Heat Transfer Filtration

Heat Exchangers • Evaporative Condensers • Cooling Towers



Reduce maintenance costs by 60% - 90%

Reduce energy and chemical consumption by 10% or more

Reduce water consumption by 3% - 5%

LAKOS
FILTRATION SOLUTIONS

GEDO

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Why Do I Need Filtration?

Airborne debris, dirt, silt, sand and other suspended particles negatively affect heat transfer efficiencies through the creation of scale, fouling, biological activity, and corrosion.

Scale

Scale is characterized by plating-out of Calcium Carbonate ($CaCO_3$) on heat transfer surfaces. These deposits are created through precipitation of dissolved solids from cooling tower water. As $CaCO_3$ mixes with silica and water it forms hard concrete scale on heat transfer surfaces – leading to reduction in heat transfer. Scale formation is the most common reason for the need to punch and clean chiller tubes.

Fouling

Suspended solids (dirt, silt, sand, airborne particulate matter and corrosion by products) in cooling tower water form deposits and collects on heat transfer surfaces, cooling tower fill, cooling tower basins, and spray nozzles. Collection of suspended solids in heat transfer equipment results in scale and fouling - thereby leading to loss of heat transfer efficiency, increased maintenance, and decreased equipment life.

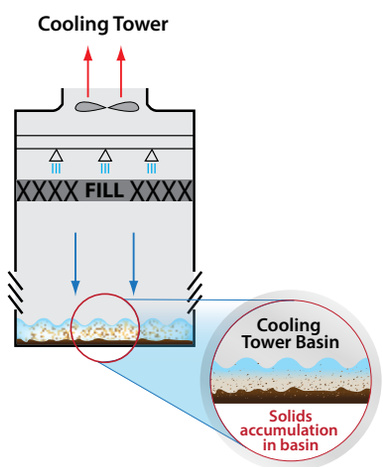
Biological Activity

Evaporative coolers and cooling towers offer a warm, moist environment for Biological Activity to grow and multiply. Biological Activity (algae, legionella, slime and biofilms) contributes to fouling of heat transfer surfaces (including tower fill), corrosion in all parts of the cooling tower system and creates health hazards.

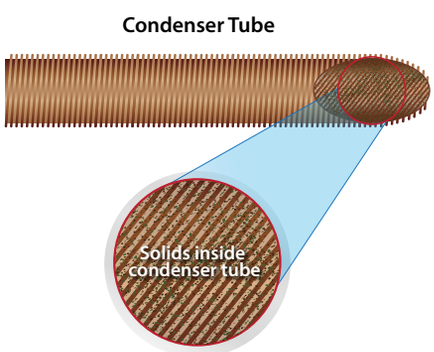
Corrosion

Corrosion in cooling tower basins is caused by suspended solids that buildup at the bottom of the basin. These settled solids not only provide a breeding ground for biological growth but also corrode the basin floor, thus increasing maintenance costs and reducing life of the tower basin.

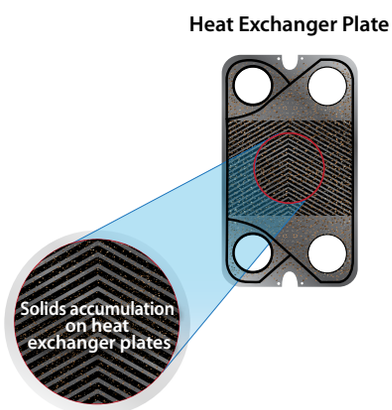




Suspended solids clog tower nozzles and water distribution systems – resulting in loss of thermal capacity as well as scale and mineral buildup on tower fill and closed tower coils.



Suspended solids reduce heat transfer areas and decrease flow inside tubes by accumulating on internal tube fins.



Solids in cooling tower water clog channels and create areas of low thermal conductivity.

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PROBLEM:

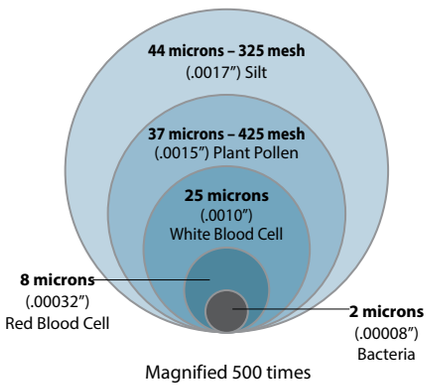
The chart below shows correlation between scale thickness and increase in energy consumption.

Scale Buildup vs. Energy Consumption

Fouling Factor (FF) H • ft² • F°/Btu	Approx. Scale Thickness in Inches	% Increase in Energy Consumption	
Clean	.000	0	
.0001	.001	1.1%	**FFA***
.0005	.006	5.5%	
.001	.012	11%	**Typical Fouling†**
.002	.024	22%	
.003	.036	33%	
.004	.048	44%	

* Field Fouling Allowance: The rating Fouling Factor for heating and heat reclaim heat exchangers shall be 0.000100 h•ft²•F°/Btu for closed loop and 0.000250 h•ft²•F°/Btu for open loop systems. Source: AHRI 2011 Standard for Performance Rating of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle. † Higher fouling rates can lead to chiller shutdown due to increased approach temperatures.

Increased approach temperatures can result from higher fouling rates – leading to chiller shutdown.



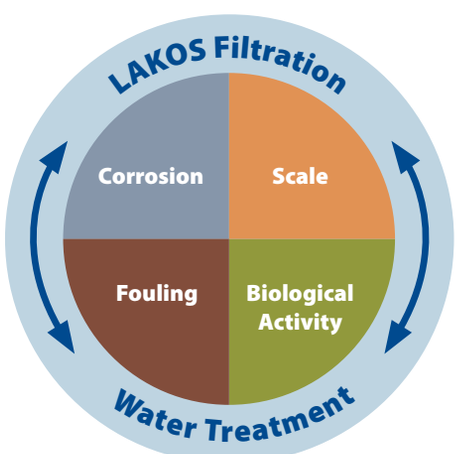
Human hair thickness: .0016 (40 microns)

For every .001" increase in Fouling Factor, your energy consumption increases by 11%.

*"A typical **200 ton cooling tower** operating 1000 hours may assimilate more than **600 lb** of particulate matter from airborne dust and the makeup water supply." (Broadbent et al. 1992)*

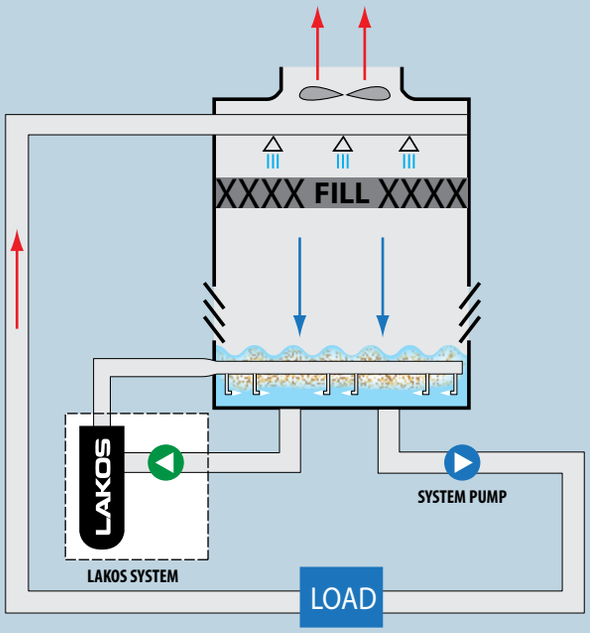
- 2020 ASHRAE Handbook, HVAC Systems and Equipment, Page: 40.16

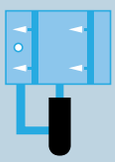
LAKOS Filtration when combined with Water Treatment…



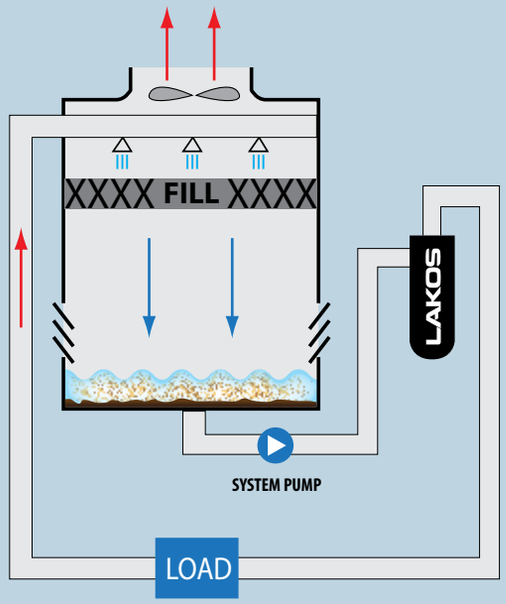
*…**Reduces** Corrosion, Scale, Fouling and Biological Activity*

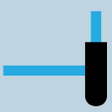
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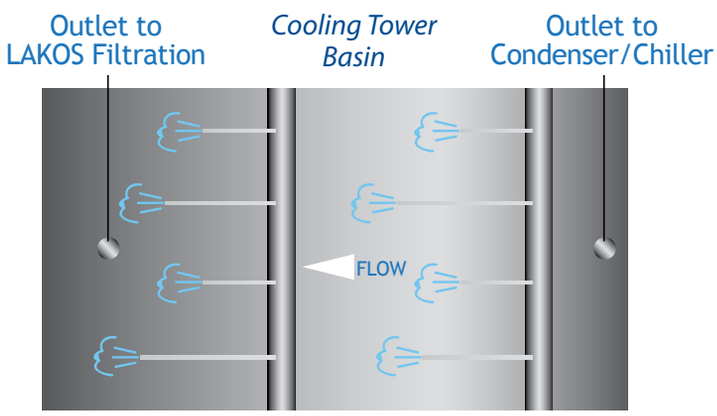


Basin Sweeping





Full Stream



Benefits:

- Reduce under-deposit corrosion, remove food source for biological activity and extend life of the basin
- Minimize manual cleaning, maintenance, downtime and risk of injury
- HydroBoosters™ sweep cooling tower basin to remove suspended solids at the source
- Maintain downstream thermal efficiency of heat transfer surfaces

For Multi-Tower Basin Cleaning see page 10

Benefits:

- Filter 100% of flow from the cooling tower to downstream equipment – with zero downtime
- Maintain design heat transfer efficiencies on new and existing equipment
- Extend maintenance intervals for cleaning chiller tubes, plate heat exchanges, compressors, etc.
- Zero filtration maintenance when using LAKOS Controllers and Automated Purge Valves
- Point of use application

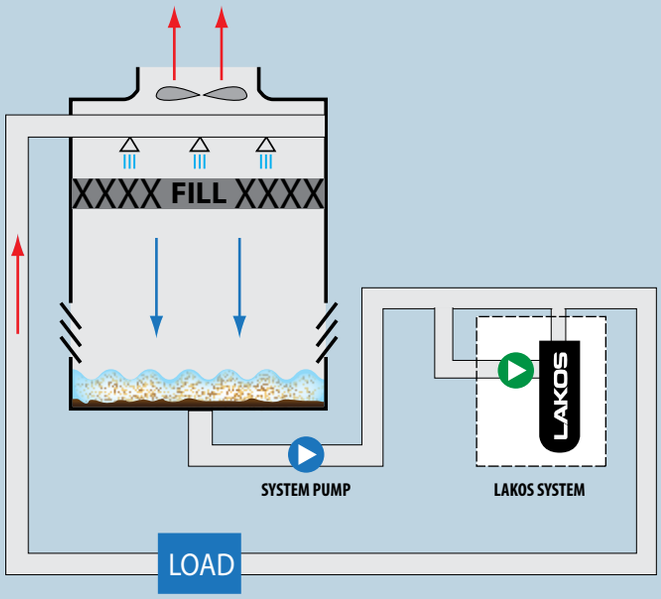
Using a LAKOS Separator in Full Stream application allows for filtering 100% of flow, from cooling tower to downstream equipment, thereby extending equipment life and maintaining design heat transfer efficiencies on new and existing equipment.

Eliminate Basin Cleaning

Extend Equipment Life by Filtering 100% of Flow

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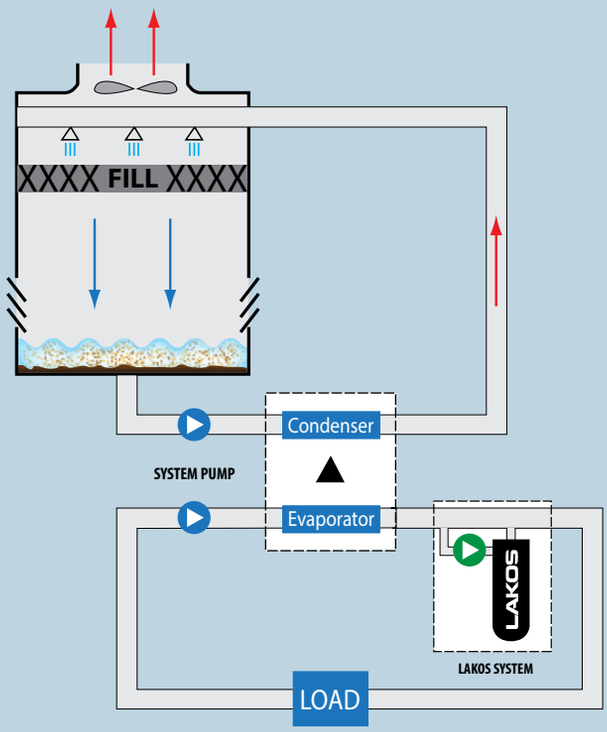
Side Stream

Benefits:

- Economical filtration solution
- Large or variable flow application where full flow is not an option and basins are not accessible
- Reduce suspended solids in mainstream flow
- Easy to retrofit
- Zero liquid loss options with LAKOS Solids Recovery Vessel
- Zero filtration maintenance when using LAKOS Automated Purge Valves

Using a LAKOS System in Side Stream applications helps reduce suspended solids in mainstream flow, thereby reducing downstream heat transfer loss.

Economical Filtration Solution



Closed Loop

Benefits:

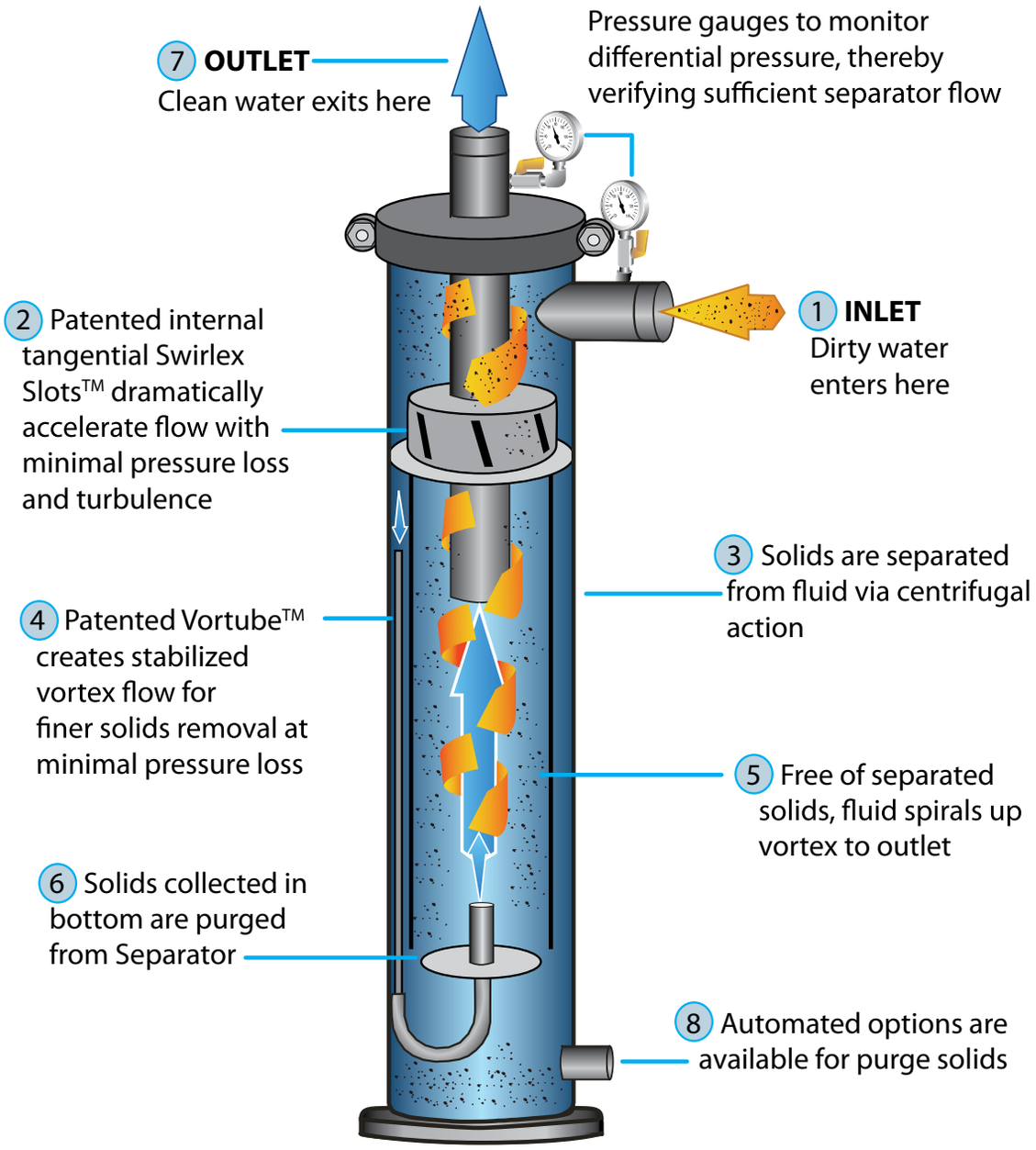
- Remove solids generated in closed loops (chiller water/propylene/ethylene glycol) by using side stream filtration
- Zero liquid loss when using a Solids Recovery Vessel (SRV)
- Direct replacement for side stream bags or spiral wound cartridges

Using a LAKOS System for closed loop filtration provides 24/7 filtration with zero system downtime, consistent pressure loss and no backwash requirements. Removing dirt, scale, rust and other suspended solids from closed loop systems helps maintain system design efficiencies.

Maintain Closed Loop Heat Transfer Efficiencies

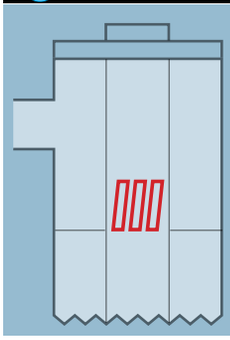
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How It Works



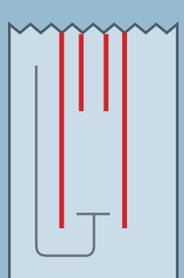
LAKOS eHTX Separators feature improved internals and operate differently than our HTX Separators. To learn more about how our HTX Separators operate, see LAKOS Literature LS-625.

2 PATENTED SWIRLEX SLOT



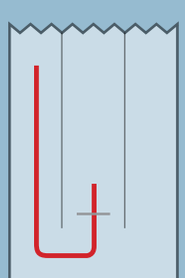
LAKOS Separators use slots to accelerate liquid and minimize turbulence - allowing highly efficient centrifugal separation of solids from liquids.

3 INTERNAL BARREL



Proprietary lower vortex stabilization methodology further enhances solids separation.

4 PATENTED VORTUBE



Patented Vortube geometry capitalizes on strong pressure gradient present at the center of the vortex to effectively pull finer solids into the collection chamber.

LAKOS Separators & Systems must be installed downstream of the main System Pump. Do not install on the suction side of the main system pump. Flow must be pushed through the separator and not pulled. Consult LAKOS for questions.

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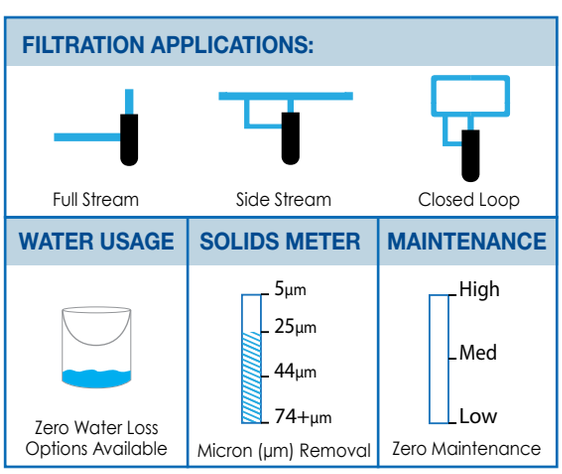
eHTX Series

Premium Efficiency Liquid-Solid Separators

Features and Benefits:

- Filter performance rated to remove up to 98% of all solids 44 micron (325 mesh), 2.6 specific gravity and larger in a single pass and up to **99% down to 25 micron (550 mesh) in recirculated systems**
- Low and steady pressure loss. 2 – 15 psi (.13 to 1.03 bar)
- Continuous filtration and no backwashing; periodic automated purging
- Optional materials of construction and ASME code available
- Flow ranges from 15 – 990 US gpm (3 – 224 m^3/hr). Higher flow rates available

For more information, see LAKOS Literature LS-924





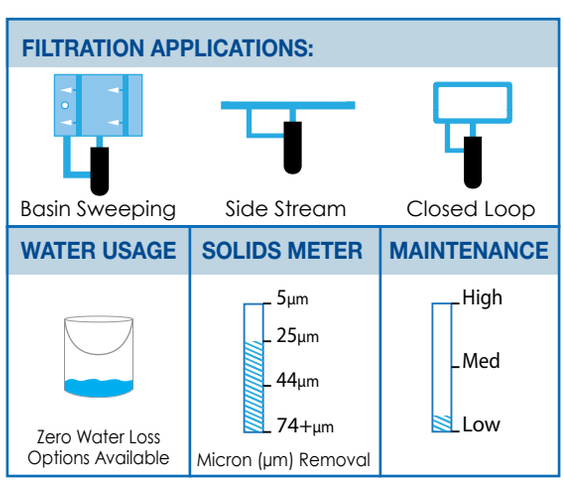
eTCX Series

Premium Efficiency Basin Sweeping and Side Stream Filtration with eHTX Series in Packaged System

Features and Benefits:

- Filtration efficiency up to 99% at 25 micron (550 mesh), 2.6 specific gravity, in a recirculating pass
- Premium Efficiency (PE) 1750 RPM pumps provide higher level of energy savings
- Can be used for basin cleaning or side stream cleaning
- 80% reduction in pump motor noise
- Basin Sweeping flow rates: 50 – 1110 US gpm (11 – 184 m^3/hr). Higher flow rates available – consult LAKOS
- Side stream flow rates: 65 – 1110 US gpm (15 – 184 m^3/hr) Higher flow rates available – consult LAKOS

For more information, see LAKOS Literature LS-910



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HTX/HTH Series

High Performance Liquid-Solid Separators

Features and Benefits:

- Filter performance rated to remove up to 98% of all solids 44 micron (325 mesh) 2.6 specific gravity and larger in recirculated pass, or up to 98% of 74 micron (200 mesh) in a single pass
- Low and steady pressure loss. 3 – 12 psi (.2 to .82 bar)
- Continuous filtration and no backwashing; periodic automated purging
- Optional materials of construction and ASME code available
- Flow ranges from 16 – 12,750 US gpm (4 – 2896 m^3/hr). Higher flow rates available

For more information, see LAKOS Literature LS-624 and LS-625

FILTRATION APPLICATIONS:		
 Full Stream	 Side Stream	 Closed Loop
WATER USAGE	**SOLIDS METER**	**MAINTENANCE**
 Zero Water Loss Options Available	 5µm 25µm 44µm 74+µm Micron (µm) Removal	 High Med Low Zero Maintenance



TCX

ABV2



Automatic Ball Valve option available

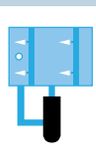
TowerClean Series

Basin Sweeping with TC Series

Features and Benefits:

- Reduce manual basin cleaning by sweeping basin of suspended solids
- Extend equipment life and remove food source for biological activity by removing solids at source
- Remove suspended and settled solids, thus preventing under-deposit corrosion
- LAKOS auto purge and collection options remove solids – without downtime or system depressurization, and with zero water loss
- Flow rates: 30 – 1670 U.S. gpm (7 – 379 m^3/hr)

For more information, see LAKOS Literature LS-710

FILTRATION APPLICATIONS:		
 Basin Sweeping		
WATER USAGE	**SOLIDS METER**	**MAINTENANCE**
 Zero Water Loss Options Available	 5µm 25µm 44µm 74+µm Micron (µm) Removal	 High Med Low

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TBI

ABV2



Automatic Ball Valve option available

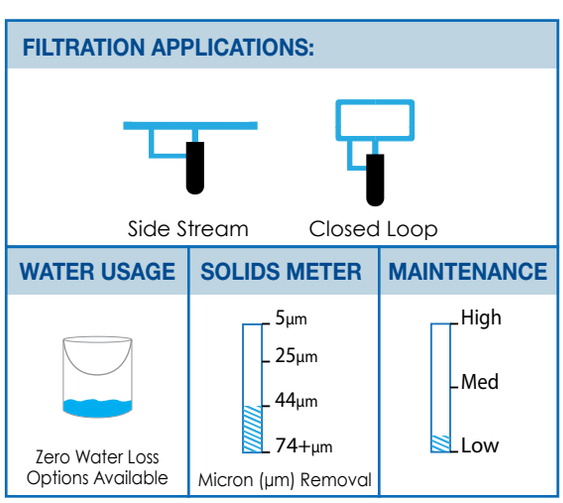
SideStreamClean Series

SideStream Clean with TB Series

Features and Benefits:

- Remove solids from mainstream flow
- Optimize the effectiveness of water treatment programs
- LAKOS auto purge and collection options remove solids – without downtime or system depressurization, and with zero water loss
- Extends maintenance intervals for cleaning chiller tubes, plate heat exchangers, compressors, etc.
- Flow rates: 30 – 1670 US gpm (7 – 379 m³/hr)

For more information, see LAKOS Literature LS-715





TPX

ABV2



Automatic Ball Valve option available

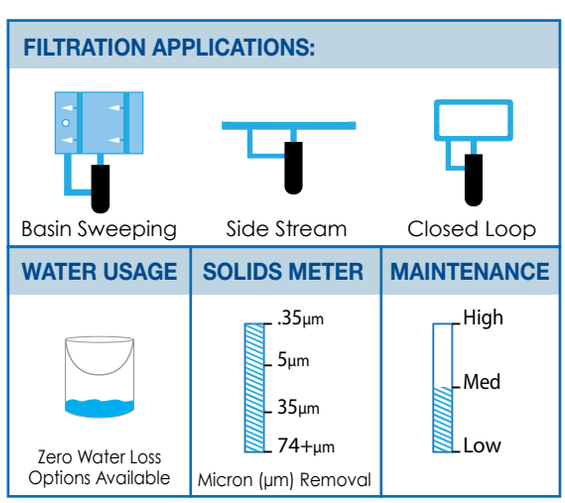
Plus Series *available in* TC–TB–eTCX

Filter Solids Down to .35 Micron with Plus Series

Features and Benefits:

- Remove solids as fine as 0.35 micron
- TC, TB and eTCX Series can be modified to include Plus Series
- All-in-one space saving system on a skid
- Provides polishing of the system flow without backwash requirements of a sand filter
- Flow rates: 30 – 1670 US gpm (7 – 379 m³/hr)

For more information, see LAKOS Literature LS-710, LS-715, and LS-910



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STS 48-inch series
Sand Filter
(stainless steel)

CTS 90-inch series
Sand Filter
(coated carbon steel)



Sand Filters

Remove Fine Floating Solids

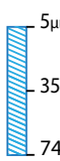
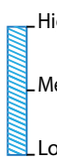
Features and Benefits:

- Exclusive, precision-engineered underdrains encourage optimum flow
- Manifold multiple units for larger flow rates
- Fully Automatic systems with adjustable backwash settings

STS and CTS Series offer 95% filtration efficiency at 10 micron.
For more information, see LAKOS Literature LS-640 and LS-720

FILTRATION APPLICATIONS:



WATER USAGE	SOLIDS METER	MAINTENANCE
	 5µm 35µm 74+µm Micron (µm) Removal	 High Med Low



LAKOS Multi-Tower Basin
Cleaning Control Panel
NEMA4x Enclosure



Actuator/Valve
Assemblies

Multi-Tower Basin Cleaning Kit

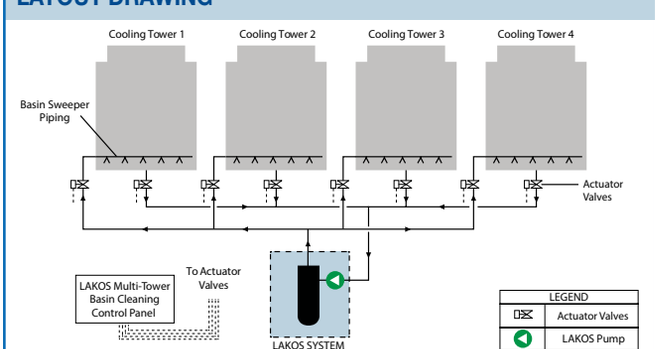
Clean up to four separate tower basins with one LAKOS Filtration System

Features and Benefits:

- Each cooling tower basin is cleaned in a sequence, so the basins do not need to be equalized.
- Kits include a Multi-Tower Basin Cleaning control panel with actuator/valve assemblies to match required cooling towers.
- Multi-Tower Basin Cleaning kit is compatible with LAKOS Basin Cleaning filtration models (eTCX, TCX, TCI, TPX, and TPI), Media Systems (CTS and STS), and all valve kit models (eTCV, TCV, and ECV).

For more information, see LAKOS Literature LS-988

LAYOUT DRAWING



1. All wiring, conduit, and fittings from the control panel to the actuator/valve assemblies to be sized and provided by others. 2. Multi-Tower Basin Cleaning control panel is powered separately from the LAKOS Filtration system.

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SRV-833
(Solids Recovery Vessel)



SRV-816

CRS-836-B
(Closed Recovery Vessel)



Solids Collection

Zero Liquid Loss and Capture Separated Solids

Features and Benefits:

- Capture separated solids easily and return liquid back to system
- Remove collected solids without interrupting system flow
- Single (1) bag Solids Recovery Vessel (SRV) available in two sizes: 16-inch (SRV-816) and 33-inch (SRV-833)
- Three (3) bag Closed Recovery Vessel (CRS) for 10" separators and larger
- Filter bags available from 10 micron to 50 microns
- Optional indicator package provides convenient way to determine bag change-outs on SRV-816, SRV-833 and CRS-836B
- Optional dry contact available for remote monitoring. Can be tied to BMS (Building Management System)
- Lower waste water treatment costs

For more information, see LAKOS Literature LS-576 and LS-622

Capture separated solids for easy handling. Return purged liquid back to source – providing zero liquid loss.

EFS
Electric Fail Safe Valve





LAKOS
Controller

ABV2



Automatic Ball Valve

Purge Options

Automated Solids Purge

Features and Benefits:

- Purge separated solids from LAKOS Separators at pre-determined intervals. LAKOS Controllers provide options to control and adjust purge intervals and duration
- LAKOS Purge valves are capable of handling all types of fine, fibrous, and mildly abrasive solids
- EFS: Electric Battery Backup Fail-safe valve automatically closes the valve in the event of a power failure
- LAKOS Controllers feature solid state reliability, thus removing the need for routine maintenance
- All LAKOS Valves are CE compliant

For more information, see LAKOS Literature LS-238 and LS-913

LAKOS Electric Purge Valves automate collected solids removal, require zero maintenance and provide controls to manage purge intervals and duration.

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Independent Testing

ICWT International Center for Water Technology

LAKOS Separators have been independently tested and certified by an independent testing agency, the International Center for Water Technology (ICWT), confirming our separators' filtration performance and capability to remove troublesome particle matter from pumped water.

For over 30 years the internationally recognized ICWT/CIT Testing Laboratories have been providing independent, third party testing to a wide range of irrigation and other industries around the world.

ICWT has experience with hydraulics, pumps, filters, and valves. Fluid component testing provides manufacturers, distributors and end-users with accurate performance data for applicability assessment and enable product development. ICWT was recently certified by IAPMO R&T - North America's premier third party certification body for plumbing and mechanical products. More information about the testing agency and testing process can be found at www.californiawater.org.

Selected customers who installed LAKOS Filtration Products

Abbott, Holiday Inn, intel, Lilly, Pfizer, Sheraton, Lockheed Martin, amazon.com, Microsoft, TESCO, Hyatt, Four Seasons Hotels and Resorts, Kaiser Permanente, Westin Hotels & Resorts, UC Davis University of California, Qatar University, IBM, IHG InterContinental Hotels Group, Motorola, Colgate-Palmolive, Palm District Cooling, Department of Defense, Texas Instruments, New Belgium Brewing, Radisson Hotels & Resorts

Logos are trademarks of their respective owners.

LAKOS Corporation, headquartered in Fresno California since 1972, is recognized worldwide for engineering, manufacturing and marketing the original centrifugal action solids from liquids separator and being the world-wide leader in cyclonic separation technology.

LAKOS Separators are manufactured in the USA.

LAKOS products are protected under multiple U.S. and foreign patents and trademarks. For details contact LAKOS.

LAKOS®, Swirlex Slots™, Vortube™, HydroBoosters™, and MediaGem™ are trademarks of LAKOS Corporation

LAKOS is a proud and contributing member of ASHRAE for over 30 years

Scan code to view our Cooling Tower Solutions

LS-580T (Rev. 8/23)

LAKOS FILTRATION SOLUTIONS®

1365 North Clovis Avenue
Fresno, CA 93727
www.lakos.com

Tel: (559) 255-1601
info@lakos.com

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