**Tips for surface water sources with rapid rate filtration**

Filter backwash is integral to the operation of a rapid rate filter. Properly operated backwash processes can significantly reduce the risk that disease-causing organisms will enter the water distribution system.

During normal operations, a clean filter accumulates and stores contaminants captured from the water as particles stick to the surface of filter grains or previously deposited material.

As this process continues, the open spaces between the grains of the filter gradually fill in and resistance to flow increases. Resistance is measured as filter headloss. Unless backwashed, filters eventually reach terminal headloss and filter breakthrough occurs—releasing turbidity and other contaminants into the water distribution system.

Backwashing cleans the filters removing the accumulated contaminants and preparing the filter media physically and chemically to begin filtering again. To avoid unnecessary health risk to your customers, you should always backwash before breakthrough occurs.

Efficient backwashing removes captured particles from the filter without losing the anthracite or sand media. In actual practice, it is normal to lose up to an inch of media per year during backwashing. If backwash rates are too high, significantly more media could vanish—compromising filter performance. In any case, it is important to track and replace any missing media during your annual filter inspection and maintenance check.

The most effective backwashing results when there is adequate expansion of the filter bed. This occurs when water flows upward at sufficient rate to fluidize the media bed, increasing the space between the media grains and causing the media to “expand”, or occupy more volume. Fluidization promotes collisions of the media grains, which scours away surface deposits.

If backwashes don’t adequately clean the filter, successive runs may result in a build-up of dirt and coagulant deposits, leading to problems such as mud-ball formation and cracks or fissures in the media, especially along the walls of the filter. Filter cracking, in turn, promotes short-circuiting through the filter, and reduces the effectiveness of the filtration barrier.

Effective backwashing depends on achieving a balance in factors. What works at one facility may not be optimal for another. With the following guidelines in mind, you can
modify your standard backwashing procedure to produce the safest water you can for your community.

**Guidelines for filter backwashing**

**Bed expansion.** In most cases, the optimal backwash flow rate will result in at least a 20 percent expansion of the filter bed. For example, if your filter has 30-inches of combined anthracite and sand media, the expanded depth of the media should be at least 36-inches. For information on an effective low-cost tool you can make to monitor bed expansion visit the Pennsylvania Department of Environmental Protection at files.dep.state.pa.us/Water/BSDW/AboutWaterSupply/FPPE/filter_bed_expansion.pdf

**Determining optimal backwash flow rate.** Backwash flow rate and water viscosity are the key factors effecting filter bed expansion. For a given flow rate, colder water will result in greater filter-bed expansion because it is more viscous than warmer water. Because water viscosity varies significantly with the normal range of seasonal temperatures encountered at many water treatment plants, you should adjust backwash flow rates as temperatures change throughout the year to ensure correct bed expansion.

When temperatures go up, backwash flow rates need to go up, too. And, when temperatures go down, flow rates need to go down. For more information, visit the Ohio State Environmental Protection Agency at web.epa.ohio.gov/ddagw/Documents/OAWWA%20Filter%20Assessment%20Articles.pdf

**Auxiliary scouring.** Air scour and hydraulic surface washers significantly improve backwashing performance. If you have problems with mud-ball formation, these tools offer a good potential solution. Contact our regional office for more information.

**When is the filter clean enough?** *Over-washing,* which means backwashing for an extended period, actually increases the time the filter needs to ripen when returning to service. One way to determine when to terminate backwashing is to look at the turbidity of the waste-wash water. In general, 10 NTU is an accepted value for terminating backwashing. After backwashing, filtered water should flow to waste until the turbidity drops below 0.1 NTU.

**For more information**
Our publications are online at http://www.doh.wa.gov/drinkingwater.

**Contact our nearest regional office:**
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