# Baywork Innovation & Technology Forum

# SFPUC Sunol Valley Water Treatment Plant Process Control Enhancements

## Chloramination: Maintaining the Proper Ratio of Ammonia to Chlorine

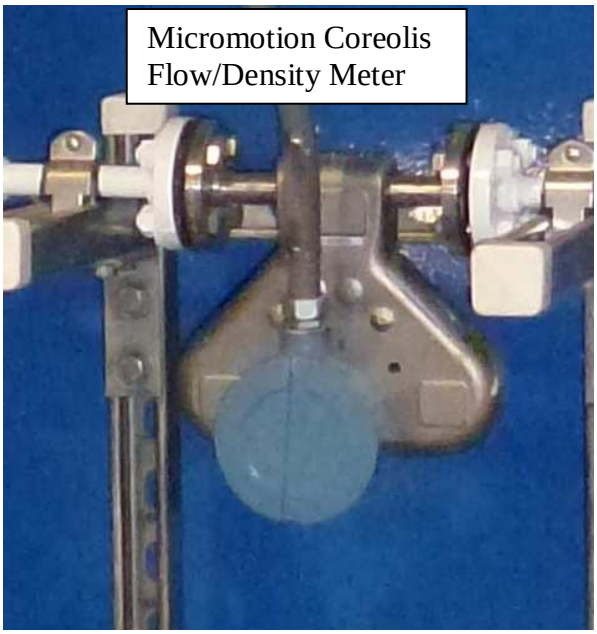

Sunol Valley Water Treatment Plant is a critical piece of the Regional Water delivery system. Water is delivered to supplement demand as Hetch Hetchy flows are adjusted and provide a sustainable supply in the event of Hetch Hetchy source issues. SVWTP has the ability to treat from 2 local sources (Calaveras Reservoir and San Antonio Reservoir). Hetch Hetchy water can also be pumped to the plant should the need arise.
The plant has recently been upgraded to provide a sustainable capacity of 160MGD, a 17.5 million gallon treated water reservoir, and a process change to disinfection from Hypochlorite to Chloramines.

Chloramines are produced by adding Ammonia to Chlorinated water. For the Chloramines to be effective and stable in the distribution system, the ratio of Chlorine to Ammonia must be accurately maintained. ( 4.7:1)
Each of the chemicals used in this process are hazardous and toxic at full strength. Training is required for the safe and proper use of these products.

Hypochlorite is the liquid source of chlorine in the process. Chlorine is purchased at about 12.5% but will decay in storage to a lower strength. A stable chlorine dose is maintained by analyzing the chlorine residual in water and adjusting the pump rate to compensate for changes. Hypochlorite flow is monitored by a Micromotion flow/density meter.

Ammonia:
The physical characteristics of ammonia make it more volatile and hazardous to work with. It is lighter than air when in a vapor and lighter than water in a liquid. It loses potency while in storage. Potency can be measured, as there is a linear relationship between the potency and specific gravity. Sampling of the tank is hazardous and may not result in a representative sample due to stratification in the tank. Ammonia is purchased at a 19% solution. Measuring flow rate, alone, does not provide enough information to dose to a specific ratio.
Maintaining the proper ratio of chlorine to ammonia by volumetric, strength and residual calculations was shown to be man-power intensive, hazardous, and inaccurate. The importance of accurate dosing is critical to disinfection compliance.

The Water Supply and Treatment Division has been using Micromotion flow/density meters for years and find them to be accurate and reliable. Density has been displayed for most chemicals but was not used for control. Ammonia's importance in the creation of chloramines and the difficulty with dosing instigated some changes.




Identification of an issue is often the biggest challenge to a solution. Operations Staff are highly trained and responsible for the proper function, monitoring and control of the water treatment plant. Most often, Operations identifies the problem and initiates a work order to the appropriate support group for repair. The SCADA system is their primary interface with the plant and regional water sites. When processes aren't behaving, the ITS SCADA Group is usually one of the first calls. Part of the SCADA team is physically located on site to maintain the regional infrastructure and the plant PLC's. The open access and communications between the two groups often leads to the proper identification of issues and a practical resolution to a problem. The Plant Chief Engineer was asking for a reliable automated ammonia control that would permit staff to focus their attention on other operational needs.

When dosing is an issue, metering is one of the first things to look at. Trending the density of the ammonia showed the decay in potency. Investigation of the chemical composition of the storage tank revealed stratification that would provide inconsistent dosing. Once the variables of the problem were understood, a solution could be developed.

The solution to this issue required accurately distilling a mathematical formula to accurately identify the concentration of the ammonia being used. The formula is calculated real time in the PLC to adjust for changing chemical composition without manual intervention.

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' Description: Calculated Percent of Solution Based on Mass Flow Meter FE-8495
'-------------------------------------

NH3_Percent_Solution_FE_8495 :=(((-265.027 * (NH3_Density_FE_8495 - 0.9589) + 8.0) - (-
319.672 * (NH3_Density_FE_8495 - 0.9589) + 11.0)) / 60.0 * (NH3_Temperature_FE_8495 - 40.0)
+ (-319.672 * (NH3_Density_FE_8495 - 0.9589) + 11.0))*0.01;
```

Summary:

This is an example of applying technology to solve a problem. It was a team effort, with a resolution that required the interest and fortitude of several disciplines and the support of Operations. The SCADA screens were updated to provide Operations with a new interface. Operators were then trained on the new functionality.

This presentation was prepared following a conversation with participants in the process. I'd like to thank Travis Hoff (IS Senior Engineer) for his contributions to the project and this program.

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Thank you……