

# Regeneration NEXT

With their ability to use media over and over again, regenerative filters are seen by some as the wave of the future.



Eight enormous concrete bulkheads fill with water, then release it all at once, unleashing a surge that builds to a 9-foot-high, white-crested crescendo as it lifts, carries, drops and delights visitors to Mt. Olympus Water & Theme Park in the Wisconsin Dells. The outdoor attraction, called Poseidon's Rage, debuted last season, and its popularity quickly spread beyond this resort town known as the water park capital of the world and into the YouTube universe, where video footage of the wave pool's fury circulated among thrill seekers everywhere.

As director of maintenance at Mt. Olympus, Jason Hammond's job is to prevent Poseidon's Rage from spreading *Cryptosporidium's* Revenge. That's why Hammond relies on four regenerative media filters to keep the pool's 1.5 million gallons of water sparkling and safe. The filters, which employ a milled mineral called perlite as the filter medium, represent a departure for Mt. Olympus, which features sand filters on all of its other water attractions. However, sand filtration on a pool the size of Poseidon's Rage would be impractical, according to Hammond. "We'd have to use between 50,000 and 60,000 gallons of water a day to backwash high-rate sand filters on a 1.5 million-gallon pool," he says. "With the regenerative filters, we only use 5,000 gallons of water every two weeks."

Defender Filter  
provided by  
Neptune-  
Benson  
to Mt. Olympus



“There’s no product in the industry right now, worldwide, that has the potential benefits of this filter”

And because water that goes down the drain carries with it all the heat and chemicals used to prepare it for public use, those too must be replaced. “There’s no product in the industry right now, worldwide, that has the potential benefits of this filter, whether it’s ours or anybody else’s,” says Barry Gertz, president of Coventry, R.I.-based Neptune-Benson, which supplied the filters for Poseidon's Rage. “It all stems from the fact that this filter eliminates about 90 percent of the wastewater associated with sand filters—hundreds of millions of gallons of water a year.”

One immediate benefit of Regenerative Filters — which utilize as a precoat media either perlite (fine, irregularly shaped particles formed by subjecting solid siliceous rock to extreme heat) or diatomaceous earth (the fossilized silica skeletons of algae) — is space savings.

Sand filters may take up to six times the floor space needed to achieve the performance of a single 60-inch-diameter regenerative filter. Smaller regenerative units can fit through a standard doorway, making renovation possible without knocking down pump room walls.

Within that compact footprint are housed several hundred to several thousand finger-like flex tubes — stainless steel coils covered in a polyester braid mesh — that hang down from a tube sheet to serve as the filter septa. The filter media is drawn from 25- or 50-pound bags through a hose and into the filter tank using a built-in vacuum-transfer system. When water pressure is introduced to the tank, the powder coats the tubes and grabs hold of contaminants as pool water circulates through at flow rates that may range from 85 to 2,800 gallons per minute. Because the filters operate primarily on the premise of surface area filtration, as opposed to the depth filtration required of sand filters, pumps don't need to work as hard to maintain desired flow rates.

Says Gertz, “Whereas a 25-horsepower pump might be necessary on a sand filter, we get away with a 20-horsepower pump. A sand filter is typically designed to handle 15 gallons of water a minute through every square foot of filter area. With our filter, it's about 1.2 to 1.5. It's going through at one-tenth the speed.” And, Gertz adds, water in a regenerative filter is exposed to roughly 10 times the amount of media surface area as in a sand filter.

Where does the “regenerative” part come in? To expose the maximum amount of surface area of the chosen media — be it perlite or D.E. — the filters go through periodic “bump”

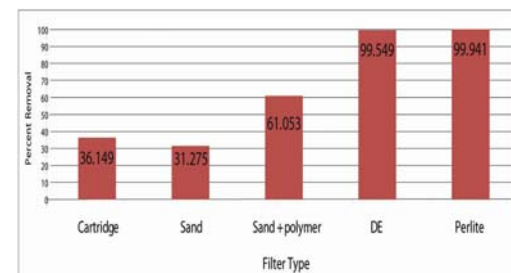
modes, during which the water pressure is shut off and the dirty media is mechanically shaken off the septa tubes and into the bottom of the tank, where it is broken down and stirred up. When pressure is reintroduced via a closed loop that temporarily bypasses the pool's recirculation system, the same media, as well as the particulate matter it has captured so far, is forced to reattach to the septa tubes in an entirely different configuration as before. This is what differentiates regenerative filters from other pre-coat filters, which use the same media types, but in only one manual application at a time before the media becomes saturated with debris and requires replacement. (Turning the pump off and back



on again will cause the media in these so-called static cake filters to drop and then reapply, but not necessarily in an even coat.)

The natural dirt-holding capacity of

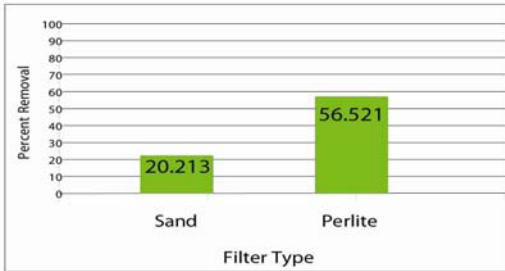
of the types of microscopic media used in regenerative filters deserves a closer look. Research presented last October at the World Aquatic Health™ Conference in Cincinnati reveals that both D.E. and perlite, when tested repeatedly under ideal precoat filtration conditions, remove on average more than 99 percent of elusive and potentially deadly *Cryptosporidium* oocysts in a single pass.



*Cryptosporidium* Oocyst and Particle Removal from Swimming Pool Water by Perlite, DE, Cartridge and Sand Filters

To be exact, perlite removed 99.941 percent on average; D.E. removed 99.549 percent. Meanwhile, sand filtration, still the most widely used method of recreational water treatment, removed 31.3 percent of crypto on average. Adding a maintenance-level dose of clarifier (a liquid polymer that helps small particles bond together for easier removal) improved sand's performance, but the enhanced filtration conditions still only reached a crypto-capture success rate of 61.1 percent. More comprehensive testing with pool clarifier products is being planned for the near future, according to University of

North Carolina at Charlotte engineering professor James Amburgey, who conducted the tests.



Tests performed by: UNCC, December 2006

“It’s obvious from the data that the precoat filters using perlite and D.E. performed much better at removing *Cryptosporidium*,” says Amburgey, whose research focused extensively on crypto management in drinking water during a two-year post-doctoral stint at the Centers for Disease Control and Prevention.

Amburgey’s expertise in drinking water treatment has urgent relevance to recreational aquatics, according to Kim Walsh, director of marketing for filtration at EP Minerals, which funded the media study. Walsh points to a report released by the U.S. Environmental Protection Agency mere weeks after the WAHC in October stating that recreational swimmers ingest an average 32 milliliters of pool water per hour, with children swallowing 47 ml hourly on average. “The CDC believes that ingesting as few as 10 *Cryptosporidium* oocysts can cause infection in 50 percent of the population,” Walsh says. “It only takes 0.14 grams of fecal mater to release a hundred million oocysts. You can’t see that in the pool. You don’t have visible evidence that you have an outbreak. The recreational water market was saying, ‘Hey, we’re not dealing with drinking water, so our filters are going to be different.’ That’s why we did this research.”

**“Regenerative media filtration is going to continue to be a sought-after solution for improving water quality and minimizing operating costs.”**

In fact, D.E., which has left some recreational pool operators wary of its reputation as a carcinogen, is used widely and safely to filter beverages of all kinds — from drinking water to fruit juice. “I think the real driver here is water quality,” says Scot Hunsaker, president of St. Louis, Mo.-based aquatics consultancy Counsilman-Hunsaker. “Because we’re seeing the pools become shallower, with less volume, and the usage go through the roof, we’re having to do a better job of

mechanically removing particulates from the water. We can do it with sand, but it takes more sand filters and lowering the flow rates and using polymers. We can trick out these filters to try to do the best we can, or we can look at a different filter medium that does it by its very nature.”

But for all their advantages, there are some tradeoffs associated with regenerative filters. Unlike sand, which as a medium doesn’t require replacement en masse for years at a time, perlite and D.E. represent an ongoing operational expense. Hammond, for example, goes through twenty-two 25-pound bags of perlite every two weeks, when it comes time to drain his four Poseidon’s Rage filter tanks of their water and media contents. “They keep the water crystal clear, but the downside is the maintenance on them,” says Hammond, who has trimmed the perlite replacement process from 10 hours to four in the time since the filters were installed. Says Hunsaker, “‘Regenerative’ sounds like you get to keep on reusing the media, but you are basically just extending the filter run. You’re putting off the inevitable of flushing that media down the drain and replacing it.”

Flushing D.E. down the drain can be a bit tricky. Since it doesn’t decompose (it’s already millions of years old), local ordinances may require that used D.E. be strained, bagged and disposed of. And then there are the perceived health risks to the D.E. handler brought on by airborne crystalline silica.

“We felt that the positives outweighed the negatives,” says Hersheypark’s Grubb. “We handle hazardous materials in other areas, as well, so it’s just one more thing for which we have to follow the proper procedures.”

Even perlite is classified as a nuisance dust, and EP Minerals’ packaging recommends wearing a dust mask when working with either perlite or D.E. Says Walsh, “To put it in perspective, you are exposed to as much crystalline silica in the air at the beach on a windy day as you are when handling D.E.”

**ALL THE ‘RAGE’ The Mt. Olympus wave pool welcomed hundreds of bathers per day during its debut season.**



Because Mt. Olympus stands to save an estimated \$13,261 annually by running 60-horsepower pumps instead of 75s on Poseidon’s Rage, the park earned a one-time \$7,956 Focus on Energy grant from Alliant Energy, which serves Iowa, Minnesota and Wisconsin. Says Gertz, “A good number of projects that we’ve worked on so far have been interested in LEED certification, and our filters have really helped them get a lot of points.”



As with any maturing technology, even initial investment costs are poised to come down. “It’s happening as we speak,” Gertz says. “We used to have 30 different models. Now we’re down to five. Our repeatability in manufacturing is bringing these prices down, and we expect that to continue.”

Not surprisingly, those supplying the recreational aquatics market with regenerative filters and media see regenerative media filtration as the industry’s future. “I believe it is and Neptune-Benson believes it is,” says EP Minerals’ Walsh. Others do too. “I think regenerative media filtration is going to continue to be a sought-after solution for improving water quality and minimizing operating costs,” Hunsaker says. “And I think we’re still seeing the first generations of this. We’re going to continue to see this technology refined. We’re going to see costs come down and performance go up.”

**Excerpted from: *Regeneration Next: The Wave of the Future in Pool Filtration?* Athletic Business, May 2008**

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