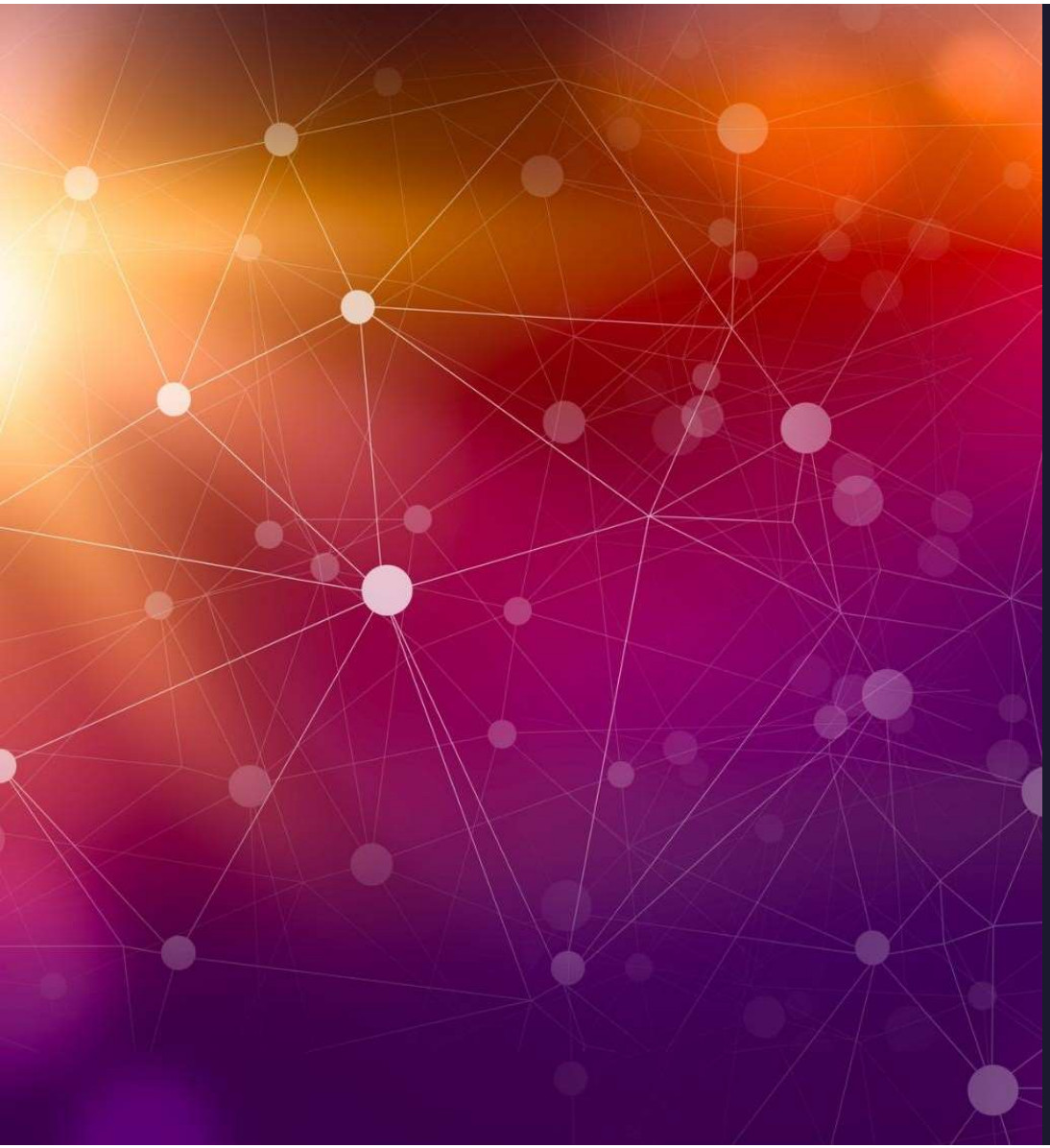


Process Control Monitoring

Why monitor?

Double check what we think we know

Optimize treated water quality with the hand we are dealt

Establishing staff and consumer confidence

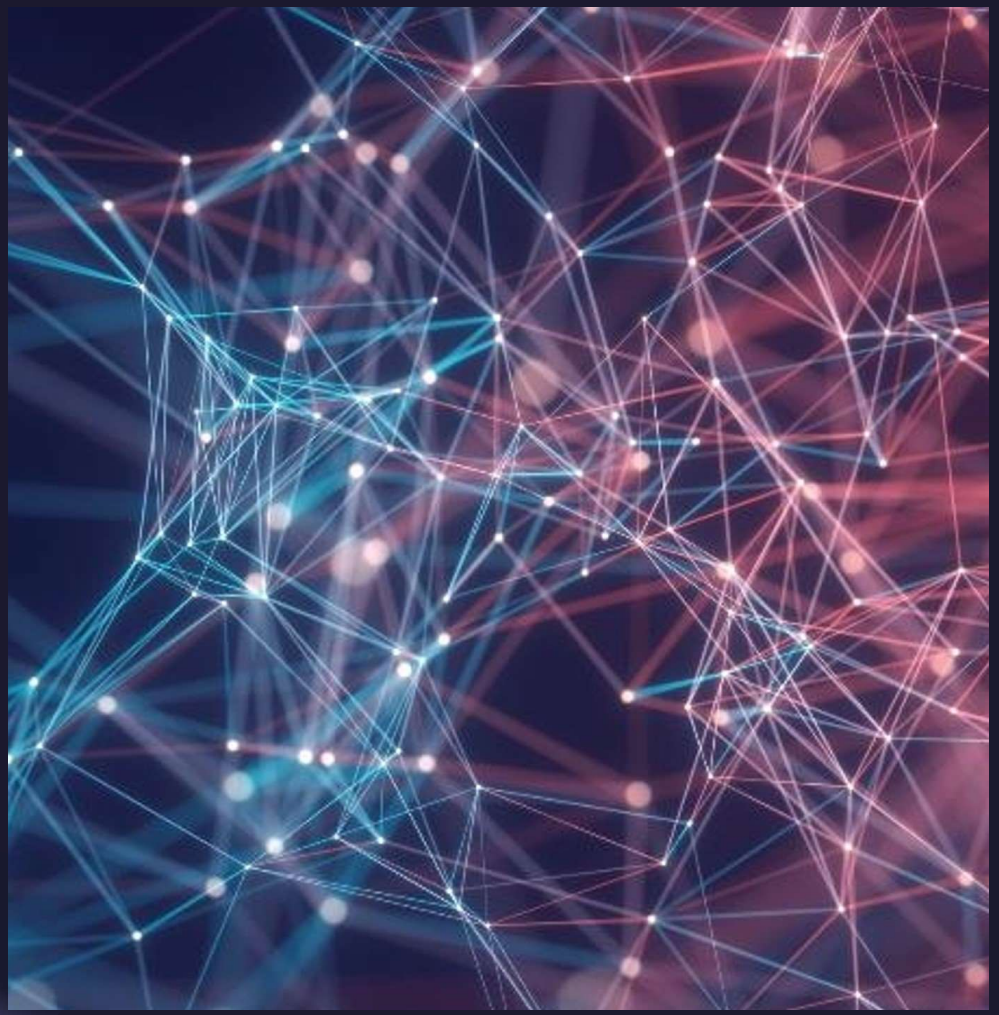
Comply with regulatory requirements

Double checking what we think we know!

Testing is only as good as the time you test!

- **Illinois Drinking Water Regulations are based upon multiple barriers of protection**
  - **Monitoring is not a barrier in protection!**
- **Monitoring is done to affirm that protective barriers are in place**
  - **E.G., chlorine dosages are calculated, metered, and weighed**
    - **We know what the resultant concentration should be**
    - **We double check by taking a colorometric reading downstream of the injection point**

We try to operate the plants where we are employed the best we can!



Taking samples outside SDWA requirements can tell us how we are doing

- **Illinois Drinking Water Regulations are not always the same as customer approval of aesthetically pleasing water**
  - **E.G., by monitoring for hardness, softening efficiency can potentially be optimized to make customers (tax payers) more satisfied with the product they are receiving. Generally, softening groundwater is not required by IPCB regulation hence the IPCB does not require hardness measurement.**
- **Taking samples that do not comply with standard methods cannot be used in compliance determinations**
  - **E.G., by sampling for lead or copper using two bottles instead of one (or forgoing a stagnation period), we can get an idea how our corrosion control is working or if we might expect to have an action level exceedence**

Sampling to instill confidence

The more monitoring we do, the easier it is to answer questions!

- E.G., We paid $17 million for this water plant, what are we getting for our investment?
  - In addition to meeting all the MCLs, during every shift we monitor our water for turbidity, iron, manganese, hardness and disinfectant leaving the plant. We can show you that we are distributing a product that is clear, soft and free of metals that can damage your cloths and plumbing fixtures…..

Monitoring To Comply with the Regulations

35 IL Adm Code, Part 604

- Contaminant Removal
  - Source water monitoring
  - Treatment efficacy monitoring
- Distribution System Monitoring

35 IL Adm Code, Part 604 / Water Plant

- **Section 604.130 Operational Testing Equipment**

  d) Testing equipment must be available to plants with specific treatment processes, which include:

  1) fluoride adjustment - test equipment for measuring levels of fluoride ion;
  2) iron removal - test equipment for measuring ferrous and total iron levels;
  3) cation exchange softening - equipment for measuring hardness, and chloride concentration;
  4) coagulation and filtration - jar testing equipment for determining chemical dosages and equipment for measuring pH, hardness, total and phenolphthalein ("P") alkalinity, nitrate, and nitrite;
  5) lime softening - equipment for measuring pH, hardness, and total and phenolphthalein alkalinity forms;
  6) reverse osmosis - equipment for measuring total dissolved solids, chlorides and monitoring sulfates;
  7) phosphate addition - equipment for measuring both orthophosphates and total phosphates;
  8) anion exchange - equipment for continuous monitoring of nitrate concentration must be provided for treated water and finished water after blending;
  9) stabilization - equipment for determining the effectiveness of stabilization treatment for parameters that may include temperature, pH, alkalinity, total dissolved solids, chloride, sulfate, calcium hardness and total hardness, expressed as calcium carbonate;
  10) chloramination - equipment to measure free chlorine residual, total chlorine residual, monochloramine residual, and free ammonia-N;
  11) coagulation using coagulants that contain aluminum – in addition to the equipment described in subsection (d)(4), equipment to measure total and insoluble aluminum;
  12) manganese removal - equipment for measuring the concentration of total manganese and soluble manganese; and
  13) chlorine dioxide treatment - equipment for measuring chlorine dioxide residual and chlorite ion concentration.

Common Treatment Plant Monitoring Locations That Can Stand Some Love

- **Source Water Quality**
  - **IOC monitoring that looks at Free Ammonia and other impactful chemicals (Iron/Manganese, TOC)**

- **Strength of Stored Sodium Hypochlorite**
  - **Sodium hypochlorite (12.5%) will reach its halflife in approximately 180 days when stored at a temperature of 77 °F. At 95 °F , the half-life is 48 days. The presence of metal contaminants or impurities in the manufactured product or storage tank will increase the degradation rate.**

- **How good is that DI water we just purchased?**
  - **Sometimes it pays to purchase laboratory grade DI, off the shelf may have "stuff" that will affect your testing. If you are seeing some weird test results, it might no hurt to invest…**

35 IL Adm Code, Part 604 / Distribution System

- **Section 604.725 Residual Chlorine**

a) A minimum free chlorine residual of 0.5 mg/L or a minimum combined chlorine residual of 1.0 mg/L must be maintained in all active parts of the distribution system at all times.

b) Community water supplies must monitor chlorine residual to determine the amount and type of residuals existing at different points in the distribution system.

c) Community water supplies must not mix water sources with free chlorine and combined chlorine residual.

35 IL Adm Code, Part 604 / Distribution System

- **Section 604.140 Nitrification Action Plan**
  Any community water supply distributing water without a free chlorine residual must create a Nitrification Action Plan (NAP). The NAP must:

  a) contain a plan for monitoring **total ammonia-N, free ammonia-N, nitrite-N, nitrate-N, monochloramine residual, dichloramine residual, and total chlorine residual;**

  b) contain system specific levels of the chemicals in subsection (a) when action must be taken;

  c) contain specific corrective actions to be taken if the levels in subsection (b) are exceeded; and

  d) be maintained on site and made available to the Agency, upon request.

Monitoring in distribution to answer questions

- **Consider having Biological Activity Reaction Test (BART) testing vials on the shelf in case you see unexplained chlorine demand (e.g., sulfate reducing, iron related, slime or nitrifying bacteria)**

- **Use NAP monitoring to drive actions taken to reduce water age and discourage nitrification**

- **Consider using other "non-standard" methods to look for answers to customer complaints**
  - **Red water, taste, and odor can be precursors to more significant problems**

Final tips & takeaways

Knowledge is power

- The more you and other water officials know about your water quality, the more confidence you will have dealing with customers (complaints) and politicians

Don’t be afraid to get input from industry experts on how to optimize your treatment process

- This always requires collection of additional monitoring data

Train operation staff on the importance of data collection

- Not just a function of complying with regulations, it is how we know if we are doing the best we can to effectively and efficiently treat our potable water
- Get recommendations from staff on additional tests that they feel would be beneficial

Don’t discount customer complaints

- Sometimes these are the precursory to more serious problems like nitrification, corrosion or pathogen presence
- Collect monitoring data to evaluate the complaint as needed, don’t be dismissive without data backup

Thank you

Dave McMillan

217-370-6485

mcmillan@ilrwa.org