CEU PLAN

What's New At CEU?

OPERATOR EDITION—4 JULY, 2012

NOTE FROM CEU PLAN

The last few weeks have been very busy for everyone in the water and wastewater world. Wildfires in the West, tropical storm winds and rain in the South, extreme heat and drought in much of the country have taken their toll. All of these weather related issues affect water and wastewater facilities and operators on both the professional and personal level. From all of us at CEU Plan, please know that our thoughts are with you during trying times such as these and if we can assist you in any way with your training needs, just let us know. We are here to help and to serve you as professionals in the water and wastewater industry.

Bill Edgar

President
CEU Plan

THIS EDITION

Using Media Inspection & Maintenance For Filtration Optimization Part One

Reprinted Courtesy of Bob Cashion, Blue Earth Labs

This article will be printed in two-parts—Part One in this edition of our e-newsletter, and Part Two in our August edition.

Filtration remains one of the most important steps in water treatment today. With increasing regulations, the filtration process has become even more crucial to the overall water quality leaving the facility. In down economic times, new technologies such as granular activated carbon and membrane filters are often not feasible for small water systems due to cost constraints. Improved performance, longevity and reduced costs can be attained for existing filters with proper operations and maintenance of these systems, thus chemical cleaning solutions should be considered as a cost-effective alternative to expensive plant upgrades and treatment changes.

Filtration Systems Impacted By Regulatory Changes

The emerging EPA Long Term 2 Surface Water Rule requires additional filtration performance and the Stage 2 Disinfection Byproduct Rule makes it impractical to feed high dosages of chlorine to improve filterability. Both of these regulations entail improved performance requirements, while placing additional loading demands on the filter media. As a result, many systems have moved away from pre-chlorination and have begun utilizing pre-oxidants, such as potassium and sodium permanganate. The use of these pre-oxidants has in turn lead to a significant increase in organic and inorganic contaminant buildup on filter surfaces and filtration media. Moreover, overfeeding coagulants to improve total organic carbon (TOC) reduction affects the inorganic constituent levels and has a tendency to scale and encapsulate filter media, actually decreasing the media's ability to perform. Further, this buildup can change densities of the media, affecting backwash flow rates, expansion, turbidity break through, as well as reducing capacities to operate at designed filtration rates—all factors that increase operational costs due to lost water and excess energy consumption.

The Importance of Operation & Maintenance of Filtration Systems

Filtration systems are extremely complex pieces of equipment that provide results based on the physical and functional design of the process, as well as the influent water to be filtered. While state regulatory agencies require periodic inspections of all portions of the water treatment process, filtration systems by design and location are very difficult to inspect due to confined space limitations and operational complacency. For this reason, not only are they often overlooked, but the filtration media is rarely inspected until an issue arises with its performance. It should be noted that if severe conditions occur such as flooding, extremely high turbidity or unusual flow patterns during backwashing, the filter process should be investigated as soon as practical.

To remain most efficient and effective, filtration media, regardless of its type, should be inspected at least once per year. An annual inspection should include laboratory analysis of a core sample of the media to determine the viability of the media particles, as well as the depth and proper stratification of the layers. Media density, particle size and uniformity should also be thoroughly evaluated. Once this annual assessment has been performed, it is critical to keep this data recorded to construct quality control benchmarks to compare past and present filter performance. This data will be foundational for water plan personnel to determine inconsistencies and accurately diagnose problem sources within the filter before major issues arise and cause large-scale and cost prohibitive failures in the filtration system.

Additionally, each filter is a distinct piece of equipment and all filters will not operate the same due to hydraulics and mechanical configurations. Therefore, each filter should be individually assessed for best operational control. (*Article continued on page two.)*

Using Media Inspection & Maintenance For Filtration Optimization, continued

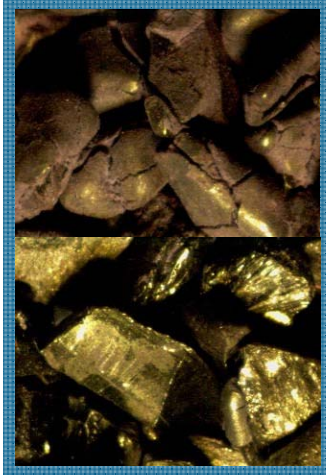

Figure 1: The sharp angles of apparently rounded media (top) and restored after cleaning (bottom).

Filter Media Sampling and Testing

The operating capacity of the media is the most critical component of the filter's overall performance. Overtime, media becomes fouled with organic and inorganic matter, reducing absorptive sites, altering media densities and causing media channeling. As this process encapsulation continues, several problems can occur ranging from shorter filter run times, higher head loss, increased turbidity, lower filtration rates, increased risk of contaminant breakthrough and inadequate bed expansion during backwash. All of these negatively impact costs and can usually be avoided with diligent media management.

Encapsulation is often confused with rounding of the media, which leads many operators to incorrectly assume the media is worn-out and requires replacement. Figure 1 demonstrates that the apparent rounded media could be completely restored after being cleaned with a chemical solution. Therefore, proper testing of filtration media is an integral part of operating and maintaining filtration systems.

To determine whether or not filter media can be chemically cleaned or it has degraded to a point that replacement is more cost effective, controlled laboratory tests must be performed. For proper testing, samples taken from the filter bed should be representative of the particular media types and the physical size of the filter. In the lab, media will be tested for its current density in a dry state. Microscopic examinations reveal the angular surface areas of the media particles, and detailed sieve tests determine the effective size and uniformity coefficient ranges for the media. Theses tests allow for a comparison of the sampled media to accepted specifications of density, size, and uniformity coefficients of standard media materials.

If preliminary lab testing concludes that the media can be effectively cleaned with a chemical solution, then additional tests can be performed to determine the composition of the contaminant buildup. Providing a complete analytical testing of the constituents attached to the media is the best way to decide which chemical solutions should be applied, the quantities of chemicals needed and how effective they will be at removing the deposits from the filter media.

Laboratory cleaning procedures will determine what constituents have been removed and the volumes of constituents removed. This is measured by the dry weight of the media before and after cleaning. The weight loss difference will be a direct correlation of the total constituents removed from the media. Laboratory cleaning results will be applied to the overall specifications of the filter media and provide an estimate of how many pounds of contaminants can be expected to be removed from the entire filter bed.

This step is accomplished by examining the chemical solution and rinse water mixture to determine what constituents were removed from the media during the cleaning process. Often times, this process will reveal coagulant residuals, iron, manganese, calcium or other constituents that are found in the raw water supply that have been encapsulated around the media particles.

These analytical results are very important because they provide a baseline which will assist in determining the optimal intervals between media cleaning and inspection. Furthermore, they can provide a window into treatment that may suggest changes in coagulant feed rates to improve filter performance or treatment efficiencies of the sedimentation process and loading on the filtration system. The results can be analyzed from year to year to see the overall operation control of the filtration system (See Table 1).

Filter ID	4
Standard Cleaning	
Anthracite	
Dry Weight Loss	4.0%
Total lbs removed	984
Mg removed (ppm)	448
Ca removed (ppm)	2,467
Sand	
Dry Weight Loss	0.8%
Total lbs removed	399
Mg removed (ppm)	112
Ca removed (ppm)	519
Combined	
Total lbs removed	1,383

Table 1: Amount and composition of the constituents removed during standard laboratory cleaning.

In the August Edition of "What's New At CEU?", we will include part two of Bob's article including "two-step media cleaning application", and "benefits and costs of chemical cleaning". Be sure to check next month for the second part of this outstanding article on filtration optimization. Also, visit us at www.ceuplan.com for our outstanding water treatment course series.

About the Author

Bob Cashion is the National Director of Training and Field Services for Blue Earth Labs. Bob is a Certified Water Technologist with over 35 years of experience in the water treatment industry. For more information, contact Bob.Cashion@BlueEarthLabs.com or (702) 286-8049.

Diesel Fuel Cleaning—Make Sure Your Emergency Generators Run When You Need Them

Annette Vail, CEU Plan Subject Matter Expert

We're having a wild weather year in 2012—from early tropical storms, to droughts, to raging fires and June's violent derecho, the straight-line storm that crossed 6 states, killed 22 people and left approximately 3 million without power.

If the year so far is any indication, there is good reason to be especially diligent when it comes to properly maintaining your system's emergency generators.

One important way of ensuring the generator will work when it is called for is to check and clean the fuel. This is especially true if you have large diesel fuel storage tanks.

Fuel can degrade and become contaminated over time. Temperature and pressure changes during periodic test runs can encourage condensation. Fuel tanks are also prone to microbiological growth, which can form a slimy compound. In addition, asphaltines—high carbon, heavy fuel molecules—can combine, forming a sludge-like substance inside the tank. Fuel tank sludges are usually acidic and may attack the storage tank as well as the engine components.

These problems may not show up until the generator is called for and performs poorly or fails due to a clogged filter. If sufficient condensation has occurred, or a loose cap or opening exists, water in the fuel can create a major problem for the generator.

Signs of Fuel Problems

The following symptoms can indicate a fuel problem when the generator runs:

- Clogged fuel filters, and having to change filters before 500 hours
- Clogged fuel lines
- Excess smoking or dark exhaust
- Corrosion on the injectors

You can also check for problems in the fuel tank itself:

- Slimy mass or sludge in the tank
- Fuel color is abnormal – dark or milky
- Water in the fuel
- Fuel has a bad odor

Fuel Preventive Maintenance

Just think of your fuel tanks as part of your entire emergency generation system, and include them in the preventive maintenance schedule.

Check the fuel for water before and a few days after a fuel delivery. This will help to ensure the fuel you are receiving is not already contaminated with water. The reason for waiting a few days is to let the water settle to the bottom of the fuel storage tank.

Have the fuel sampled and tested on a regular basis. Getting a representative sample from the tank bottom is important to test for water, sludge, and biological contaminants. Sampling from the middle of the tank will allow a check of fuel quality.

Fuel testing should be done by a qualified fuel lab. The fuel lab will have recommendations for which tests to run, and should provide sample containers. Or you may wish to contract with a service that will perform sampling as well as testing.

When test results indicate a problem, you may wish to have a specialized mobile fuel tank cleaning contractor clean the fuel. Many facilities have their fuel tank cleaning scheduled annually instead of waiting for problems to arise.

Other alternatives include implementing a stationary, automated fuel cleaning system or adding in-line fuel conditioners. Some fuel additives can help to prevent problems as well, but cannot take the place of regular testing and tank cleaning.

Annette Vail is a Certified Environmental Professional with over 30 years of experience. Be sure to check www.ceuplan.com and view the variety of courses offered by Annette including "Emergency Response—After The Disaster", and "ERS: Generators".

CEU PLAN SUBJECT MATTER EXPERT SPOTLIGHT—Mike Switzer

Michael Switzer began his career in Biloxi, Mississippi in 1986, working for contract operations companies EOS, OMI, PSG, OPTECH, ECO Resources, Southwest Water Company where he held Class A wastewater certifications in Mississippi, Alabama, Arkansas, Louisiana, Class B wastewater in Texas and Class A Water in Louisiana and Class C Water in Mississippi . He specialized in water and wastewater plants troubleshooting and training and is currently "semi-retired" working for S. H. Anthony, Inc in Gulfport, MS.

Mike was involved with Florida Water & Pollution Control Operators' Association as Vice-Chairman and Chairman of Region 8 and East Vice-Chairman of Region 9. Mike served as Governor of the Mississippi Water and Pollution Control Operators' Association, District 6 on the Mississippi Gulf Coast. He is currently the Vice-President and Chairman of the Collection System Committee of the Mississippi Water Environment Association He is on the Mississippi State University Extension Service "Peer Review Committee of Small Water System Committee".

Mike has been involved in training water and wastewater operators for over 23 years. His specialty is getting the math "back to the basics" recognizing how long much operators have been out of school and need a refresher on the basic math. He was awarded the "Leroy Scott" award by Florida WEA in 2001 and the Mississippi WEA Hatfield Award, 2011 Mike holds an Associate Degree in Environmental Science.

Whether you need help with math for a certification exam or just need a refresher for continuing education, be sure to check out Mike's very popular CEU Plan courses designed specifically to help operators "get back to basics" with math questions and problem solving.

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ABOUT CEU PLAN.....

The mission of CEU Plan is to provide water and wastewater operators and supporting staff with the latest in emerging technologies, procedures, methods and/or concepts; in order to enrich their knowledge and experience within the work-place and obtain required CEUs for license re-certification/ renewal.

Our programs and courses are 100% internet based providing the student with the opportunity to concentrate on their courses at their convenience and available time. CEU Plan provides a convenient, cost effective means of delivering course content while advancing the student's understanding and knowledge of various industry topics.

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*Sept. 24-26	NRWA WaterPro Conf. Nashville, TN
*Oct. 14-18	ASDWA Annual Conf. Little Rock, AR

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