

Episode 59 GreenSandPlus™ by Inversand Discussion with Ray Jones & Mike Urbans

Inversand Company History

- Inversand started in 1925, producing a product called Zeolite, primarily used for water softening. The product evolved over time, transitioning from Greensand to Manganese Greensand and currently GreensandPlus™.
- The glauconite deposits mined by Inversand in New Jersey were extensive, running from New Jersey down to South America. Glauconite, the base mineral for Greensand, played a significant role in the early history of the product.
- Over time, synthetic ion exchange resins, developed by companies like DuPont, surpassed the original Greensand (used in softening) in terms of efficiency, prompting Inversand to adapt its product.
- Inversand's next generation Greensand was Manganese Greensand. Glauconite is stabilized, then coated with manganese oxide in various valence states. It is this coating that provides the glauconite with its special chemical oxidation-reduction properties for the removal of iron and manganese as well as small quantities of hydrogen sulfide.
- Environmental and industrial pressures eventually caused Inversand to cease operations in New Jersey, selling their mining site to Rowan University.
- Manganese Greensand production officially ended November 2012. [Manganese Greensand Technical Data](#)
- Despite challenges, the company persisted, creating GreensandPlus™, an updated version of their traditional product, marking Inversand's 100-year anniversary in 2025.

Manganese GreenSand (the original) Availability

- A number of vendors may still have the original Manganese Greensand in stock. Contact Urbans Aqua for more information.

GreenSandPlus™

- **Function of Greensand/GreensandPlus™**
 - GreensandPlus is coated with manganese dioxide (MnO₂), a critical part in its filtration mechanism. The manganese dioxide coating creates an active surface for the oxidation of dissolved metals in water.
 - Oxidation and Filtration Process: The process relies on a chemical reaction where the MnO₂ on the media surface acts as an oxidizing agent. When dissolved manganese, iron, and sulfur pass through the GreensandPlus bed, they are oxidized and transformed into solid particles. These solid particles are then trapped within the media bed, allowing clean, filtered water to flow through.
 - Common Ion Effect - This process works based on the common ion effect. The manganese oxide (MnO₂) surface attracts ions with similar properties (like dissolved manganese and iron), pulling them out of the water even when the pH is neutral or slightly acidic. This allows for effective manganese removal even at lower pH values (as low as 6.5).

- pH Considerations: The media works best in waters where the pH ranges between 6.5 and 9. For best performance, a slightly alkaline environment is recommended, ideally between 7 and 8.2 for enhanced oxidation rates.
- **Performance and Application**
 - Flow Rate: GreensandPlus can handle high flow rates, up to 2-3 gallons per minute per cubic foot (GPM/ft³), without losing filtration efficiency. It stays effective in reducing manganese levels to below the EPA's secondary MCL of 0.05 mg/L.
 - Contaminant Removal Capabilities: In addition to manganese, GreensandPlus is capable of removing:
 - Iron: As dissolved iron passes through the media, it is oxidized into solid iron oxide (rust) and trapped in the filter bed.
 - Sulfur: Hydrogen sulfide gas (H₂S), often responsible for the 'rotten egg' smell in water, is oxidized into elemental sulfur, which is then filtered out.
 - Arsenic: GreensandPlus can reduce arsenic levels, although it works better in conjunction with iron. The arsenic adheres to the oxidized iron particles, which are then removed by the media.
 - Radium: GreensandPlus has a special affinity for radium, particularly the radium isotopes 226 and 228. Radium removal works even in low manganese conditions, though it is recommended to use a hydrated manganese oxide (HMO) solution for enhanced protection.
 - Backwashing and Regeneration:
 - Backwashing: Over time, the bed becomes loaded with oxidized particles and needs to be cleaned through backwashing. Backwashing with water at the correct flow rates helps to dislodge and remove trapped particles from the media, restoring its filtering capacity.
 - Regeneration: GreensandPlus requires periodic regeneration to recharge the manganese oxide coating. The most common regenerant used is sodium hypochlorite (household bleach), which helps restore the oxidative capacity of the media. Chlorine gas, chlorine dioxide, or ozone can also be used as regenerants depending on the application.
 - Oxidant Selection
 - Hydrogen peroxide is not recommended as it is not very effective in regenerating manganese dioxide.
 - Sodium hypochlorite or ozone is commonly used for residential systems due to ease of handling.
 - For larger systems or industrial applications, stronger oxidants like chlorine dioxide or ozone may be used.
 - Potassium permanganate was used as a regenerant, but its usage has declined due to environmental concerns and regulatory controls. Permanganate can be messy and hard to handle, staining surfaces and materials.



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- **Applications in Various Systems**

- Anthracite Cap: In larger systems, an anthracite cap (a layer of 0.60-0.80mm anthracite coal above the GreensandPlus) can significantly improve filtration efficiency. This added layer helps capture larger particulates, reducing the load on the GreensandPlus media and extending its service life.
- Home vs Municipal Systems: In residential applications, GreensandPlus is typically used in well water treatment systems, where iron, manganese, and sulfur are common contaminants.
- In municipal systems, it can be used for larger-scale water treatment, especially when dealing with contaminants like radium and arsenic.

- **Handling Special Contaminants**

- Radium: It is important to ensure that the manganese concentration is above 0.4 mg/L to protect the media from accumulating radioactivity. If manganese is low, adding HMO (hydrated manganese oxide) can help prevent this issue.
- Arsenic: GreensandPlus works best on arsenic in the presence of iron. The iron assists in binding arsenic, making it easier for the media to filter out. Without enough iron, the arsenic removal rate is less consistent.

- Learn more about [Inversand](#)
- Learn more about [Urbans Aqua](#)
- Connect with Urbans Aqua on [LinkedIn](#)
- Connect with Mike on [LinkedIn](#)
- Connect with Denise on [LinkedIn](#)

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