

Restoration of Leadwood Water Treatment Plant Operating Conditions

July 9, 2003

H₂O'C Engineers, John and Tom O'Connor, traveled to Leadwood on July 9, 2003 to meet with representatives of MDNR (Tim Robbs, Deana Cash) and USEPA Region VII (Robert Dunlevy) to review progress on the project.

Following the review, the engineers worked to evaluate and restore the initial Filtronics plant operating conditions in conjunction with Leadwood staff (Raymond Moore, Paul Lashley, Van Gilliam). Based on the operations manual and recommendations from Mike Hoyer and Bill Webb of Filtronics, the following steps were taken:

Backwash and Filter Flow Rates

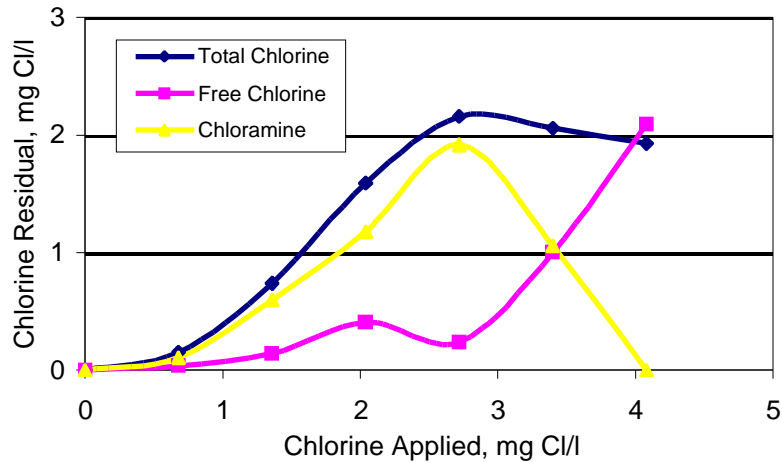
The backwash rate setting was confirmed at approximately 510 gpm for a total of 4.6 minutes duration. The temperature of Leadwood's ground water, which remains relatively constant throughout the year, was about 62° Fahrenheit. Flow rates for both Filter #1 and Filter #2 were each set at 100 gpm.

Chemical Feeds

At the time of system resetting, the rate of ferric chloride feed was yielding an iron concentration of 0.66 mg Fe/l. The rate of iron feed was subsequently increased to 1 mg Fe/l for the new operational protocol.

The appropriate chlorine dose was determined by conducting laboratory tests to establish a breakpoint curve for Leadwood's well water. The results confirmed Leadwood's current chlorination practice that resulted in the formation of a 1 mg Cl/l free chlorine residual in the filtered water.

Breakpoint Curve - Leadwood, MO 7/9/03



Based on the laboratory testing, the application of 4 mg Cl/l should satisfy the chlorine demand and result in a chlorine residual of approximately 2 mg Cl/l.

The breakpoint curve plot, shown above, indicates that the immediate chlorine demand was satisfied by the addition of 0.5 mg Cl/l. Approximately 2 mg Cl/l of chloramine and 0.5 mg Cl/l as free chlorine was then formed at an applied chlorine dose of 3 mg Cl/l. Breakpoint chlorination appeared complete at an applied chlorine dose of 4 mg Cl/l when the total chlorine residual consisted of a free chlorine residual.



Ferric Chloride and Sulfur Dioxide Feed Systems

At the time of resetting, sulfur dioxide was not being fed post-chlorination. However, to conform with the manufacturer's recommendation, the sulfur dioxide feed was reestablished to feed 0.25 mg SO₂/l.

Filter Media Restoration and Filter Break-In Period

Previously (May, 2003), Leadwood's *Electromedia I* filter media was core-sampled using a one-inch, thin-walled PVC pipe to obtain a vertical section through the filter depth. Based on their inspection of the filter media core sampling, Filtronics determined that the top layer remained intact, but the middle layers were gone. Based on their analysis and recommendation, that portion of missing filter media was purchased from Filtronics and shipped to Leadwood in June, 2003.

The restoration of the filter media took place on July 8, 2003 with the introduction of the 1,500 pounds (3 drums) of media into the manway atop Filter #2. This was followed by several backwashings to re-stratify the filter bed. No media addition was made to Filter #1 so that a comparison could be made between radionuclide removals achieved by a restored and a depleted filter.

A series of filter backwashes were performed throughout the break-in period for the restored filter in order to re-stratify and condition the media as well as to wash out filter media fines. Initially clear, the appearance of the backwash water became orange-brown after a minute of backwash and cleared readily thereafter. There was no visible evidence of media loss on July 9, although operators reported a slight loss upon initial backwashing a day earlier.

Overall, the operators appeared to be familiar with the Filtronics operations manual, knowledgeable of the required operational protocols, and eager to operate the plant so as to achieve the optimum removal of radionuclides.

With completion of the restoration of filter media and the resetting of chemical feed rates, the plant was considered ready for evaluation of its performance with respect to the removal of radionuclides.



Filtronic's Filter Units and Reaction Vessels