

Every Minute.
Every Day.

WE ARE HERE.

Coagulation Optimization

BENEFITS OF REAL-TIME MONITORING

- ✓ Cost savings from optimized dose control
- ✓ Lower potential for DBP formation
- ✓ Improved water quality for upstream treatment

Seasonal variations, heavy rainfall or accidental contamination events can change the raw water quality in ways that are hard to predict (Figure 1). Online sensors that continuously monitor parameters such as UV254 and turbidity are the plant operators' best tools to determine the required coagulant dose of the plant based on the changes in raw water quality.

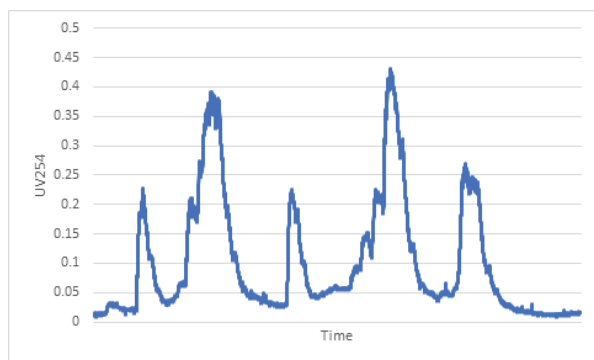


Figure 1: UV254 absorbance in raw water sources can vary quite significantly over the course of a few days.

The benefits of optimizing the coagulation/flocculation process is multi-faceted:

- 1) coagulant chemical costs are reduced,
- 2) sludge quality is improved while costs associated with sludge disposal are reduced
- 3) filter run times are extended (run-time between backwashes is longer). In addition, optimized removal of organics along with turbidity decreases the risk of exceeding disinfection by-product (DBP) limits in the treated water.

Many water quality parameters provide information relevant to coagulation. These include pH, temperature, conductivity, turbidity, suspended solids, UV absorbance, colour, TOC, alkalinity, total-P, surface charge/zeta potential, and ortho-P concentration. However, the success criteria are usually based on removal of turbidity as treatment plants are required by regulations to reduce the filtered water turbidity to below 0.3 NTU. Nonetheless, UV absorbance based control is more beneficial when the coagulation process itself is controlled by natural organic matter (NOM) concentration rather than

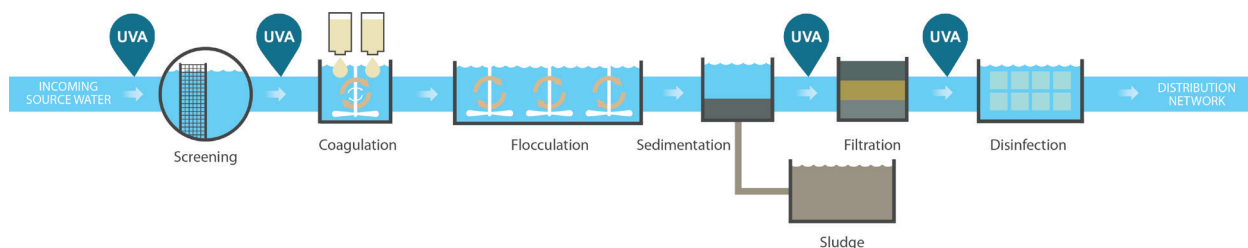


Figure 2: Locations of interest for absorbance monitoring in a drinking water treatment plant.

turbidity. This typically happens when specific ultraviolet absorbance (SUVA) is greater than 2, and hence applies to the majority of raw water sources. UV absorbance is of interest both before and after coagulation (Figure 2) as a water quality parameter, and can be used to control and optimize the coagulation process by two mechanisms:

- 1) Feed-forward control based on raw water quality (at source water intake or just before coagulation)
- 2) Feedback control based on treated water quality (after sedimentation, or alternatively after filtration or before disinfection)

It is important to note that there is significant time lag between dosing and the separation processes, sedimentation and filtration. This time lag can be in the order of hours for sedimentation. Therefore, when possible, the feed-forward control option should be preferred. In a feed-forward control system, the coagulant

dose calculation is not affected by time lag, fluctuations in the flocculation process or coagulant mixing efficiency factors. The raw water quality parameters are the only variables that affect the coagulant dose calculation, and hence the response to changes in these parameters is immediate. This also results in more stable coagulant dosing.

In addition to monitoring absorbance at 254 nm, spectral information on absorbance values measured at several wavelengths can be used to further support coagulation optimization. The benefits of spectral absorbance monitoring stem from the fact that DBP formation depends on the reactivity of the organics present as well as the total amount of organic matter present. Using proprietary algorithms, Real Tech can characterize the NOM and provide information for a comprehensive control strategy to optimize coagulant dosing while minimizing the DBP formation potential.



Real Tech's UV254 Online Analyzer and Spectrum Series Sensors are ideal solutions for coagulation optimization applications.