Your Source for Condensate Polishing







"Graver has supplied more critical CP systems around the globe than any other company."

We are the condensate treatment **experts**.

As the technology leaders in Condensate treatment, Graver has over 70 years of application experience and real-world operation that cannot be duplicated.

Graver is the only supplier with the full suite of condensate polishing technologies to meet the increasing demanding needs for power generating stations as well as industrial plants.

Condensate Polishing (CP) is an essential component of combined cycle plant design and operation to maintain high purity condensate and uptime.

The CP safeguards high-value plant assets by reducing startup/downtime, stabilizing cycle chemistry, minimizing corrosion transport and optimizing operations. CP is particularly important for air-cooled condenser (ACC) systems, once-through steam generators and plants with frequent startups. Utilities can't afford to ignore this vital and economical system that consumes a tiny portion - typically <1% of plant construction budgets.

For industrial applications, CP is used to maintain a proper quality of water by removing impurities from return condensate for reuse/ recovery. The condensate is returned to an ultrapure and reduces the need for fresh make up process water.

Not sure what you need?

Contact us today and we can help you choose the proper Condensate Polisher System to meet your requirements.

Process Selection Guide

High Pressure / Super Critical Steam



Medium Pressure Steam Boiler Treatment





Powdex[®] Precoat Demineralizer: Ultimate CP with Impressive Flexibility

The Powdex[®] precoat filter demineralizer system removes both suspended solids and ionic contaminants in a single compact unit. These proven high performance systems are customized to any power plant design and quickly achieve target chemistry for fast online operation. Powdex systems are particularly suited for ACC facilities' higher condensate temperatures and corrosion product transport levels.

Powdex stands alone as the most economical and effective CP choice for all types of combined cycle plant operations. These systems:

Fit any footprint: New and retrofit Powdex systems fit vessels, precoat septa, piping, state-of-theart process controls and ion exchange resins into very compact spaces.

Install quickly: Off-site construction and skid-mounting for quick installation and rapid start-up.

Remove soluble and suspended contaminants: Systems capture suspended particles, iron, copper silica, activated corrosion products and salts, and more.

Meet tough challenges: Systems cover a wide range of flow rates, particulate types and chemistries including unusual heavy metals.

Operate at higher temperatures:

Powdex is not subject to the same 60°C temperature limit as bead anion exchange resin to avoid degradation. New Powdex resin is applied with every precoat.



Deep Bed Condensate Polishers

Graver Water has optimized deep bed condensate polishing technologies through the use of proprietary flow distribution enhancements and enhanced collection, to maximize resin utilization. For on-site regenerated systems Graver's trademarked



and proprietary two-vessel SepraEight[®] regeneration design results in a smaller footprint for regeneration equipment without compromising separation efficiency or optimum regenereration. Conventional in-situ regeneration or off-site regeneration designs are also available.

Both Deep Bed and Precoat type Polishers remove iron, copper, silica and salts, and suspended solids. However, Deep Bed Polishers provide the best method for the removal of high ionic loads due to their large ion exchange capacity. Graver's Deep Bed Condensate Polishers have been designed to handle service pressures of up to 800psi with inlet distributors and underdrain that operate more efficiently than competitive designs.





Design

Deep Bed Ion Exchange Polishers use mixed ion exchange resins (cation and anion) in a 3 to 4 foot or higher bed to remove dissolved contaminants. The resin bed also acts as a media filter and is able to provide some modest reduction in the corrosion product transport.

Where to use

High TDS cooling water sources (seawater or towers), desire to operate long term with small condenser leaks, inability to control excessive air in-leakage.

Advantages

- High ionic loading removal
- Up to 800 psi service pressure
- Up to 50 gpm/sq. ft. flowrate
- Superior resin regeneration

GRF[®] Condensate Polishers

Graver's GRF[®] Condensate polishers are a proven solution for treating condensate for reuse as boiler feed water and reduce the need for fresh makeup



process water. In addition, GRF prevents contamination risks within the production cycle which could result in loss of boiler efficiency and possible mechanical damage to key components. GRF Polishers remove corrosion products such bold iron, copper and other metal oxides as well as dissolved solids from the steam condensate, including bold hardness (calcium/magnesium) and other multi-valent cations resulting in efficient maintenance of boiler water quality.

What the GRF Does

GRF typically functions as a sodium cycle ion exchanger which removes hardness that creates scale deposits on downstream equipment. GRF is effective at temperatures up to 300° F using specially processed cation resins that have been selected for their ability to withstand this high temperature without degradation. In addition, the GRF functions as a filter that removes suspended solids called crud and is designed to utilize the entire depth of the resin bed, resulting in long run lengths. Chemical regeneration of the ion exchange resin is typically accomplished using salt brine and available in amine or ammonia cycle option upon request. Frequency of regeneration is determined by solids load and flow rates.

Underdrain System

The Graver underdrain system, incorporating stainless steel Partilok[®] Strainers, assures uniform collection and distribution of water during both service and regeneration cycles. These strainers utilize self-cleaning venturi slots, designed for low headloss and high jet velocity during backwash.

Testing equivalent to over 16 years of use indicate no effect of wear, fatigue or decrease in particle retention capabilities. Our standard subsurface washer effectively cleans the bed of accumulated iron oxide (aka "CRUD").

Contaminant Removal Efficiency of GRF		
Contaminant	Influent	Effluent
Iron	40 PPB	20 PPB
Copper	1 PPB	-
Hardness	1000-3000 PPB	< 500 PPB*
Suspended Solids	1000 PPB	250 PPB

* Limit of test procedure accuracy



AFA® Backwashable Condensate Filters

Graver's AFA[®] Condensate Filters are designed to remove iron oxide particles as well as other insoluble corrosion products present in the condensate systems. AFA Systems use unique Aegis AFA condensate polishing filters engineered to meet the high demands in the utility industry for repeated backwashing and particle retention.

The AFA filters are absolute rated for 1 to over 20 microns and specifically designed to meet the demands of multibackwashing without the loss of filter integrity. Fixed pore construction eliminates dirt unloading as differential pressure increases while maintaining a removal efficiency of 99.9%.



Design

Permanent Core-Type Guide Rod Support, Distribution of Contaminants and Backwash, Minimum Area Resistance to Water Flow, Quick Disconnect Hardware, Minimum Vessel Turnaround and Re-Assembly Time

Where to use

- Pre-filter for removal of CRUD and TSS to extend deep bed demineralizer service life
- Pre-filter to prevent premature fouling of RO membranes
- Used in boiler condensate for both nuclear and fossil plants, heat recovering steam generators and combined cycle plants

Advantages

Bottom Tube Sheet Design – The bottom tube sheet provides a more efficient backwash and good distribution of the contaminants during the filter process. This design reduces the volume of water generated during each backwash by over 50%.

Bottom Inlet and Outlet Piping

No Header Piping to Remove during Installation, Enhanced Distribution of the influent Contaminant for More efficient filtration, Integral Backwash Air & Water Containment, Unique Air Surge Backwash, Lowest Water Volume During Backwash, Repeatable High ΔP Backwash, "Target" Backwash Option.





TurboGuard[®] Condensate Filters

Graver's TurboGuard[®] High Flow Filter is designed specifically for use in condensate streams or other critical utility applications where substantial dirt holding and CRUD removal properties are essential. TurboGuard High Flow Filters are available in a variety of retention ratings, lengths and gasket materials to meet the specific needs of your project.

Design

- Fits many applications including full-flow or partial-flow condensate filtration, deep bed demineralizer protection, RO pre-filtration and the retrofit of competitive large geometry units.
- All standard vessels are sized to accommodate Graver Technologies' 60" TurboGuard filter elements. 20" and 40" sized units are available by request.
- All vessels are ASME Code Section VIII Division I stamped
- Horizontal design facilitates easy filter cartridge change out and minimizes pressure drop
- Equipped with 2" Clean and Dirty Drains and 1/2" Gauge and Vent Taps

Where to use

As a pre-filter where the corrosion product removal is insufficient or the cost of cleaning the suspended solids from the deep bed systems is prohibitive or impeding the ion exchange performance of the polisher.

Advantages

- High flow in a compact footprint, space saving design
- Inside-to-outside flow prevents contamination during element replacement
- TurboGuard Filters are wrapped in a one-piece extruded outer cage pre-venting excessive media expansion due to inside-to-outside flow
- TurboGuard's one-piece extruded outer cage allows for easier maintenance and removal after use
- One-piece molded end caps, including molded-in handle for secure handling during installation and removal
- Quad Seal gasket system provides maximum sealing surfaces with no bypass of inlet to outlet water
- High dirt holding capacity: approximately 25 lbs (11.5 Kg) before removal is required
- Low pressure drop: < 0.2 bar at the beginning of a service run at specified flow rate
- Optimized media surface area allows full use of installed media area – not blocked off by media "squeezing"
- Ergonomic vessel design with Davit Arm or hinged cover
- Dirty elements can be crushed or incinerated for easy disposal

About Us

Graver Water Systems and Graver Technologies (Graver) are part of Marmon Holdings, Inc., a Berkshire Hathaway company, is a global industrial organization comprising 13 diverse business sectors and more than 100 autonomous manufacturing and service businesses achieving multi-billion dollars in annual sales.

Graver has pioneered high-performance condensate polishing and water treatment for power generation and industry around the globe. We offer the world's most complete, durable, and proven solutions for CP and filtration needs.

For more information, call 1-877-GRAVERW or visit www.graver.com and www.gravertechnologies.com.





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