Case Study
Data Analytics to Improve Quality of Water in Aging Infrastructure

The "Aging water" problem, also known as water age or hydraulic residence time, refers to a critical issue in water distribution systems. It represents the time it takes for water to travel from its source, such as a treatment plant, a reservoir or a metered supply connection, to the delivery destination or a specific location within the distribution network. Understanding and managing water age is crucial for ensuring the quality and safety of drinking water supply. Aging water is also an unintended consequence of any successful water conservation drive, where the water system, which is designed for normal water usage, is confronted with drastically less flow of water longer residual time in the system, and that would cause aging water and water quality concerns.

The age of water in a distribution system can significantly influence water quality. Here's how water age can impact the quality of the water supplied to consumers:

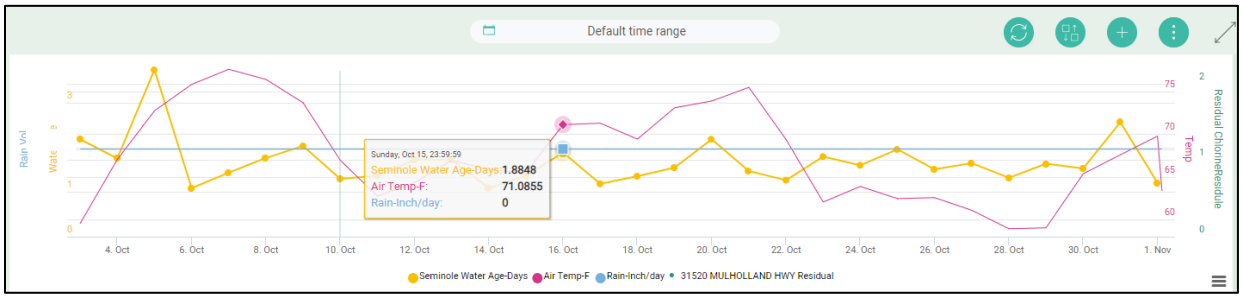
1. **Disinfection Residuals**: As water sits in the distribution system for an extended period, the concentration of disinfection residuals (e.g., chlorine or chloramine) can decrease. Disinfection residuals are crucial for preventing microbial growth and ensuring water remains safe to drink. With aging water, lower disinfectant levels can allow for the regrowth of bacteria, potentially leading to waterborne diseases.
2. **Contaminant Accumulation**: Over time, water can pick up contaminants from the materials it comes into contact with, such as pipes and storage tanks. This is particularly concerning if there are lead, copper, or other metals in the distribution system. The longer water remains in contact with these materials, the higher the risk of elevated metal concentrations, which can pose health hazards.
3. **Microbial Growth**: Stagnation and prolonged water residence times can create conditions favorable for microbial growth. Bacteria can multiply in stagnant zones, contributing to biofilm formation in pipes. This biofilm can release bacteria into the water, degrading water quality and causing taste and odor issues.
4. **Water Temperature**: Water age can also impact its temperature. Warmer water encourages the growth of microorganisms and can promote chemical reactions that affect water quality. For example, warm water can accelerate the release of contaminants from pipe materials.
5. **Taste and Odor**: Extended water age can result in changes in the taste and odor of the water. These changes are often due to the presence of disinfection byproducts, the breakdown of organic matter, or the growth of algae and other microorganisms in the distribution system.
6. **Water Quality Degradation**: Water that has spent too much time in the distribution system may not meet water quality standards. This can lead to regulatory compliance issues and, in extreme cases, water quality violations.

To maintain water quality and safety, water utilities need to manage and control water age within their distribution systems and receive reliable indications whenever there is a risk of unsafe water quality.

IOSight, in collaboration with Las Virgenes Municipal Water District (LVMWD), has co-created an analytical Water- Age tool designed for to identify water age within remote tanks and pipelines in the district. This Water- Age tool serves as an add-on module integrated into the iGreen platform, which LVMWD uses since 2020 for data management and analytics. The iGreen platform collects, cleanses, and processes data from a variety of sources, including meters, environmental systems, pumps, laboratories, and SCADA. It provides valuable insights with its intelligent dashboards and reports.

With the water age add-on, relevant data such as supply, demand, temperature, rain, water quality and tanks and pipes information are analyzed. As a result, LVMWD get real-time information about water age in remote tanks and pipes in a timely manner, as well as chlorine levels and water quality. This information is invaluable for making decisions and optimizing water distribution and water quality. By tracking the water age, LVMWD can identify areas where water is stagnant and where it may be flowing too quickly, allowing them to prioritize areas for water conservation and restoration. LVMWD can also use the data to identify potential sources of contamination and plan for preventive measures.

Additionally, LVMWD can determine the correlation between environmental conditions and water age and prepare an intelligent water supply plan based on this information.



Water Age Status