

Biofiltration Benefits

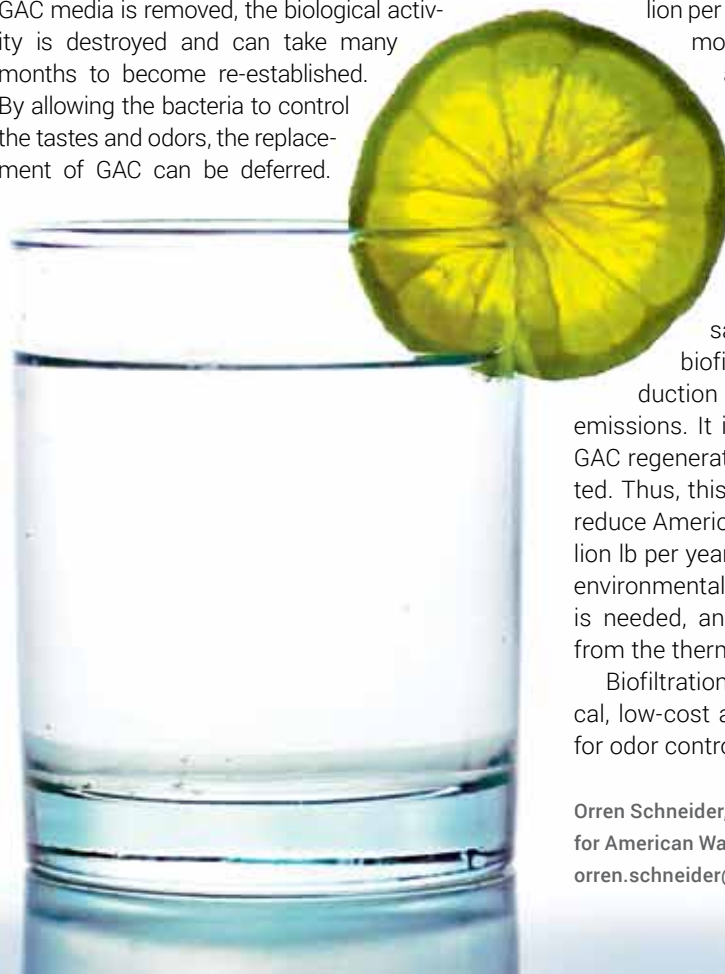
Reducing unpleasant tastes & odors
with bacteria metabolizing process

By Orren Schneider

In an era of increased concern about limited water supplies, energy consumption, water quality and climate change, the pressure on water utilities to deliver more efficiency and operational effectiveness is greater than ever for this energy-intensive industry.

Currently, a large number of surface water treatment plants in the U.S. use granular activated carbon (GAC) in their filters, primarily to reduce unpleasant tastes and odors in the water through a process called adsorption. In practice, due to the presence of organic matter in the water, the adsorptive capacity of GAC in surface water plants is generally effective for only a few months, after which little organic matter is adsorbed even though the media may be in place for three or more years. In recent years, the water industry in North America has begun examining a concept called biofiltration.

In biofiltration, naturally occurring bacteria are allowed or encouraged to grow on filter media. The bacteria can metabolize many organic compounds, including taste- and odor-causing compounds. When GAC media is removed, the biological activity is destroyed and can take many months to become re-established. By allowing the bacteria to control the tastes and odors, the replacement of GAC can be deferred.



Thus, the replacement period can be reduced from three or four years to 10 years or more.

Swimming River Demonstration

A demonstration-scale trial of biofiltration was conducted at the Swimming River Water Treatment Plant, which is operated by American Water's New Jersey subsidiary. The plant is one of three surface water plants and several groundwater plants within the Coastal North System with a rated capacity of 36 million gal per day (mgd), but can operate for short periods up to a design flow of approximately 38 mgd. The plant is faced with several treatment challenges, including organics removal—which can affect taste and odor—and particulate removal.

The plant also maintains the Partnership for Safe Drinking Water Phase III designation and has received a 10-Year Treatment Program Directors Award. As such, the plant strives to maintain a combined filter effluent turbidity of 0.1 ntu at all times; a switch to biofiltration would not be accepted if this goal was not maintainable.

Results of the initial testing indicate the biofilters are capable of controlling taste and odor over the long term and that regular replacement of the GAC is not required to meet organics removal goals. Additionally, based on the combination of organics removal and hydraulic results, it is apparent that the four-year replacement period for the GAC is too frequent. While the performance of new GAC eventually becomes similar to the biofilter, the benefits of the media replacement for organics removal do not seem to warrant the capital cost of media replacement, especially when balanced against the increased operational costs of lost water production.

Based on a full-scale demonstration, the Swimming River Water Treatment Plant could save, on average, approximately \$40,000 per year by extending the media life from four to five years, or up to \$150,000 per year by switching to a strategy in which a small amount of media (5%) are replaced each year to account for media loss.

Widespread Application

Based on internal estimates, if biofiltration was implemented across all of American Water's 32 plants using GAC, the savings could exceed \$4 million per year and negate the need for replacing more than 3.5 million lb of GAC. As part of a company-wide effort, 25 of the company's 32 plants with GAC are going through some level of testing to determine if biofiltration is appropriate at the specific plant sites.

In 2014, deferring replacement of GAC led to savings of more than \$2 million. In addition to these cost savings, other benefits of moving to biofiltration include improved water production and a decrease in greenhouse gas emissions. It is estimated that, for each pound of GAC regenerated, 0.7 lb of carbon dioxide are emitted. Thus, this change in practice could potentially reduce American Water's CO₂ emissions by 2.4 million lb per year. Additional benefits include reduced environmental impact because less transportation is needed, and lower potential air quality impact from the thermal regeneration process.

Biofiltration technology is proving to be a practical, low-cost and environmentally friendly solution for odor control needs. **w&wd**

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