

## Not All Powdered Resins are Created Equal

**Graver Technologies pioneered the use of powdered ion exchange resins. Powdex® and Ecodex® remain at the top of their class.**

After pioneering the use of powdered ion exchange resins in the early 1960s, Graver Technologies (Graver) still sets the worldwide standard with its Powdex® family brands. Today, Powdex and Ecodex® are the powdered resins of choice for fossil, nuclear and cogeneration utility customers with applications such as condensate polishing, reactor water clean-up (RWCU), fuel pool and radwaste processing.

When evaluating possible technologies for condensate polishing systems, powdered resin systems are often the clear choice for optimal, cost-effective operation. Among other advantages, the higher surface area of powdered resins yields better reaction kinetics, greater ion exchange utilization and excellent water quality. Powdered resin systems provide superior performance while eliminating resin regenerations and the costly handling/disposal of regenerant chemicals. When evaluating powdered resin brands, the choice is clear as well. The Powdex family offers significant benefits over competing options:

### **Innovative product design:**

The dual functions of filtration and ion exchange work together to remove both dissolved and suspended impurities from

your condensate. The fine particles with high surface area provide a flocced mixture with a controlled precoat porosity to enhance filtration. Concurrently, the ion exchange sites control water chemistry by removing contaminant ions.

### **Strictly controlled manufacturing:**

Graver utilizes a proprietary grinding process developed and perfected by our own engineers which assures consistent particle size and stable floc formation; it is important to avoid inappropriate particle size and characteristics that can lead to weak floc formulation, shearing and poor precoat usage. We optimize charge balance and floccing characteristics during production. Additionally, Graver carefully manages water purity, handling, processing and chemistry during manufacturing, then verifies product quality with strict QA procedures and QC methods.

### **Cutting edge components in a proven system:**

Powdex products are specially designed for use with Graver's industry-leading Aegis® brand precoat septa – high-quality, backwashable, reusable components that typically last seven to 10 years, with many performing well beyond this time frame. Together, Powdex resins and Aegis septa deliver far superior, highly dependable system operation and condensate quality when compared to single-use filter system configurations.

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### Exceptional process characteristics:

System performance depends on consistent differential pressure and even precoat deposition along the entire length of the septa. The formulation of Powdex products ensure an even precoat that enhances condensate polishing performance; less carefully controlled precoat products may demonstrate uneven powder loading that can reduce effectiveness.



### New standards for excellence:

Graver continues to lead the industry in powdered resin technology by developing advanced products, beginning with Ecocote® and progressing through additional groundbreaking products such as Ecodex®, EcoGuard®, Premix™ and Meridian® to name a few. Combining powdered resins with selected fibers, Ecodex® creates an exceptional floc to enhance ion exchange kinetics and improves CRUD removal without increasing differential pressure. Further, Ecodex® and other pre-mixed products eliminate the need for slurry preparation and measurement. Graver continues to invest in powdered resin technology R&D that promises new performance standards, ease of use, dependability and durability.

### Products designed for your precise needs:

Graver offers Powdex in three ionic forms: hydrogen form cation, or PCH (H<sup>+</sup>); ammonium form cation, or PCN (NH<sub>4</sub><sup>+</sup>); and hydroxide form anion (PAO (OH<sup>-</sup>)).

In addition to Ecodex with its own wide range of fiber and charge properties, Graver also offers pre-made beds and premix options. In sum, Graver is your source for a wide range of powdered resin products, services and technical assistance to meet your water chemistry requirements, run length targets, CRUD removal capacity or chemistry performance.

### Quality that boosts equipment longevity:

Powdex and Ecodex® outperform budget alternatives in reducing corrosion, metal fatigue and in managing CRUD events. Budget options may save money in the short term, but can compromise condensate quality, increase maintenance costs, require frequent replacement and shorten the useful life of costly system components.

For more information about these revolutionary products, please contact your Graver representative.

## Solving Demineralizer Issues at Air-Cooled Condenser Plants

### ACC demineralizer challenges can be overcome with awareness, planning – and high quality powdered resins like Powdex® and Ecodex®.

Faster permitting, flexible plant siting, reduced water usage – utility customers around the world increasingly choose ACC plant designs for many reasons. When it comes to optimizing the performance of condensate systems for ACCs, customers obtain the best results by considering process idiosyncrasies and choosing high-quality powdered resin filter demineralizer systems rather than regenerable deep bed resin systems. Below we review important points to consider during system development, installation and operation.



### Expect start-up and break-in of new condensate filter demineralizers to be lengthy.

- The interior surfaces of ACC piping not only collect many environmental contaminants that enter the feed water stream, but also are coated with treatments that dissolve during the break-in period. Thorough rinsing before start-up can help minimize the level of dissolved coatings that must be removed during the start-up phase.
  - Contaminants trap airborne SiO<sub>2</sub> that enters the feed water, so early leakage occurs.
  - The break-in stage is characterized more by particle filtration than chemistry improvement, requiring a powdered resin product with good ion exchange capacity paired with high mechanical filtration capability. Graver recommends Ecodex® with proper fiber type and content for this stage.
  - Re-starts always have a high level of suspended particles – Graver recommends Ecodex or Powdex with an overlay of filter aid such as Ecocote® E100.
- ### Manage start-up carefully using high quality products.
- Powdered resins for start up and break-in periods should contain a high ratio of fiber to resins because suspended materials – rather than dissolved ions – dominate the contaminants during start-up. Graver recommends Ecodex products with an overlay of Ecocote specialty fiber.

- When precoat cycle time increases, you may begin using powdered resins with a higher ratio of resin to fiber to increase the removal of dissolved contaminants. Graver again recommends specific Ecodex products for this purpose.

### Follow recommended preparation and operating procedures to improve performance.

- Be aware of how temperature affects performance. ACCs operate at temperatures that can exceed 80° C (176° F). At these temperatures, the ability of any anion to remove SiO<sub>2</sub> is compromised and leakage can occur quickly. The SiO<sub>2</sub> may be concentrated on the resin and then released at a higher level than the inlet. Because the Powdex precoat filter demineralizer systems and the Powdex family of products are so flexible, Graver recommends solutions such as overlays of Ecocote followed by PAO for additional capacity. Further, bead size anion in deep beds will thermally degrade leading to performance issues and short runs between regenerations. Powdex PAO anion will not degrade within the normal life of each precoat, always ensuring maximum performance.
- Ensure that mechanical applications of precoat resins are accurate and consistent. An even precoat distribution forms a tight floc and eliminates failure points that can occur if areas of precoat are thin.
- Manage conditions to prevent precoat cycle end point difficulties. For example, controlling chemistry and choosing the correct product mix can yield 18 to 30 days between precoats (though this may take some time at consistent operational levels to achieve.) Likewise, Graver can provide effective methods for solving pressure differentials, silica leakage, sulfate leakage, or sodium leakage.

### Maximize run length with high quality Graver powdered resin products

- Graver has formulated Powdex, Ecodex and Premix products for extreme consistency, high flow rate through the resin layer, and resistance to precoat compaction and tightening on the precoat filter.
- Inferior powdered resins products may appear more economical, but give inconsistent flow performance and inconsistent initial ΔP, leading to short runs.
- Graver recommends adding an overlay of Ecocote if ΔP rises too quickly as precoat removes solids. Ecocote will add depth to the top of the precoat and remove more suspended contaminants before backwashing is needed.
- Add the correct, required precoat mixture indicated by the operating conditions. Changing precoat resin: fiber ratios and cation: anion ratios at different times of the year or when indicated due to changing conditions will result in the most efficient precoat cycle.

For more information about how Graver's high quality powdered resins optimize the performance of your condensate filter demineralizer, please contact your Graver representative.



## Nanodex™ Filter Papers Q&A, Part II

In this issue, we continue our Q&A about Graver's new Nanodex™ Ion Exchange Filter Papers for diverse quantitative analyses in the power industry, especially nuclear, to monitor corrosion products, measure activity levels and satisfy fuel warranty requirements. The first Q&A installment is found in the [Spring 2012 Powerline issue](#) on our website. Your Graver representative has further information about the two available types of Nanodex filter disks: AX 100 anion and CX 200 cation.

### Q: What contaminants can I monitor using Graver's Nanodex Ion Exchange Filter Papers?

**A:** In terms of contaminants, the ion exchange filters disks are often used to monitor corrosion product transport, isotopic separations, activity levels, and trace metal quantities. Among cationic species, transition metals including iron, copper, nickel, chromium, zinc, and cobalt are commonly monitored. Zinc analysis is particularly important for suppression pools while copper analysis is correspondingly important for stator cooling. Lead, calcium, magnesium, sodium, and cesium are also monitored by some nuclear plants. Iodine is the most common anion species measured using ion exchange filter disks, though they also will pick up other halogens (i.e., chloride, bromide), sulfate, phosphate and dichromate.

### Q: Are there other purposes for Graver's Nanodex Ion Exchange Filter Papers?

**A:** Nanodex Ion Exchange Filter Papers can be used anytime quantitative analytical separations are required. These uses include basic chemistry and pharmaceutical applications.



## Evaluating Used Precoat Elements/Septa

As a value-added service, Graver can evaluate the efficacy of used precoat elements – often termed “filters” – that have been functioning in customers’ condensate polishing systems. This service helps

customers assess system performance or trace the source of water quality issues. It also aids routine preventive maintenance procedures and helps with scheduling and budgeting precoat element replacement. Aegis® brand precoat septa evaluations are often included as part of the original purchase price.

Our personnel compare the performance of used Graver brand elements against the expected performance of a new element; our staff are able to test competing brands that have compatible end fittings or that will accommodate an added guide rod with compatible end fittings. Customers receive comprehensive, illustrated reports detailing precoating and backwashing effectiveness and characteristics, as well as yarn tensile strength compared against

minimum expectations for new yarn. Reports include both written recommendations and actual data generated during the evaluations.

Testing requires about three weeks from the time Graver receives the element, which must be accompanied by a fully completed request form. Our staff cannot assess elements without complete forms that detail the element’s history, operational data and plant usage.

To learn more about this service or request a form, please contact your Graver representative.

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