

# Filtration...Perhaps the Greenest of A

By Edward C. Gregor

*Filters, separation or coalescing can solve any pollution or environmental challenge the world is facing.*

**“T**here isn't a pollution or environmental problem that cannot either be prevented or remediated through the use of filtration, separation or coalescing.”

I've been making the above statement for 20 plus years and have never had its veracity questioned or challenged. A few processes may not be 100 percent perfect yet, but the principal remains and is hard to dispute.

Filtration, separations and coalescing companies are always on the search for new opportunities and challenges, which brought to mind the idea of exploring the broad world of filtration, separations and coalescing,

through examples.

What follows is a “day in the life” of a married couple – John and Mary – and noting some of the many technologies that engineers, scientists, academia and companies have created to prevent or resolve many pollution problems that result in a higher standard of living for us while also maintaining a cleaner and safer world environment.

## THE DAY BEGINS

John and Mary wake in the morning with the help of their digital alarm clock – who's acids, solvents and de-ionized water were safely used to make its microchip, and which was

filtered by prefilters, reverse osmosis and microfiltration. John turns up the thermostat, not giving a thought to how their home air filters protect the heating unit. The electricity being provided by the local utility company from a coal-fired power plant uses scrubber technology and baghouse filtration to remove particulate from the exhaust stream. Mary heads to the kitchen to make a pot of coffee, pulling out a coffee filter, without knowing the coffee had the caffeine removed safely via super-critical fluid extraction. Her water is pre-filtered through a series of meltblown and carbon prefilters as well as an RO unit



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hidden under her sink. Now, Mary heads back to the bathroom where John is in the shower, using clean and odorless filtered municipal water. Mary applies her cosmetics, many of which were filtered for purity. Getting dressed, neither considers the polyester fiber in their clothing that was filtered during the fiber manufacturing process. Included, were the manufacture of John's cotton/polyester blend shirt and Mary's dress, which were both finished with a filtered antimicrobial treatment. Running a bit late for work, they quickly open breakfast protein bars wrapped in multi-layered plastic packaging used

to keep convenience-foods fresh, and which have benefited from polymer filtration once again. They drink their coffee and orange juice, where pulp has been removed using ultrafiltration. Being diabetic, John uses his membrane diagnostic test kit and gives himself an insulin shot, which had been filtered by the pharmaceutical supplier.

#### **OFF TO WORK**

Time to leave and both jump in their cars. Mary drives a hybrid, but dislikes the odor of exhaust fumes and pollutants and made sure a cabin air filter came with her car. It's a foggy winter

morning as she leaves, not thinking about a potential moisture build-up in the head and tail lamps, which evaporated overnight via the oleophobic membrane media vents embedded in the glass. These are similar to the vents where water by-passed the gaskets in the small motors controlling the windshield wipers and power windows in her car, which collected when she was driving in the rain the afternoon before. John's a lead-foot and an amateur racer, driving his pride and joy "muscle" car with its high-performance engine. In the back of his mind, he knows he can rely on the gas tank filter from monofilament and meltblown fabric and the



*Virtually every aspect of human life is touched by the principles of filtration.*

fuel injector filters of monofilament woven fabrics to provide clean fuel, and that the engine air-intake and lube oil wetlaid media filters will provide peak performance as well. He's also confident the space between the engine block and the pistons, only a few microns wide, are clean, thanks to two honing coolant filtration systems at the engine production plant that eliminated shavings and other debris, using 25 micron bag filters, and the other line with gradient density non-woven fabric roll stock to clear debris during precision machining of both his engine and transmission. Mary's car has an automatic transmission, which incorporates a transmission filter containing needlefelt and/or monofilament woven fabric. Both Mary and John's batteries also utilize

porous plastic media vents to prevent a build-up of gasses, eliminating the potential of a battery failure and even an explosion. Before reaching the office John calls his mother on his cell phone, which contains a microchip, not all that dissimilar to the digital clock. Mom is receiving hemodialysis using a cleanable hollow fiber membrane filter. She was fine, but asked John to please come by over the weekend to get her lawn mower ready for the spring with a new paper fuel and reticulated urethane foam air filter as well as to look at her gas dryer's lint filter screen, which might need replacement.

As Mary reaches her office as VP of OA/QC Manager at Living Well Pharmaceutical & Medical Device Company, LLC, she turns on her computer

containing an e-PTFE disk-drive air vent, but before she can remove her coat, an anxious employee tells her about problems on the production line over night. The injectables production line used to produce diabetes medication was having problems. The meltblown prefilter and membrane sterilizing filter line might not be working properly as the microbiology test lab detected bacteria in the serum on their membrane disk filter. Furthermore, the insert molding lines used to produce I.V. vent and in-line bacteria medical filters were acting up. Yesterday, they had a similar problem with the ophthalmic and pre-bypass filter line used in extracorporeal open heart surgery.


In the meantime, John arrives at his chemical plant where he is Director of

Operations. Unlike Mary's situation, everything is running smoothly. The filter presses using woven fabric, flat bed filters with rolls of nonwoven media and filters, and leaf filters using filter aids are all operating efficiently. However, one chamber of the bag house needs to have its filters replaced today as part of routine maintenance along with all the meltblown box air filters in the offices. The new fleet of large diesel trucks used to transport liquids and powders produced at his facility had finally arrived overnight. John feels relieved, as he has had many complaints about the diesel soot exhaust from the neighbors. He is also pleased to learn in the company newsletter, printed using filtered ink, that the oil and gas drilling operations the company owns elsewhere, has successfully installed improved coalescing and absorption separation systems. This was done to remove the higher percentage of oil and fine droplet chemicals from produced water in the oil and gas recovery process.

#### TRAVEL TO HEADQUARTERS

The day goes smoothly for John, before leaving for lunch and the airport and a flight to headquarters. At lunch, John enjoyed a burger, fries and sweet tea - the fry oil efficiently filtered using a polyester media, and the sugar sifted to size for his tea. On his way, John drove by a plating facility, where he previously was employed, and said hello to his replacement that had just installed both tubular and RO crossflow membrane systems to remove heavy metals before water disposal and recycling. Once at the airport, John boarded the aircraft confident the FAA-approved fuel, cabin air and hydraulic filters would perform perfectly. Looking out the cabin window, John noticed the hydrant cart, coalescing water out of the aviation fuel being loaded onto the aircraft.

Upon arrival at the hotel, John had supper, called Mary asking how things went today. Mary said she had concerns, but everything turned out well, relating

the microbiology lab diabetes report proved to be a false-positive. John said the same from his end and mentioned his company has just uncovered a new highly-efficient technology that sounds capable of complete mercury removal and direct recovery at the company's huge natural gas drilling facility. Best of all, there were no disposable absorbents requiring post-cleaning. John said good-night and he'd call in morning. Before turning out the lights, John watched the news, where the TV had an LCD screen made in a factory cleanroom using HEPA filters to prevent surface contamination during the manufacturing process. And so it goes...another healthy and trouble free day for John and Mary as well as the rest of us, thanks to safe and reliable filtration, separations and coalescing technologies. 

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