

# Pretreatment Absorption News™

Vol. 1, No. 1

March, 2001

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## **New Pretreatment Absorbent Cartridge Cuts Nano Membrane Replacement Over 50% In Ethylene Glycol Recovery Process**

*Also Reduces Downtime, Batch Process Time*

Tea, SD — Use of a new pretreatment absorbent cartridge in an ethylene glycol recovery operation here has cut nano membrane replacement costs by over 50%, while reducing downtime for membrane cleaning by about one-third, and shortening batch process time by an estimated 15%, according to the company's president. Further considering labor and energy savings, he judges the consequent increase in annual throughput to be at least 25%.

The new Fulflo® TruBind™ pretreatment absorbent cartridge, manufactured by Parker Hannifin Corporation's Process Filtration Division in Lebanon, IN, features a proprietary modified polymer that absorbs and chemically binds contaminant hydrocarbons inside the unit's interior matrices.

"When those petroleum and emulsified oils hit the nano filters, it'll take them out in a heartbeat," said Robert J. Kolhoff, president of Antifreeze Recycling Inc. "When we replaced a nano set in March, 2000, with the new pretreatment in place, we didn't have to replace the nano set again until October, 2000. But when we ran without the TruBind for just a couple of weeks, we lost the set within 2-1/2 months."

"We estimate the normal, twice-a-year nano replacement would go up to four or five times a year without this new pretreatment cartridge, while downtime for nano membrane cleaning would go up by 1/3, and batch processing time would take 15% longer, because of lost nano membrane capacity. Overall, we figure we're getting 25% more throughput annually, while keeping membrane cost at 0.3% of production cost, versus 1% or more otherwise."

Kolhoff added there has been no adverse effect on his efforts to comply with GM 1825M specification for process line output rephosphate or borate-based corrosion/scaling inhibitor content. The spec is checked quarterly on a routine basis, and also when there is any change in the process or its equipment (see photo #1).

He said each pretreatment cartridge processes 500 to 1000 gal. of waste antifreeze, collected from automotive repair shops and over-the-road truck repair and maintenance facilities, before replacement by a new cartridge at nominal cost. The absorbent cartridge serves as the final step in a pretreatment process that begins with three-phase

(more)

polypropylene filtration that steps down from 20 to 5 to 1 $\mu$  pore size to meet the initial contact with traces of contaminants such as motor lube oil, transmission fluid, emulsified oils, diesel fuel, organic foulants, metallics, and minerals.

In the subsequent treatment phase, Kolhoff explained that fouling of the four-stage, Thin Film Membrane (TFM) nano filters is monitored by measuring flow rates and pressure drops through them.

"We should get a 5 psi drop per membrane," he said. "At 15, we've got big problems. We like to run a flow of 7 to 10 gal./min., and that could easily drop by 25% if there's enough membrane contamination. If things are going well, we can process 500 gal. of feedstock between cleaning outages."

Kolhoff added that the addition of the new pretreatment cartridge has helped considerably in his efforts to realize the benefits from the nano phase installation.

"It wasn't enough to just run through polypro to 1 $\mu$ ," he recalled. "That only saved our customers some labor. With the nano filtration, we can have output that's even cleaner than new antifreeze made with tap water. Our new ability to compete on a quality and price basis, and save our customers waste disposal costs, has enabled us to double our business. And the new pretreatment cartridge substantially reduces the cost of using this nano filtration."

The 4-1/2" diameter, 20" long TruBind absorbent cartridge, contained in a clear plastic vessel with side-seal, dead-stop screw top for easy and effective installation and replacement, serves as the final step in the process line's pretreatment process (see photo #2). Feedstock offloaded into a first batch tank is air-diaphragm pumped through the pretreatment array at about 3 to 4 gpm, and deposited in a second batch tank for

high-pressure pumping to the nano membranes.

"It's essentially a reverse osmosis (RO) operation, but not as tight," Kolhoff noted. "It reduces molecular weight to 200 on the Saccharide Scale, versus 1 for RO."

According to Parker Hannifin, its Fulflo®TruBind™ absorbent cartridge has also worked well in reverse osmosis applications, where membrane filtration is down to 0.0001 mm, as well as the 0.0008 mm for nanofiltration, 0.005mm for ultrafiltration, and 0.05 mm for microfiltration.

In addition to removing hydrocarbons from coolants like ethylene glycol, it has effectively reduced oil, lubricant, grease, and solvent contamination needed for quality control and discharge compliance for a wide variety of industrial and commercial water processing, washing, runoff, and disposal operations.

Developed as an alternative to surface adsorption onto a medium, the new absorbent cartridge utilizes a proprietary polymer, modified to eliminate the potential for skin formation at the polymer/hydrocarbon interface, that both absorbs the hydrocarbon molecules and chemically binds them within the unit's polyolefin interior matrices (see figure #1).

At an equivalent flow rate of 1.0 gpm per 10" cartridge, the unit typically reduces trace hydrocarbon contaminants in excess of 95% in single pass mode, maintained to a net differential pressure of 10 psi, while series or multipass filtration is said to be able to virtually eliminate hydrocarbon contamination in water and water-based fluids.

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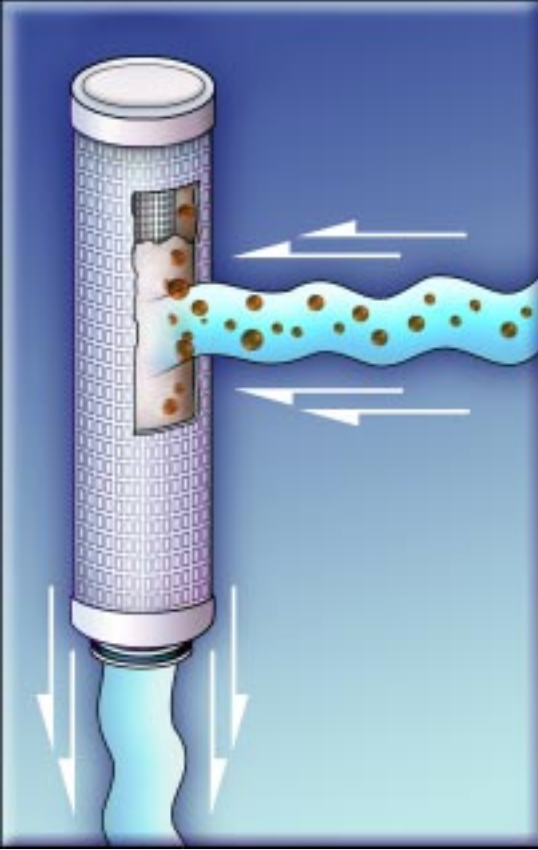
**Photo #1:**

Installation of new absorbent cartridge upstream of nano filter array in ethylene glycol filtration operation has had no adverse affect on compliance with GM 1825M specification for process line output re phosphate- or borate-based corrosion/scaling inhibitor content. Spec is checked quarterly on a routine basis, and also when there is any change in process or equipment. Preliminary samples are taken re color and freeze point.



**Photo #2:**

Installation of new Parker Hannifin Fulflo® TruBind™ pretreatment absorbent cartridge upstream of nano filter array decreased membrane replacement costs by over 50%, while reducing downtime for membrane cleaning by about one-third, and shortening batch process time by an estimated 15%. Each new pretreatment absorbent cartridge in this ethylene glycol recovery operation processes 500 to 1000 gal. of used coolant before easy replacement, at nominal cost, via clear plastic vessel with side-seal, dead-stop screw-top for easy and effective installation.



**Figure #1**

Developed as an alternative to surface adsorption onto a medium, new pre-treatment absorbent cartridge successfully removed trace amounts of contaminants such as motor lube oil, transmission fluid, emulsified oils, diesel fuel, and organic solvents in ethylene glycol(antifreeze) recovery operation. The new cartridge utilizes a proprietary polymer, modified to eliminate the potential for skin formation at the polymer/hydrocarbon interface, that both absorbs the hydrocarbon molecules and chemically binds them within the unit's polyolefin interior matrices.