Floc size and count app

Turbidity measurements provide the primary source of performance monitoring at many water treatment plants. Turbidity provides an excellent way to measure overall plant performance, but it does not provide insight into WHY the water treatment plants are performing well or poorly. We are learning more about the interaction between collision potential, energy dissipation rate, floc strength, and floc size. It is becoming clear that a low cost meter capable of measuring floc size distribution could provide much needed insight and diagnostic power to improve the flocculation, sedimentation, and filtration processes.

Digital cameras are capable of counting and sizing clay particles and flocs with the right software. Designing hardware to collect the images is relatively easy. The more challenging task is to create an app that is user-friendly and that provides real time useful interpretation of particle size distributions. The goal is to develop an app that is capable of being deployed in the AguaClara project lab and in water treatment plants in Honduras. It is possible that this tool will be used routinely for floc size measurements in the flocculator to guide coagulant dosages.

The app will need a well designed architecture for acquiring and processing images. The image processing routines will need to be carefully designed to handle changing lighting conditions and to provide feedback to the user to optimize image analysis.

The app is written using LabVIEW for easy deployment on a laptop. Licensing of the National Instruments vision acquisition software and vision development module costs approximately $430 per installation and National Instruments will subsidize that to help us develop a market for this new tool.

Features of the app will include:

- event loop to handle user actions
- configuration dialog box
- configuration files to store user settings (pixel size, image processing inputs)
- visual feedback on the step by step image processing with advice on how to improve the identification of in focus flocs.
- real time particle size distribution analysis with options for continuous sampling or for grabbing a set number of images for analysis
- data storage format for processed image data to allow rapid viewing of trends over time (perhaps a sorted array of floc areas)
- Possible integration with other data streams including turbidity, plant flow rate, coagulant dose

The current design of the image acquisition hardware requires that a sample stream flow through a cell. This flow cell will likely be the best option for deployment in water treatment plants although options for building a submersible unit could also be explored.

A draft version of this app was created during the spring of 2016. The goal for this semester is to add image acquisition, demonstrate the app using the imaging hardware, and then test the app with one of the AguaClara research teams. As testing with real users begins additional features can be added based on user needs.

Resources

Sun, Siwei; Weber-Shirk, Monroe; Lion, Leonard W. Characterization of Flocs and Floc Size Distributions Using Image Analysis. Environmental Engineering Science, Volume: 33 Issue 1: January 26. (201tion. Reducing the environmental impact requires reducing the emission of greenhouse gasses (dissolved methane in the effluent), biodegradable organics, and nitrogen and phosphorus. 6).