

Is Your Water Treatment Plant Optimized?

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If someone asked, “*Is your plant’s water treatment process performing at an optimized level?*”, you probably would quickly recall the plant effluent turbidity results and with no hesitation respond, “*yes!*”. Well, although most plants in Alabama that process surface water into drinking water meet EPA/State standards, most may not have an optimized treatment system.

“*What constitutes an optimized treatment system?*”, you might ask. A simple example may help answer your question.

Two men living next door to each other and who work at the same location several miles away, each drive his car to and from work daily. Both have the same make and model car but maintain them differently, one carefully pays attention to maintenance and regularly tunes the car’s engine and keeps to the manufacture’s recommended servicing schedule. The other only occasionally changes his car’s oil and seldom performs a tune-up. Varying terrain and changing environmental conditions will probably not affect arrival of the car that is properly, maintained with its engine periodically tuned. On the other hand, the car, which is not maintained and serviced properly with its engine not properly tuned, will most likely encounter difficulty during abnormal environmental conditions and invariably infrequently arrive late because of automobile problems.

Similarly, some plants meeting quality standards when processing raw water with low turbidity, will usually have difficulty achieving the same filtered water quality when raw water quality becomes poor, such as following heavy rainfall. Just like the well tuned car, a plant staffed by knowledgeable operators who frequently modify the chemical dosage for best coagulation, commensurate with changes in raw water quality and who insure all mechanical processes are functioning properly, feeders are calibrated, and adequate chemical is on hand, will continue to produce water of the highest quality, even during extreme changes in raw water quality.

“*Well*”, you say, “*this gives me a general idea of what is meant by optimization, but how can I determine if my specific plant is optimized?*”.

Alabama is one of four states in the nation who are involved in an Area Wide Optimization Program (AWOP). The purpose of this program is to achieve, among systems in a selected pilot area, optimized surface water treatment facilities in order to reduce the threat of microbiological contamination of drinking water provided to the consumer. It has been demonstrated that reducing the filtered water turbidity from .3 ntu. to .1 ntu., or less, provides an additional approximate 1 log reduction in particles, or a reduction of 10 particles per 100 particles. This becomes extremely important when you consider that some of these particles could be cryptosporidium oocysts. This indicates one can substantially reduce the risk of drinking water containing cryptosporidia by making only a slight improvement in filtered water turbidity, possible without major physical improvements/additions!

Over the last two to three years all water plant operators in Alabama have been informed they should maintain filtered water turbidity of no greater than .2 ntu. and only return washed filters to service when the “filter to waste” turbidity is substantially below .2 ntu. With few exceptions, water plants in Alabama have been conforming to this practice.

“Ok, but what about optimization?”.

Optimization, which is a continuing process, can be considered achieved when the following goals are being met at a water treatment facility.

Sedimentation

- Settled water turbidity is less than 1.0 ntu. 95 percent of the time when daily average raw water turbidity is less than or equal to 10.0 ntu. during the same period
- Settled water turbidity is less than 2.0 ntu. 95 percent of the time when daily average raw water turbidity is greater than 10.0 ntu. during the same period

Filtration

- Filtered water turbidity is less than 0.1 ntu. 95 percent of the time based on the maximum values recorded during 2-hour time increments
- Maximum turbidity of any filtered water measurement is never greater than 0.2 ntu.

Monitoring Requirements

- Daily raw water turbidity is determined at 2 hour increments
- Settled water turbidity is determined at 2 hour increments from each sedimentation basin
- Filtered water turbidity is determined at 2 hour increments from each filter
- One filter backwash turbidity profile is performed each month for each filter

Recommended Instrumentation:

- Each filter effluent is equipped such that turbidity is continuously monitored and recorded
- The pH of raw and filtered water is continuously monitored and recorded
- Plant is equipped with an adequately sized PC for recording and electronically transmitting raw, settled and filtered water data, and for generating turbidity vs. time graphs

As you can see, to determine if your plant is continuously optimized with respect to turbidity removal, requires some data entry with statistical analysis of this data. Don't get concerned! This part is fairly simple. First, since all water plants in Alabama monitor and

record turbidity data, it's only a matter of transferring the data from monthly reports to a computer where a software program does the rest.

Ok, you don't have the software or maybe even the personal computer (PC) on which to run the software! For those plants that have access to a PC, the software with instructions can be provided directly to you at no cost by mail, or, if the plant personnel have the capability, electronically (e-mail). For those personnel without access to a PC and who will not be able to secure one (generally considered a standard piece of equipment today at a water plant) the ADEM district engineer will work with plant personnel individually.

“Ok, I do all this and find out my plant is not optimized according to the optimization criteria! How can I get my plant optimized?”

First, you need to perform what is considered an evaluation of the mechanical and operational aspects of the plant to identify all constraints to achieving better treatment. These could be operational procedures, feeder problems, monitoring sites, parameters monitored, etc.. The district engineer will be glad to assist you in this effort as needed. By providing us with a copy of the computerized statistical analysis of results of the plant's prior 12 month's turbidity data, we can assist plant personnel in determining the necessary actions/steps to bring about improved treatment and result in optimized treatment. Water system personnel will need to continually input water quality data and use the software to analyze and visually display the results. These results – both positive and negative – can help drive appropriate chemical and process changes to achieve an onsite, ongoing water plant optimization program.

“Are there other advantages to water systems getting involved in water treatment plant optimization?”

In addition to producing the best quality drinking water for your customers, operators and water system management will be in an enviable position of being able to successfully meet the lower turbidity standard. The system will also have the opportunity to include in/with the required yearly Consumer Confidence Report a positive statement that the water system has “gone the extra mile” to achieve and maintain an optimized water treatment process.