Evaluation of Filter Performance

Filter evaluation is the cornerstone of a Water System Assessment (WSA). The evaluation will start with a thorough review of the design criteria, historical operations, and performance.

Filter Coring
Analysis of filter coring data is one of the best ways to assess its performance. As part of this process, floc retention profiles are developed for each cored filter, before and after backwashing (see figure below). The level of media intermixing and the L/d ratio, which is commonly used in calculation of particulate removal efficiency (and can be a useful tool in understanding filter performance), is obtained through sieve analysis. Additionally, we have the capacity to measure biological activity in the filter bed and address strategies to optimize organic matter removal.

Initial Turbidity and Particle Breakthrough Monitoring
Turbidity and/or particle breakthrough monitoring data are typically assessed. The data obtained from monitoring the trends of these two parameters can reveal poor initial filter ripening, poor backwash efficiency, and inadequacy of media design.

Managed Filtration
"Managed filtration" describes our philosophy of total filter management for optimal performance. Specifically, it refers to the fact that a filter performs best when conditions are both optimal and constant. In many instances, any change in flow rate for a filter represents a departure from constant, steady-state conditions and can produce a particulate/turbidity spike. Managed filtration deals with methods of eliminating particles/turbidity spikes and can include:

- Increasing the size of the filter-to-waste piping to allow operation at the capacity of an online filter.
- Installation of automated controls and a filter-to-waste modulating valve.
- The addition of a flow control valve to the filter waste washwater.
- The addition of filter control automation to allow for a smooth transition when a filter is taken out of service for backwashing.

Filter Waste Washwater Turbidity Profile
Another tool that is used when assessing filter performance is the filter waste washwater (FWW) turbidity profile. Using this technique, filter backwashing will be optimized in order to maximize filter performance and minimize filter-to-waste volumes. It is commonly observed that filters are often backwashed for too long, resulting in longer maturation times. This translates into wasted water both during backwash and maturation.
An example of the impacts of filter backwash optimization is provided in the figure to the left.

**Gravel Profiles**

If gravel is present in the underdrain system, profiles are developed to determine if there are any major disturbances in the gravel bed. These disturbances are typically caused by errors in the design phase, construction phase, or during operation. Using the design drawings and elevations, an accurate, noninterruptive assessment of the gravel depth at each location can be developed which will indicate the presence or absence of disruptions, as shown in the figure below. This step can result in the identification of physical problems in the underdrain or as a result of improper backwashing procedures.

*Impact of backwash optimization on filter waste washwater turbidity profile.*

*Representative data obtained from gravel bed profiling.*