



It's Your Water — Quick Tips Catalytic Carbon

This episode focuses on catalytic carbon, emphasizing that not all catalytic carbons are the same. The discussion centers on differences between coconut shell-based and coal-based catalytic carbons, their applications, and the chemistry that drives performance in real-world water treatment systems.

Key Topics Covered

- Chloramine reduction in municipal water
- Hydrogen sulfide removal
- Differences between coconut and coal-based carbons
- Role of oxygen in catalytic reactions
- Impact of TOC (Total Organic Carbon)
- System design considerations (contact time, oxidants, temperature)

Catalytic Carbon Basics

Catalytic carbon is enhanced activated carbon that holds more oxygen on its surface, enabling oxidation-reduction reactions. Unlike standard carbon, which primarily performs adsorption, catalytic carbon actively participates in chemical reactions.

How Catalytic Carbon Works

- Chlorine is removed through a surface reaction (reduction to chloride)
- Ammonia (from chloramine) requires additional catalytic oxidation
- Oxygen stored in the carbon acts as the catalyst
- Without sufficient oxygen, the reaction fails (catalyst depletion)

Applications

Chloramine Removal:

- Standard carbon fails quickly (often <6 months)
- Catalytic carbon required for effective ammonia breakdown

Hydrogen Sulfide Removal:

- Catalytic oxidation converts H₂S
- Requires oxygen source (air, ozone, peroxide)



Iron Removal:

- NOT recommended despite past claims

Oxygen & Oxidation

- Oxygen is critical to catalytic performance
- Sources include:
 - Dissolved oxygen
 - Air injection (AIO systems)
 - Hydrogen peroxide
 - Ozone (preferred for performance and cleanliness)
- Water O₂ saturation limit ~8% oxygen

TOC (Total Organic Carbon)

- Represents organic load in water (tannins, algae, decomposed material)
- Competes for adsorption sites
- High TOC reduces catalytic efficiency
- >1-2 ppm can significantly impact performance

Media Comparison

Coal-Based Catalytic Carbon:

- Larger pore structure (macropores)
- Better for hydrogen sulfide
- More consistent manufacturing

Coconut-Based Catalytic Carbon:

- Smaller pore structure (micropores)
- Stronger structure
- Better for chloramine/chlorine resistance

System Design Considerations

- Chloramine requires longer contact time than chlorine
- Typically use ~2x carbon vs standard chlorine systems
- Temperature impacts oxygen retention (warm water loses oxygen faster)
- Proper empty bed contact time (EBCT) is critical
- Undersized systems will fail



Operational Risks

- Biological fouling (especially in larger pore media)
- Oxygen depletion leading to reaction failure
- Incorrect media selection (coal vs coconut)
- High TOC reducing capacity

Comparison Table: Catalytic vs Standard Carbon

Feature	Catalytic Carbon	Standard Carbon
Primary Function	Oxidation + adsorption	Adsorption only
Chloramine Removal	Excellent	Poor / short lifespan
Hydrogen Sulfide	Effective with oxygen	Limited
Oxygen Role	Required for reaction	Not required
TOC Impact	Reduces catalytic sites	Competes for adsorption
Lifespan	2–5 years typical	Often <1 year for chloramine
Applications	Chloramine, H ₂ S	Chlorine, taste/odor

Dealer Takeaways

1. Not all catalytic carbon is the same—know your base material
2. Always match media to application (chloramine vs sulfur)
3. Oxygen is the limiting factor—no oxygen, no reaction
4. Test for TOC—it can quietly kill performance
5. Design matters—contact time and sizing are critical

Quote from Episode

“The right carbon in the wrong system will fail, and the wrong carbon in the right system will still disappoint.”

These notes summarize the It’s Your Water — Catalytic Carbon episode and are intended for education only. They are not engineering or regulatory design guidance.

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