

This issue of Powerline focuses on recent Graver innovations for the power generation market. As the world's source for high performance condensate polishing (CP), Graver strives to continually advance the technology through quarterly innovation meetings, intensive R&D, frequent product introductions, customer feedback, performance tracking, product improvements and more.

## INNOVATION ALERT: INTRODUCING POWERGUARD® HUB AND LATERAL UNDER DRAIN STRAINERS WITH POROPLATE®

Patent-pending PowerGuard Hub and Lateral Under Drain Strainers install quickly and outperform traditional metal media.

**THE CHALLENGE:** Traditional metal media as material for lateral under drain strainers are inadequate, causing many difficulties in ion exchange systems. Screen, too flexible and with low mechanical strength, deforms and distorts, allowing resin to bleed through. Wedge wire has the lowest open area of any filter media, resulting in the highest pressure differential of any filter media. Further, facilities require fast under drain strainer installation due to ALARA regulations.

**THE INNOVATION:** New patent-pending PowerGuard® Hub and Lateral Under Drain Strainers with Poroplate®\* media and Victaulic pipe end fittings offer exceptional performance and faster installation compared to competing choices.

**THE BENEFITS:** These new components are quicker and easier to install than previous generation Hub and Lateral Under Drain Strainer products due to innovative Victaulic pipe end fittings that fit and tighten with just a wrench. Further, the new strainer system increases filtration surface area, reduces radioactivity exposure, lowers operating differential pressure, increases flow rates and boosts ion exchange efficiency. Additionally, sintered Poroplate offers improved performance and extended durability that metal media cannot match.

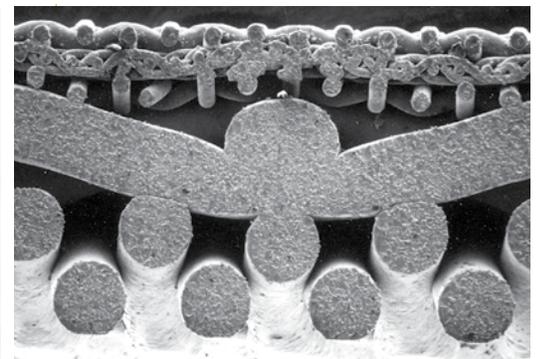
**CASE STUDY RESULTS:** A U.S. mid-western 1034 MW power plant utilizing wedge wire under drain strainers in two deep bed

demineralizer vessels experienced high differential pressure, bypass, broken pieces of wedge wire downstream and problems with feed pump suction. The facility replaced the wedge wire with new PowerGuard Hub and Lateral Under Drains with Poroplate. Results included simple and fast installation, better ALARA compliance, more than a five percent throughput increase, lower differential pressures of up to five psid in each vessel, elimination of wedge wire degradation and increased bed utilization.

**NEXT STEPS:** PowerGuard Hub and Lateral Under Drain Strainers with Poroplate retrofit existing deep bed systems or fit new systems. Contact your Graver representative to discuss how these new components benefit your facility. ■

Left photo: Poroplate media for under drains. Middle photo: Foreground shows installed hub and lateral under drain strainers. Right photo: Detail, cross section of sintered Poroplate media.

\*Poroplate is a registered trademark of Purolator. Facet Inc.



## GRAVER OFFERS INNOVATIVE SOLUTIONS IN CHINA

**Gravex® nuclear grade resins provide exceptional performance in nuclear primary side applications.**

**N**uclear is a dominant trend in the Chinese power sector. "In the last four years, China brought eight nuclear PWR units online, increasing total plants from 11 to 19," says Mark Koster, president, International Utilities business at Graver, who notes that most nuclear facilities are in the eastern part of China while nuclear plans are longer term in western provinces. "Simultaneously, the Chinese are gradually decommissioning smaller coal-fired plants – 50 to 150 MW – principally to control air pollution." Larger coal-fired facilities from 600 to 1,000 MW remain in service. About half of Chinese fossil plants currently choose Graver filters and powdered resins for CP applications.

**Experts expect Chinese electricity demand to double by 2026.**

Graver is working with a Chinese distributor and Graver's own 10-person, Shanghai-based team to supply primary side ion exchange resins to many Chinese nuclear sites. "Larger companies supply these types of resins, too, but because we are the recognized global technology leader in nuclear ion exchange applications, we feel we provide the most up to date products and superior customer service," Koster remarks, noting that service and training are essential in this region.

**China added electrical capacity equal to Japan's entire electrical capacity – which is the third largest globally – every four years during its economic boom decade.**

Removing and controlling radionuclides continues to be an

important nuclear power industry goal to improve overall plant operation, prevent accumulation within system piping and promote worker safety. In PWR plants, ion exchange media reduce isotopes of cesium, cobalt, antimony and iron in primary side applications like chemical and volume control systems (CVCS) and fuel pool demineralizers. "Gravex® resins meet stringent nuclear grade specifications, so they are ideally suited for primary side CVCS applications because they offer high purity – low chloride, low metals, low leachables – high capacity, and conversion of both cation and anion products as well as the mixed beds," notes Al Tavares, ion exchange product manager.

**Industry watchers expect China's total power load to trump the combined power load of Europe and the United States by 2035.**

According to Tavares, many U.S. nuclear customers are transitioning to high capacity resins such as Gravex® High Capacity Nuclear Grade Resins either completely or in mixed beds for primary side applications. Graver's team is introducing this newer product extension to Chinese nuclear customers as a complement to its Gravex® Nuclear Grade Resins and Gravex® Macroporous Nuclear Grade Resins product lines.

For more information about Graver products and service in China, please contact Erbao Zhang at (86) 137.0188.2885 or ezhang@gravertech.com.

## GRAVER'S INNOVATIVE CP SOLUTIONS IN INDIA

**Leading with utility filters and powdered resins, Graver delivers technology and service to a growing energy market.**

**M**uch has changed since the Indian parliament passed the Electricity Act, 2003, which governs generation, distribution, transmission and power trading in



Assorted Gravex® resins

India. Supercritical power plants are coming on line, outside investors are financing projects, the government is supporting nuclear capacity, generation has increased 60% in the last seven or eight years. Much also remains the same. "We don't expect India to substantially change its heavy reliance on fossil fuels in the near future," remarks Anand Harohali, Graver director of Business Development. "Seventy to eighty percent of planned capacity for the next five years is coal-based. The government supports nuclear capacity but it will represent a very small portion of the mix in the near term."

**Fossil fuels, predominantly imported from Indonesia and Australia, provide about 60% of electrical energy in India. The second highest source is hydroelectric, with nearly 15% of the total.**

Graver recently kicked off an intensive initiative in India to provide CP solutions for existing and planned installations. To do so, Graver Technologies and its sister company Graver Water have partnered with Thermax, Limited, a leading energy and environmental solutions provider. "Our current focus is supplying disposable and backwashable pre-filters as well as custom Powdex® systems," Harohali says, "supported by expert customer service and training."

For the Indian market, disposable Aegis® TurboGuard® filters are easily installed and economical options that

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“*India has one of the lowest per capita energy consumption rates in the world: 734 units yearly compared to a global average of 2,429 units. United States citizens consume an average of 13,647 units.*”

provide superior CRUD removal and low pressure drop upstream of deep bed systems, though they don't affect dissolved contaminants. For plants with backwashing capabilities, AFA® Pleated Backwashable Filter Elements last many years if backwashed properly. “AFA or any filter element requires housings, however, so customers may find that a full Powdex precoat demineralizer system is possible without much additional investment in the filter system,” explains Brian Raab, Graver's product manager, Utility Filters.

Powdex precoat filter demineralizers efficiently remove suspended and dissolved contaminants including iron, copper silica, activated corrosion products and salts. “We choose among a wide selection of Powdex product choices – including Ecodex® with a cellulose fiber aid and a Premix option – to suit any system parameter: chemistry, flow rate, particulate type and more,” explains Al Tavares, product manager for Ion Exchange Resins, who also notes that Graver Water specifically designs its systems to suit Powdex products.

For more information about Graver products and service in India, please contact [anand@gravertech.com](mailto:anand@gravertech.com). ■

## CONDENSATE POLISHING PROTECTS COMBINED CYCLE FACILITIES

### Precoat filter demineralizers trump filters and deep beds for CCGT plants.

One of the ways power producers achieve peak performance in Combined Cycle Gas Turbine (CCGT) facilities is by optimizing water chemistry on the heat recovery steam boiler condensate.

“*Innovation Alert: Graver recently mounted Powdex systems on skids to reduce plant footprint and significantly speed system installation. Graver and Graver Water build custom systems offsite and rapidly install finished systems on site.*”

When these plants ran as peaking plants in the past, CP was often left out of the balance of plant requirements due to cost constraints. Plants lacking CP are already facing consequences such as flow accelerated corrosion, long cycle starts, inefficient operations with associated higher costs and future capital expenses to replace damaged equipment.

Plants with installed CP have realized significant operational benefits beyond strict reliance on blow-down and chemistry treatment. CP safeguards expensive assets, stabilizes cycle chemistry to achieve EPRI recommended iron levels, prevents CRUD transport and deposition,

Top left photo: Assorted AFA® filters  
Right photo: Skid-mounted custom Powdex® system.

and optimizes start up and operation of these units. These benefits are especially pertinent to facilities employing air-cooled condensers and the resulting high metal oxide loads.

For most CCGT plants, a precoat filter demineralizer such as the Graver Powdex system trumps filters and deep bed ion exchange systems as the preferred technology to optimize water chemistry for many reasons:

- Custom Powdex systems are nearly turnkey and extremely durable, offering exceptional long-term performance.
- A wide selection of Powdex products can be combined and easily modified to remove a wide range of soluble and suspended contaminants including unusual heavy metals.
- Graver Water and Graver Technologies design equipment and ion exchange products in tandem for optimal system performance.

“*Innovation Alert: A recent process innovation in Powdex precoat systems now allows recovery of backwashed ion exchange particles for non-hazardous ID 27 waste disposal.*”

- The limited personnel typically on site at CCGT facilities easily handle low maintenance needs.

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## CONDENSATE POLISHING

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- Compact skid-mounted Powdex systems are easily retrofitted into existing facilities as well as installed at new plants.
- Powdex is a cost effective system for both filtration and ion exchange.
- As the worldwide leader specializing only in condensate polishing technology, Graver continually improves its Powdex systems and products. ■

## NANODEX FILTER PAPERS TRACK SYSTEM AND PLANT PERFORMANCE BY MONITORING RADIONUCLIDE AND CORROSION PRODUCTS

Graver's patented Nanodex™ Ion Exchange Filter Papers enable diverse quantitative analyses in the power industry, especially nuclear, to monitor corrosion products, measure activity levels and satisfy fuel warranty requirements. Nanodex AX 100 anion exchange filter disks contain strongly basic, quaternary ammonium functional sites in the

chloride form, which can be converted to the desired ionic form (i.e. hydroxide) as required. Nanodex CX 200 cation exchange filter disks contain strongly acidic, sulfonic acid functional sites in the hydrogen form. Contact your Graver representative for more information about these innovative filter papers. ■



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