



News



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Purolator Facet Poroplate® Filter Septa Dramatically Improves Reactor Water Cleanup Systems, Deep Bed Condensate Demineralizer

Facilities Report Cost Savings in Excess of \$1 Million, Longer Run Times, Fewer Man Hours, and A “Lifetime” Plant Solution

GREENSBORO, NC—It’s been a dilemma in the nuclear power industry for years: in a typical Reactor Water Cleanup (RWCU) System, filter/demineralizer (F/D) run times can become dramatically short.

Some plants are only able to operate systems for a two-to-five day duration, while others may be able to stretch run times to 15 days before requiring the precoat exhaustion. The systems require frequent maintenance, resulting in extremely high annual expenses for man-hours, waste storage and disposal, replacement filter components, and more.

But there’s a cost-saving solution. Purolator Facet, Inc. based in Greensboro, NC, has had proven success with extending filter run times in nuclear plants across the country with its Poroplate® filter septa. To date, Poroplate media technology has been something of a “best-kept” secret, known only to those engineers and consultants seeking alternatives and enhancements to RWCU systems. But that may be changing. “We doubled our run times from 35 to 70 days, resulting in a savings of \$76,245 a year,” notes one operations manager. “The Purolator system paid for itself in two years.”

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Variables Among Systems Create Challenges

Problems with RWCU systems can have a major negative impact on nuclear power plant operation.

Problems can include:

- Minimal precoat run times
- Inadequate precoat formulations
- Degradation of RWCU performance due to septa fouling and bridging
- RWCU post strainer fouling
- Resin leakage from the RWCU system into the reactor
- Excessive waste, storage, and disposal concerns, and
- Reduced reactor core component operation due to insufficient water chemistry control.

But Poroplate filter septa allow plants to address each of these issues and improve performance. To get a clear idea of how Poroplate filter septa is benefiting the nuclear power generation industry, interviews were done at several plants using the product, including Entergy's Grand Gulf Nuclear Station in Port Gibson, MS; Progress Energy's Brunswick Nuclear Plant in Brunswick, NC; and Constellation Nuclear, Nine Mile Point Unit 2 in Lycoming, NY.

During these interviews, this became quite clear: the Purolator technology has made a proven, positive impact on plant operations in terms of run-time, maintenance man hours, waste reduction, and operating costs.

Grand Gulf Nuclear Station – Port Gibson, Mississippi: A Run Time Multiplier

Grand Gulf Nuclear Power Plant has the largest boiling water reactor in the country, a 1250 megawatt electric unit. Entergy handles the plant operations and Bryan Warren, Operations Manager, explained how Purolator Poroplate filter septa at least doubled run times there. "We were

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running for 15 days, down to ten days even, before we made the transition to Poroplate septa. Since the switch, we get upward of 45 to 60 day runs. It is so successful it is almost ridiculous. Purolator really delivered on what they promised.”

Poroplate septa have performed even better than initially expected. Reports note that the septa, in combination with using a 9:1 resin-to-fiber mix, has increased pre-coat run times by nearly 95 percent, instead of the anticipated 50 percent. Plus, the improved steady state sulfate concentration in the coolant system includes benefits which range from increased protection of the reactor core to an improved chemistry index value, resulting in a positive impact on optimum water chemistry goals.

At a separate installation located in Oswego, New York (formerly New York Power Authority), and also run by Entergy, Purolator filter assemblies have been utilized in the RWCU system for nearly 15 years. The Poroplate technology there has doubled and even tripled precoat run times from 30 days to 60-90 days. Again, that improvement results in reduced waste, fewer man-hours for maintenance, and less burden on the waste storage and removal system.

Poroplate filter septa have had a tremendous impact on the nuclear power generation industry, no matter what the plant specifications. The Poroplate septa are individually engineered and manufactured to optimize filter/demineralizer systems. They are tailored to specific operating conditions and requirements of each individual plant.

Poroplate filter septa extend run times, maximize the use of ion exchange resins, improve pre-coat uniformity, and improve backwash efficiency with no measurable resin bleed-through. Poroplate filter septa pre-coat uniformly, eliminating the need for a cellulose pre-coat. The overall result is an optimized filter/demineralizer system.

Grand Gulf Results With Poroplate Filter Septa (Since 1996)

- Previous average RWCU run time: **31 days**
- Current runtime with Poroplate septa: **66 days**
- Hard savings (1996 dollars): **\$86,710/year**
- Soft savings (avoided dosage): **\$6,010** (based on \$10,000 per person Rem)
- Estimated total savings over lifetime of plant: **\$2,341,170**
- Payback on initial investment: **1.56 years**

Progress Energy—Brunswick, North Carolina: Fewer Sulfates and Downstream Chemistry Problems

Progress Energy operates the nuclear power plant in Brunswick, North Carolina. Gary Anthony, Operations Manager, offered a brief overview of the Poroplate septa installation, used at Progress Energy to reduce the possibility of downstream fines from the Deep Bed Condensate Demineralizer resin beds. “In 2002, we went with the Purolator 150-mesh underdrain screens to replace the original Wedge-wire screens. Since the upgrade, we have not seen any excursions from the system, and we have reduced the amount of resin pre-washing.”

Anthony explained that the original system left too much room for error. “Before installing the Poroplate underdrains, we never really were sure whether the screens would retain all the resin beads because of the slot mechanism. Any undersized bead from the resin vendor had the potential to get through, which gives poor chemistry once the resin bed is put into service.”

Since cation resin contains sulfur, once it gets into the feed water system, it breaks down and introduces sulfates into the reactor system. Keeping sulfates to a minimum is of vital necessity, because they lead to potential growth of cracks within the reactor vessel.

But, Anthony observed, with the much finer straining capability of the Poroplate underdrains, “I can sleep a lot better at night because I can pretty much take a bed in and out of service or load it with brand new beads and have little or no chemistry concerns downstream. The better the chemistry, the longer the life of the equipment,” he said.

As for any support or assistance from Purolator Facet, “we haven’t needed any,” stated Anthony. “Obviously we had to agree on specifications when we bought our

**Progress Energy
Results With
Poroplate Underdrains
(Since 2002)**

- Reduced resin pre-washing
- Reduction of sulfates in system
- Finer straining capability
- Superb fit
- Fewer downstream chemistry problems

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first batch, but that is all I ever needed. They guaranteed me the Poroplate elements would fit, and ever since I bought the first one I've never had a problem. Product quality is excellent – it has almost a zero reject rate—and I continue to expect reduced long-term maintenance.”

Constellation Nuclear, Lycoming, New York: A Savings of Over \$1 Million

Constellation Nuclear’s Nine Mile Point Unit 2 RWCU filter/demineralizer (F/D) run times were dramatically short—only two to five days. After investigating alternatives, the station learned it could increase precoat longevity to a period of three months or longer when using the Poroplate septa, a pre-coat resin educting support system, and high concentration of resin media.

System Engineer Dave Kazyaka reported superior F/D system performance at Niagara Mohawk with the enhancement of the Poroplate technology. “Utilizing Poroplate allows us to take advantage of advanced design septa, pre-coat methodology, and process controls to promote high quality resin beds for optimization of F/D efficiency and performance.”

The Poroplate septa, noted Kazyaka, provides for absolute particle retention rating of 64 microns and an overall open area of greater than 35 percent. “This is a superior design,” said Kazyaka, “when compared to the previous stainless steel wedge wire septa with a slot opening of about 76 microns with a wire width of about .060 inches, providing an open area of approximately 4.76 percent.” The Purolator design with greater percent open area equates to greater utilization of the available ion exchange capacity of the applied pre-coat resin, with better particle retention at a lower operating differential pressure.

**Constellation Nuclear
Results With
Poroplate Filter Septa
(Since 1994)**

- Precoat longevity increased to three months
- Reduction in amounts of powdered radioactive waste (and reduced interim storage costs)
- Fewer precoat changeouts and lower manpower requirement
- Total saving over \$1million

Kazyaka summarized the value of Poroplate filter septa: “By optimizing F/D performance we extend the longevity of precoat run times, so change-outs occur less often. This reduces both

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the manpower burden and incurred radiation exposure for system operation and maintenance. In addition, there is less challenge on interim storage space due to the reduced amount of powdered resin radioactive waste. These improvements correlate to a savings of over \$1 million.

“With the Poroplate septa we get superior F/D system performance and better water chemistry control, thereby extending the life of reactor core components,” he said.

How Poroplate Filter Septa Work

Poroplate filter septa are custom-designed for each application, with specific aim to provide longer service and reduce exposure to radioactive material. A key feature of Poroplate septa is a diffusion-bonded, stainless steel wire-cloth and perforated plate. The resulting laminate possesses millions of independent wire bonds, which enable maximum resistance to abrasion, fatigue, oxidation, and corrosion far greater than fiber or powdered metal constructions.

Available in a variety of filtration ratings, the Poroplate septa provide low differential pressures and high collapse strength. The high strength and corrosion resistance allow for enhanced pre-coating, aggressive backwashing, and extended service life.

Another design feature with the Poroplate filter septa is the tube bundle assembly, which enhances installation as well as removal of the filter/demineralizer to not only lower installation costs and soft labor expenses, but also dramatically reduce radiation exposure.

The Poroplate filter septum is composed of three to four main layers:

- An optional guard layer to protect the fine filtration layer from any mechanical damage;
- A fine layer of wire cloth for exacting porosity;
- A distribution layer of wire cloth for uniform flow and pre-coating; and
- A perforated plate for maximum strength, integrity, and durability.

PUROLATOR POROPLATE® MEDIA

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Purolator's unique Poroplate media technology is used in RWCA, rad waste, fuel pool, and systems at power plants throughout North America, Europe and the Far East. It is also used in resin traps, cup strainers, and underdrain systems.

To learn more, contact Purolator at 800-852-4449, or at www.purolator-facet.com.

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