

AI-enabled control use cases identified in cooperation with Ai-Ops for the water and wastewater industry:

Waste Water Treatment Optimization:

- Coagulant Feed Optimization
- Polymer Feed Optimization
- Deep Well Injection Pump Control
- Disinfection Systems (i.e., Dosing Pumps)
- Aeration Basin Oxygen and Blower Control
- OCS (order control scrubber)

Collections:

- Lift Station Network Optimization

Distribution:

- Distribution System Flow and Pressure Monitoring
- Distribution-free chlorination optimization
- Distribution system flushing optimization

Water Treatment Optimization:

- Well Operations & Monitoring
- Pretreatment (sand filters, cartridge filters)
- Chemical dosing system optimization
- Membrane Life Extension & CIP optimization
- Nano & RO membrane performance improvement
- High-pressure pumping system optimization
- Post-treatment
- Blending basin optimization
- Lime dosing optimization
- Dechlorination optimization

Desirable AI model reward functions:

Reward functions should be based on multi-objective models that target the following:

- Process variable set point... plus:
 - Water Quality
 - Energy Consumption
 - Chemical Consumption
 - Regulatory Compliance
 - Personnel and facility safety

Specific AI-enabled control measures to achieve the reward function:

- Valve Control
- Chemical dosing control
- Pump Speed control
- Etc.

The Ai optimization pilot program should have a larger overarching strategy that aligns with utility objectives:

- A view of long-term plant optimization goals
- Identification of associated risks
- Definition of implementation via CIP or manageable phases
- An Ai control strategy that is scalable and replicable
- Incorporate operations, maintenance, control and engineering team training
- Foster reliance and trust in Ai models among operations
- Mechanism for operations to accept or reject Ai model control
- Migration and integration with other applications, i.e.: City Works, or other Asset Management and work order systems
- Predictive maintenance initiative alignment: i.e.:
 - Trigger workorders as a result of system alarms
 - Alert operations that membrane CIP or pH probe calibration is required
- Be based on standards and tools that can be utilized by multiple service providers
- Models created and deployed should be owned by the utility
- Access to standardized tools to support autonomy and internal support if in the best interest of a utility