Dutchess County Health Department

The following is an article written by Brian Jobb for the AWWA.

Filter Media Cleaning; An Alternative to Media Replacement

Filtration is an extremely important component of any conventional water plant. The role of a filter is even more critical for direct-filtration facilities. In order to ensure optimal performance, many experts recommend replacing the sand and anthracite in a typical dual media filter every 10 to 20 years. Operating authorities often go the trouble and expense of replacing media that is fouled, but remains within an acceptable physical size range. Media replacement may not be necessary provided that the effective sizes and uniformity coefficients for the sand and anthracite remain within original specifications. It is often possible to regenerate filter media without removal by means of chemical cleaning. This technique was documented in the 1960's and has become routine maintenance at numerous facilities.

Media fouling and mudball formation can occur for many different reasons. The most typical causes are inadequate backwash rates, uneven backwash flow distribution, ineffective surface wash and /or improper chemical dosages. Poor clarifier performance may also lead to floc carry-over and fouling of filter media. Filters equipped with air scour appear to be less susceptible to fouling and mudball formation, likely due to the effective scrubbing action of the air.

Initial inspection of the media is necessary to ensure that the depth of the sand and anthracite layers remain within original specifications. If the media is over 10 years old (5 years if air scour has been used continuously), samples should be removed and subjected to sieve analyses to determine effective sizes and uniformity coefficients. Media sampling is readily accomplished by pushing a four foot length of 4" to 6" pipe into the media and removal of the media inside the pipe with a wet/dry shop vacuum. Four or five samples taken along a transect from corner-to-corner across the filter is usually sufficient.

Fouling can occur in the form of mudballs, visible debris clinging to media, media agglomeration (clumping) or media homogeneity (sand and anthracite caked together). If fouling is apparent, add a small amount of the media to two flasks, one containing a weak solution of acid and the other, caustic. (5% sulfuric acid, 5% sodium hydroxide). Swirl the flasks and look for separation of media from the debris. If dense mudballs are present, allow at least an hour soaking time and re-examine media. If little success is achieved with acid or caustic, weak solutions of hydrogen peroxide, sodium hypochlorite or soda ash may also be used.

After determining the most effective clearing agent it is possible to clean the media by taking the filter out of service, draining it down so that a small amount of water remains above the anthracite and adding the chemical directly to the filter. The soaking time is variable and will depend on a number of factors; 2 hours may be adequate, but large dense mudballs may take much longer to dissolve. Based on the extend of the fouling, two cleaning cycles may be necessary.

A typical filter wash procedure is outlined below. Site-specific applications may require modification of these guidelines.

1. Take filter out of service and drain down, leaving some water on top of anthracite.
2. Add sufficient sodium hydroxide to obtain a 2% solution in the water remaining in the filter, considering a void volume of approximately 40% (40% of the filter media volume is water).
3. Allow the filter to soak or preferably, air scour for at least two hours. A longer cleaning cycle will generally produce cleaner media.
4. Initiate a normal water backwash. Re-examine media and if necessary repeat the cleaning procedure with a 1% sodium hydroxide solution.
5. The final backwash should be monitored (pH, turbidity) to ensure that all residue from the cleaning process has been removed. It may be necessary to extend the duration of backwash before putting the filter back into service.

Sodium hydroxide is available in dry or liquid form. Using dry product may alleviate certain safety-related concerns associated with application in a aqueous form. Liquid sodium hydroxide (50%) is very slippery if spilled and may have a greater tendency than solid pellets to burn if it comes in contact with the skin. The solid form is shipped in 50 lb. bags, which are more easily handled than the 45 gallon drums or totes commonly used to transport liquid material. Solid sodium hydroxide pellets may take several minutes to dissolve, while liquid disperses throughout the filter more readily.

The effectiveness of the cleaning process is dramatically improved by air scour, which may help reduce soaking time and will loosen debris. A temporary air scour system may be set up by introducing air through a fabricated PVC pipe grid that rests on top of the backwash troughs and extends down into the media. If air scour is not available, an air or water probe can be used to stir up the media, paying particular attention to the walls and corners.

From experience at numerous facilities, a conditioning period may be required before achieving optimum filter performance. As is typical of new media, it may take several full cycles before obtaining very low finished water turbidities and/or particle counts. Low dosages of an organic polymer added to the backwash water may reduce this conditioning period.

There are numerous benefits of media cleaning that have been observed at various facilities. A significant reduction in filtered turbidity has been a very common result. Other benefits that have been noted include: a reduction in final effluent particle counts; an increase in filter run duration before reaching terminal headloss; and reduced backwash water consumption. Likely the most significant advantage is the reduction in material and labor costs when compared with media replacement. The cost of cleaning the media in a 16' x 16' filter using sodium hydroxide as described earlier is expected to be approximately $300 to $400, depending on the availability and freight charges.

Precautions:

- Media fouled with organic compounds may generate a substantial amount of foam, particularly during air scour. Caustic-laden foam is very slippery.
- It is important to follow appropriate safety precautions whenever aggressive chemicals are being used - Ensure that safety equipment is available.
- For facilities using GAC filter-absorbers instead of anthracite, check with your carbon supplier before proceeding.
- Depending on the cleaning agent, the backwash water may require additional treatment.
- Following addition of the cleaning agent, the water may be corrosive to filter materials (hardware, plumbing, concrete). If in doubt, consult your supplier before proceeding.
- When added to water, sodium hydroxide undergoes an exothermic reaction (generates heat). This is not anticipated to be of concern when used at concentrations described previously.

For more information on this procedure contact Brian Jobb, Ontario Section AWWA Treatment Committee Chair (at Sternson Ltd., 1-800-265-0712).