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Episode 28 Cerapure 4U

Background – Derek French

Mike interviews Derek French of Wateropolis about their new product Cerapure-MAC. Derek has a long history in the water treatment industry. He started out with the industrial division of a Culligan dealer, moved to Osmonics where he worked with membranes and separation processes. Most of his career has been doing municipal and wastewater filtration.

3M invented granular ceramics. Kinetico® purchased the patents. Derek worked with Kinetico® as part of their municipal drinking water group. The patents have expired. At Wateropolis these same ceramic products are being produced.

#### Cerapure-MAC Product Background

Wateropolis examined manganese dioxide type products in the marketplace – Pyrolox, Greensand, etc. They looked at medias that worked great for two weeks, three weeks, a month, or two months, and then the performance drops off. They believe this failure occurs because biologically active water impacts the surface area thus performance.

The product developed, Cerapure-MAC, is a patent pending, proprietary blend of manganese dioxide, no-lead copper zinc metal alloy and activated carbon permanently attached to a highly textured (rough), ceramic granular substrate.

#### Applications

- Iron & Manganese removal
- Hydrogen Sulfide removal
- Cerapure-MAC is .25 to .3 millimeter in size. It removes 99% of 10-micron particles and 90% of 5-micron particles. If there is pre-oxidized material in there, it's going to pick that up as well.
- Use Cerapure-MAC if you have an application where you need oxidation and chlorine or chloramine removal. It is ideal in front of membranes, RO, NF.

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### How it Works

Cerapure-MAC is a combination of manganese dioxide, an alloy and carbon. It works in highly oxygenated environments for removal of iron, manganese, and hydrogen sulfide. The alloy is there to prevent the biological overgrowth.

- The manganese (Mn) in your source water combines with oxygen (O<sub>2</sub>) to create manganese dioxide (MnO<sub>2</sub>).
  - It forms a crystal that loosely attaches to the media until it's backwashed out.
  - There are at least 16 different manganous crystal structures. Manganese is not just one crystal. It forms all sorts of different types of crystals depending on the pH and the ionic strength of the water. There is a little bit of witchcraft involved in manganese removal sometimes.
- To "fuel" the reaction you can use ozone, chlorine, or hydrogen peroxide.
  - Given the oxidation potential of ozone, it works in a broad array of waters where dissolved oxygen can be limited, particularly as it relates to pH.

Cerapure-MAC will remove chlorine and chloramine. This may be ideal for homes or as pre-treatment to membrane technologies. However, care should be taken to install proper disinfection equipment on community wells and municipalities.

### Working with Cerapure-MAC

- Will copper leach off the substrate if the pH is too low? Cerapure-MAC is certified to NSF/ANSI 61. Copper-Zinc alloy is more stable and less prone to dissolving. Over its lifespan of 5-7 years, any metal coming off is well below drinking water standards.
- Pre-treatment to Cerapure-MAC is required where pH is 6.5 or less.
- Backwash – 40% Expansion
  - Fluidization is when the energy of the water flowing upwards through that bed lifts and separates all the materials. Contrary to popular belief, particles do not collide during backwash. The energy of the water separates all the particles and keeps them apart. The orientation of the media changes with high upflow velocities. Those influences knock the dirt off the media. If you don't fluidize the media and have enough lift and separation, you're not going to get it clean. Fluidization can't be measured in an 8, 10 or 12, or 24- or 36-inch closed tank, so bed expansion is a surrogate for fluidization.
- Backwash Rate – 8-10 gpm per ft<sup>2</sup>. Cerapure-MAC is finer and has a lower UC (uniformity coefficient) than competing products.
  - By making it finer the surface area is increased. Chances of intercepting dirt on to a media receptor go up as your media gets smaller.
  - As the uniformity coefficient (UC) comes down oversized material is eliminated. This also helps reduce backwash rates.

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- Subfill
  - Underbedding must be matched to the particle size of the media.
  - Go with a hub and lateral or a single high flow cone distributor.
  - Choose your subfill to match the effective size of the media that you're putting on top.
    - Use the right combination to avoid having the filter media migrate or slide down into the support bed.
    - If it gets to the distributors, it can go through the distributors and/or pack around the slots in the distributor.
    - If it's really mismatched, the filter media will get down into the interstitial spaces of the support bed and cause a hydraulic bottleneck with a surprisingly high clean pressure drop.
    - Once the media gets down in the support bed, there is no effective way to get it out during a backwash.
  - **Use only #36 garnet as subfill.** Gravel will migrate down and plug the distribution system.
  - Cerapure-MAC is too fine for use in a Vortech or bottom plate tanks.
- Equipment
  - Use Cerapure-MAC in place of GreensandPlus, Katalox Light,
  - Used in conjunction with Ozone systems, AIO- Air Injector type systems, or filters with oxidation pre-feed.

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