten as necessary.

Whenever maintenance or repair is needed for the pump, SHUT-OFF and LOCK-OUT power into the panel feeding the pump; close

the suction and discharge valves, open drain plug/valve, making sure no air or hydraulic pressure is in the system before unhooking the pump. Refer to Pump Manual.

Outside air is very important to cool the motor. The TEFC motor has a fan in the back. Ensure that the fan is rotating when motor is energized. Zerk fittings were installed in the front and back of the pump shaft/bearing housing. A small amount of grease might be needed periodically to replenish the old grease in the housing. Whenever new grease is injected, the old grease will ooze out on the opposite side. Wipe it clean. Whenever motor is required to be unhooked/ repaired, follow shut-off lock-out procedure and refer to the pump/motor installation manuals as required.

**C. CONTROL PANEL/PUMP STARTER**

A consistently kicked-back circuit breaker is indicative of a motor overloading/overheating. The built-in thermostat in the motor is experiencing an excessive rise in temperature, which might be caused by sudden voltage increase/drop, phase imbalance or over-torqued shaft. Verify motor bearings, terminal connections for looseness and correctness. Verify pump is rotating freely. Mechanical interference inside the pump might be causing this problem.

Under-rated circuit breakers, contactors, relays and/or heaters will also cause this situation. Use appropriately sized components. Also, undersized wires/cables might cause shorting and overheating. An excessively hot environment might also cause premature failure of motor and electrical components. Avoid installing system in direct sunlight or near heated objects or equipment. Vibrating equipment may cause loosening of terminal bolts and screws; make sure vibration is dissipated whenever the eTCX System is required to be installed in such a location.

**D. PRESSURE GAUGES**

Stuck needles/pegged gauges might indicate false readings. Verify their operation by opening and closing petcock valve installed before the gauges. Replace gauges, if necessary.

**NOTE:** *Each System is provided with either a SRV-833 Solids Recovery System (see "E" below), or EFS (see F below) for evacuating separated solids from the system. Follow the appropriate instructions for your system componentry.*



**E. SRV-833 SOLIDS RECOVERY VESSEL**

**SYSTEM DESCRIPTION**

LAKOS Solids Recovery Systems (SRV) are intended for the purpose of continuously collecting and concentrating separated particle matter from the purge outlet of a LAKOS Separator.

**EQUIPMENT CHECK & ASSEMBLY**

The basic SRV System includes a bag-like housing. Standard systems include an auto air vent assembly and two solids collection bags (single bag units) typically inserted in the SRV vessel for shipping. Open the vessel and remove all extra items (except for one bag per basket assembly, properly seated in the internal basket). Be sure the stainless steel basket is seated properly with the o-ring under the upper lip.

**START-UP PROCEDURES**

Do not attempt to start-up the SRV system until the LAKOS Separator is in full operation. At that time, follow these steps:

1. Close the manual valve going to the pump suction.
2. Fully open the manual valve on the purge line coming from the separator.
3. The auto vent on the top of the SRV lid will vent air (this will be audible) until the SRV is filled with water.
4. Fully open the valve going to the pump suction. If the Indicator Package is installed, check the sightglasses for proper flow to and from the SRV vessel. System is now in operation.

**MAINTENANCE PROCEDURES**

Separated solids collected in the SRV vessel must be periodically removed. The collector bag may be cleaned and re-used (up to three times) or discarded and replaced. This operation can be performed without interrupting system flow or the LAKOS Separator's operation (see instructions below). Recommended maximum solids load per bag is 25 lbs. (11 kg) or until 18 psid is reached indicated by the "red" zone on the differential gauge attached to the SRV.

The indicator package uses a pressure-differential sensor to identify when the bag should be serviced. The standard gauge will point to a red zone, indicating service is needed. The optional dry electric contact will engage whatever indicator is connected (a light, buzzer, horn, etc. which is not provided as a standard option).

**FOLLOW THESE STEPS:**

1. Close the manual valve on the purge line off the separator.
2. Close the manual valve on the line going to the pump suction.  
**IMPORTANT:** *Wait until all pressure has been released before proceeding.* Open the lid to the SRV vessel. Grasp the handle and remove the entire assembly from the SRV vessel. Remove the bag(s) and clean/replace in the basket.
3. Check o-rings on the basket lip and SRV vessel lid; replace if damaged. Replace the basket/bag assembly in the SRV vessel. Close lid and secure properly.
4. Fully open the manual valve on the purge line.
5. The auto vent will vent all air from the SRV vessel.
6. Fully open the valve going to the pump suction. If the Indicator package is installed, check the sight-glasses for proper flow to and from the SRV vessel. System is now back in operation.

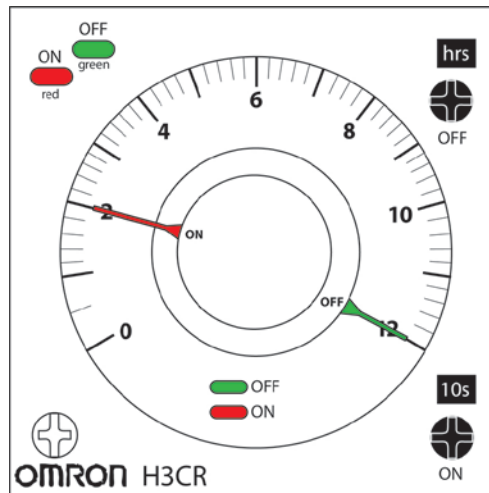
F. **EFS (Electric Actuated Fail Safe Ball Valve w/ controller)**

**COMPONENT FUNCTION**

The LAKOS EFS Electric Actuated Fail Safe Ball Valve provides for periodic and automatic flushing of separated solids at timed intervals selected by the system operator. The actuator fail safe component is a battery back-up that is continuously charged when the system is in operation. If there is a loss of power to the system, the actuator will close the valve so that no water is lost to the system.

**PROGRAMMING FUNCTIONS**

The controls for programming this valve are located next to the main motor starter in a separate control box. **CAUTION: Before changing timer settings be sure the main power is off.**



**EFS Factory Setting**

(20 second purge every 12 hours)

All eTCX systems have the timer located in the main starter control panel and a manual purge button on the panel front door. Timer settings can be adjusted to increase or decrease purge frequency and duration as needed. You can refer to our LAKOS Timer Setting Video on Youtube or on our LAKOS.com website.

## **VII. SYSTEM TROUBLE SHOOTING PROCEDURES**

- A. PUMP WILL NOT PRIME** (if pump is not self-priming). Possible causes and solutions:
1. Make sure the diffuser strainer basket is not clogged (if applicable).
  2. Make sure the strainer basket is positioned correctly (if applicable).
  3. Tighten the diffuser cover down completely (if applicable).
  4. Make sure the diffuser is full of water (if applicable).
  5. Tighten all the fittings and seal all the joints on the suction side.
  6. Open all the valves on the return and suction lines.
  7. Remove and replace the pump seal if needed.
  8. Check the compatibility of the pump and motor.
  9. Check pump rotation. Reverse motor wire terminals if necessary.
- B. MOTOR RUNS HOT** Possible causes and solutions:
1. Motors will run warm to the touch. The motor starter thermal and overload module will function to turn off the motor if there is an overload current problem.
  2. Factors which will increase the operating temperature:
    - a. The pump is installed in the direct sun.
    - b. Poor ventilation in the area the pump is located.
    - c. Low voltage is available to the pump.
    - d. The wiring is the incorrect size for the load.
    - e. The solids loading requires more than the pump's motor horsepower rating.
    - f. The pump is operated above the full load amp rating of the motor.
    - g. Motor is experiencing imbalance load (in case of 3 phase; it is doing a single phase.)
    - h. Fan is broken/missing.
- C. THE MOTOR WILL NOT TURN** *The following procedure advises a warning and caution:* There is a safety/shock hazard. Have a qualified electrician perform the testing. Opening the motor starter box does not shut off power into the box; it only disconnects the starter module and control transformer. Follow electro-mechanical safety lock-out procedure.
1. If the system does not start, open the motor control box and check for power and/or tripped circuit breakers. If the motor overload trips, check the overload amp setting. Adjust the overload module to the motor's full load amp rating. Replace the overload with the correct overload module going from 460 to 230 system and re-wire the control transformer and motor terminals inside the motor junction box. Do not set or adjust to above full load amp rating.
  2. If deadhead pressure cannot be met:
    - a. First determine if the pump motor is rotating in the correct direction. Jog-start the motor control box hand switch off

- and on while observing the motor shaft/fan rotation.
- b. If the pump is not rotating correctly, shut off the power and switch two of the motor lead wires.
  - c. If the pump is rotating correctly, check for shut valves on the suction line, a clogged suction line at inlet, a clogged strainer basket, or a clogged pump.

Adjust the separator outlet valve to the required pressure drop across the separator for the desired flow. If the flow rate cannot be obtained, check for closed valves downstream of the separator, or restricted outlet piping. Systems with LAKOS HydroBoosters can use the HydroBoosters to act as a control valve.

**D. NO SOLIDS IN THE SOLIDS RECOVERY VESSEL (Filter Bag Housing)**

1. Purge valve to the inlet of the SRV is closed.
2. Air-locked in the system, bleed SRV of trapped air. Follow SRV maintenance procedure.
3. Purge line is blocked. Isolate the system from pressure by closing the purge line and liquid recovery line valves. Remove piping and clean out the blockage or replace the appropriate components.

**E. EFS Automatic Purge Valve Not Purging**

1. Check timer settings. Make sure function lights (green/red) on Omron timer are cycling properly.
2. Check wiring from panel to actuator. Make sure there are no loose wires.
3. Check and make sure ball valve is not jammed or plugged.
4. If problem can still not be resolved please contact LAKOS.

## **VIII. SPARE PARTS FOR eTCX SYSTEMS**

### **SRV replacement bags (set of 4):**

- CBX-334-10 (10 micron, 33" lg) LAKOS P/N 105202

### **eTCX Pump Repair Kits:**

- Please contact the factory for pump repair kit part numbers and details.

### **SRV-833 Parts:**

- Auto Vent LAKOS P/N 111016
- Gasket for Lid (nitrile) LAKOS P/N 106213
- Stainless Steel Basket (33") LAKOS P/N 105356
- O-ring for Basket (Buna-n) LAKOS P/N 106807

### **SRI-816 Parts:**

- Differential Pressure Indicator LAKOS P/N 101849
- Flow Control Valve (10 GPM) LAKOS P/N 115183
- Manual Isolation Valve (3/4") LAKOS P/N 108034

### **EFS Parts:**

- EFS-07-120V 3/4" Complete Assembly LAKOS P/N 134196
- EFS-15-120V 1-1/2" Complete Assembly LAKOS P/N 134197
- Omron Timer LAKOS P/N 121226

## **IX. STANDARD PUMP CONTROL PANEL WIRING DIAGRAMS**

- A. The separate LAKOS SmartStart Control Panel Installation Guide LS-916 contains information for proper control panel installation on eTCX system packages. All control panels supplied by LAKOS are provided with NEMA-4X enclosures and are UL Listed. If the system you purchased has a different voltage or phase than those shown on the drawings, please request the correct control panel wiring schematic for your model from LAKOS.
- B. There are three sizes of control panels sized on the horsepower (3hp-10hp) of the pump for each system. All the wiring schematics will be similar to what is shown here.
- C. All panels are set up to be used with either the SRV-833 or EFS automatic purge valve assembly.
- D. Refer to LAKOS literature LS-916 for all SmartStart Control Panel information.

## **X. STANDARD PUMP AND MOTOR IOM's**

- A. The LAKOS eTCX packaged systems use either a SCOT pump or PACO pump with premium efficiency motors. The Scot pump will be provided with a WEG motor and the PACO pump will be provided with a Baldor motor. The factory IOM's (see addendums to this installation manual) for these products are included in this manual.
  
- B. **LAKOS highly recommends that the pump and motor nameplate information be documented and kept for reference. LAKOS will request this information for any type of warranty issues that may arise with the pump and motor.**
  
- C. If your system is supplied with a pump and motor that is not standard please contact LAKOS for further information.



# LAKOS<sup>®</sup>

## eTCX Tower Clean/Side Stream Clean SYSTEMS

### START-UP FORM

DATE OF START-UP: \_\_\_\_\_

COMPANY NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

\_\_\_\_\_

PROJECT NAME/DESCRIPTION: \_\_\_\_\_

CONTACT PERSON(S): \_\_\_\_\_

*(Please include titles)*

DESCRIPTION OF LIQUID & SOLIDS (type, size, etc.): \_\_\_\_\_

TEMPERATURE OF SYSTEM FLUID: \_\_\_\_\_

COOLING TOWER BASIN SIZE: \_\_\_\_\_

NUMBER OF COOLING TOWER CELLS SERVICED: \_\_\_\_\_

DOES SYSTEM USE HYDROBOOSTERS IN THE TOWER BASIN:

Yes  No

Number of HydroBoosters per Cell: \_\_\_\_\_

*Prior to start-up, please record this data:*

PUMP SERIAL NUMBER: \_\_\_\_\_

MOTOR MAKE AND FULL LOAD AMPS: \_\_\_\_\_/\_\_\_\_\_

eTCX PACKAGE SERIAL NUMBER: \_\_\_\_\_

*For start-up, please record this data:*

MOTOR AMPS: \_\_\_/\_\_\_/\_\_\_ MOTOR VOLTAGE: \_\_\_\_\_

PRESSURE TO INLET OF SEPARATOR: \_\_\_\_\_

PRESSURE AT OUTLET OF SEPARATOR: \_\_\_\_\_

ADDITIONAL OBSERVATIONS/REMARKS: \_\_\_\_\_

\_\_\_\_\_

*Please complete this form and send a copy to LAKOS; keep a copy for your records.*

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