Asia Water Forum 2022
8–11 August 2022 • Online

Focus Area: 2 - Universal water supply and sanitation services

Session Title: Wastewater Treatment and Potable Reuse Optimisation with an Advanced Data Modelling

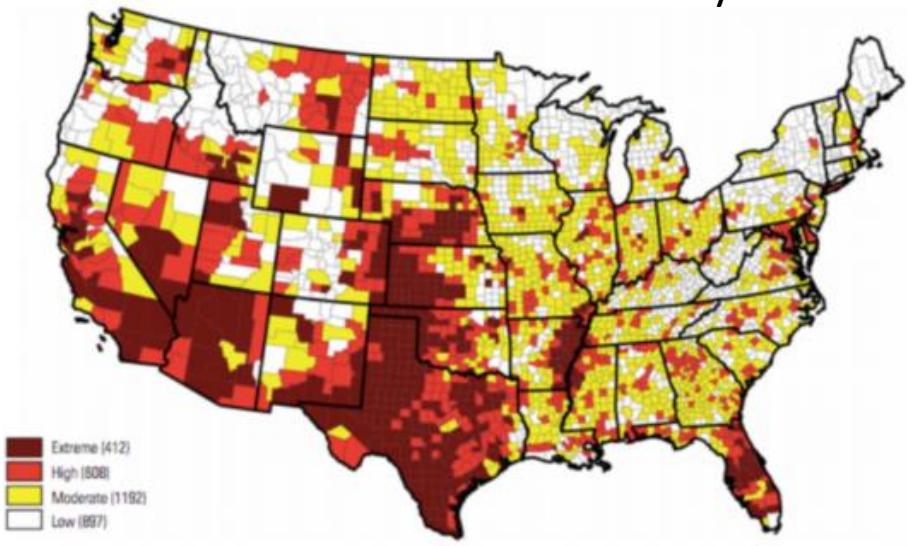
Schedule: [10 August 2022 | 9:00 a.m. - 10:30 a.m.]

Water Stress caused by Population Growth and Warming

10. Orlando
9. Atlanta
8. Tucson
7. Las Vegas
6. Fort Worth
5. San Francisco
4. San Antonio
3. Phoenix
2. Houston
1. Los Angeles

Courtesy to The University of Arizona

Water Supply Sustainability Index in 2050
Roy *et al*. 2012

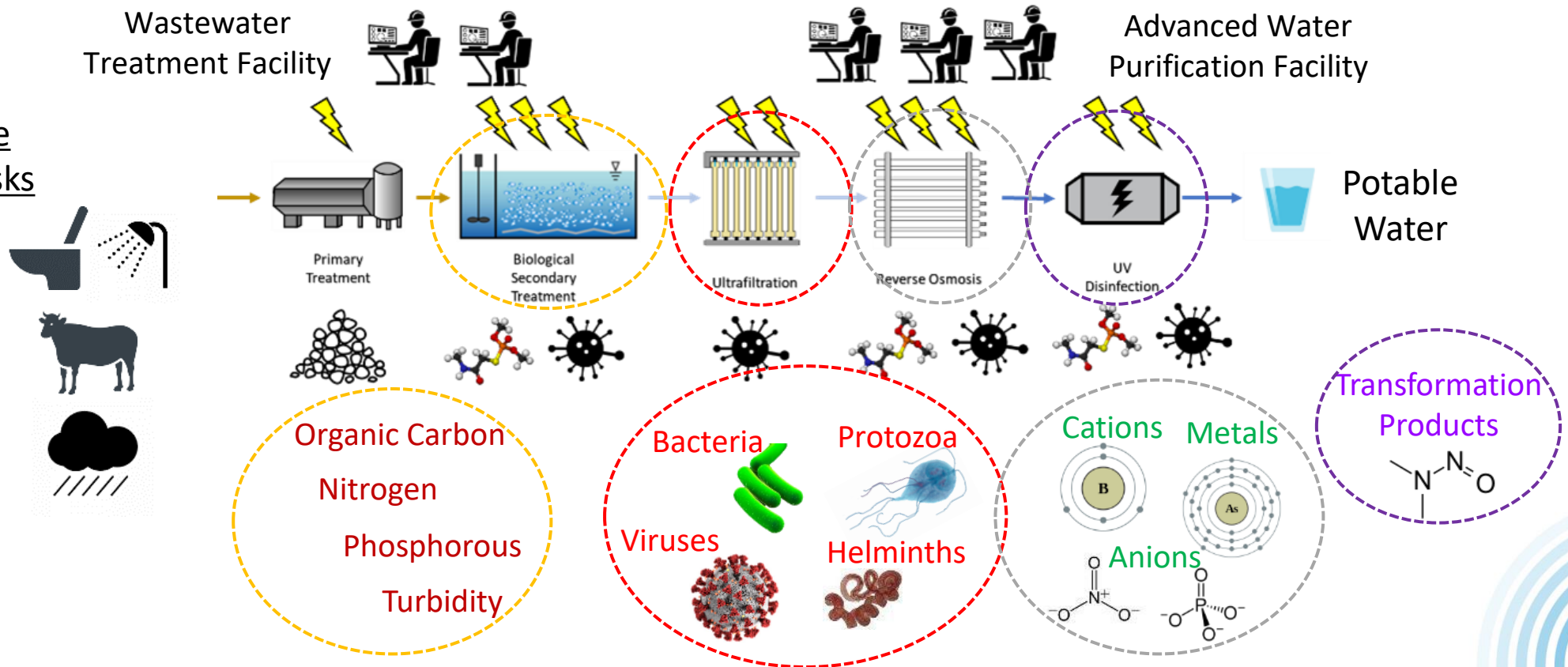


- Climate change is expected to increase the likelihood of drought events.
- Decreased precipitation, increased evapotranspiration and increased demand related to population and economic growth.

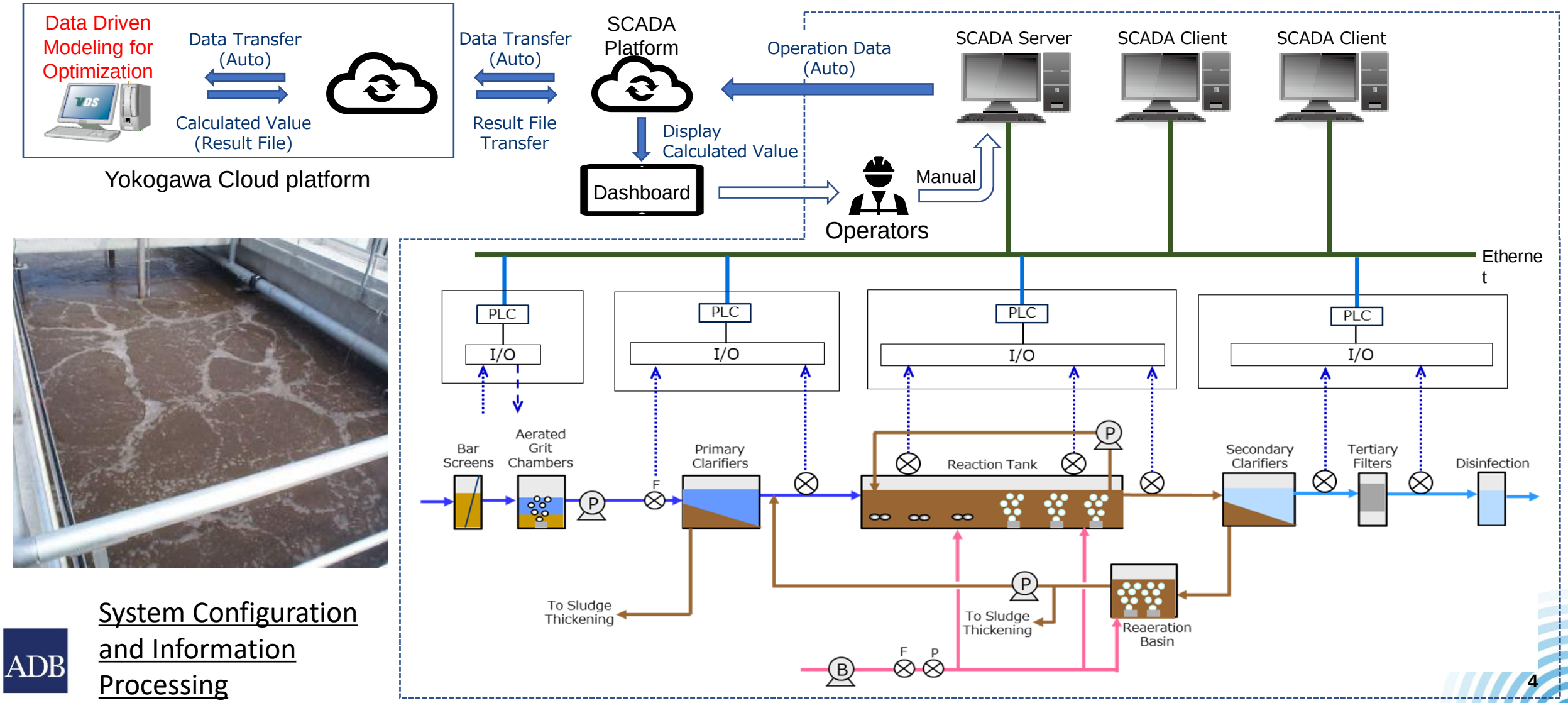
Reuse Wastewater as Potable Water

- Wastewater reclamation for potable reuse requires a large amount of energy to meet the water quality and sanitisation criteria.
- Our technology reduces and optimises the excess capacity by digitalisation of process management, visualisation of safe water quality and risk assessment for membrane facilities.

<u>Direct Potable Reuse Facilities and the Risks</u>



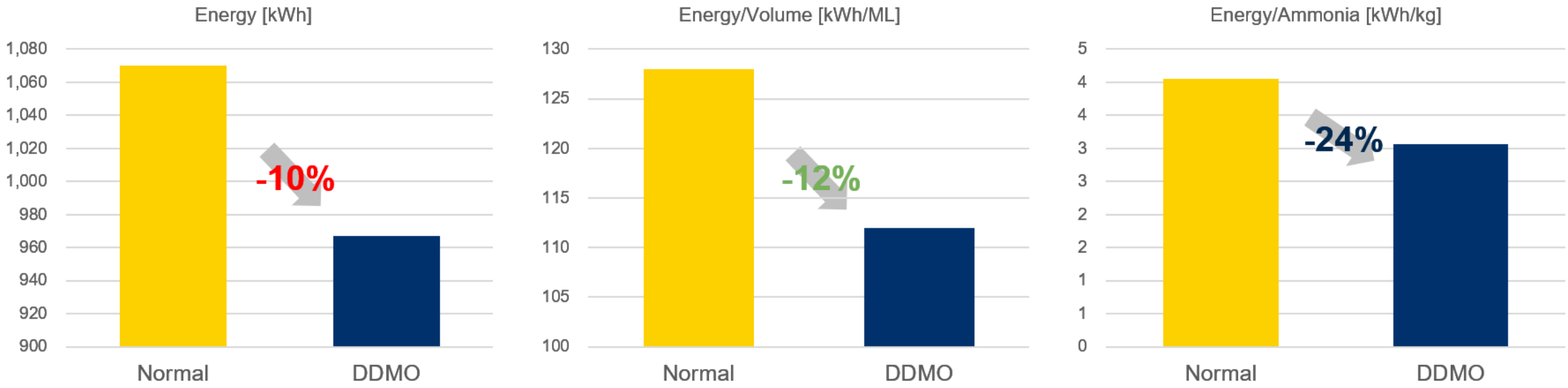
Energy Optimisation for Wastewater Treatment Facility: Proof of Concept



System Configuration and Information Processing

AI/ML can Optimise Operation and Save Energy

- As a result of the demonstration test, **10%** less energy, **12%** less energy per volume, and **24%** energy per mass of primary effluent ammonia compared to the Normal days.

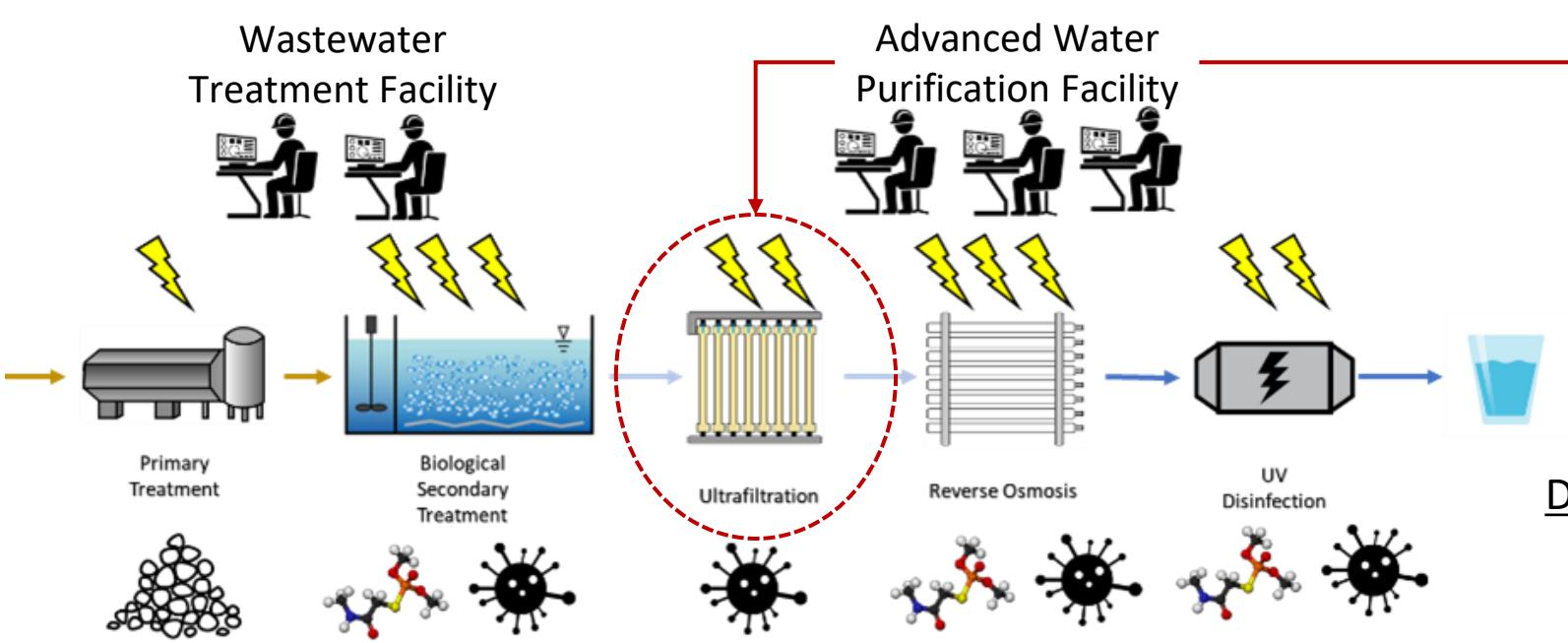


Energy Saving Effect

Source: "Yokogawa Successfully Completes Proof of Concept for Optimization of Operations at US Wastewater Reclamation Facility Producing Potable Water", https://www.yokogawa.com/news/press-releases/2022/2022-03-25/

Prediction for Membrane Facility

- We developed a model that successfully predicted the future fouling resistance of ultrafiltration (UF) membrane at Advanced Water Purification Facility.
- It will help the plant operators to adjust the interval of chemical cleaning according to the extent of membrane fouling thereby ensuring longer membrane life, lower energy cost and ensuring water quality.

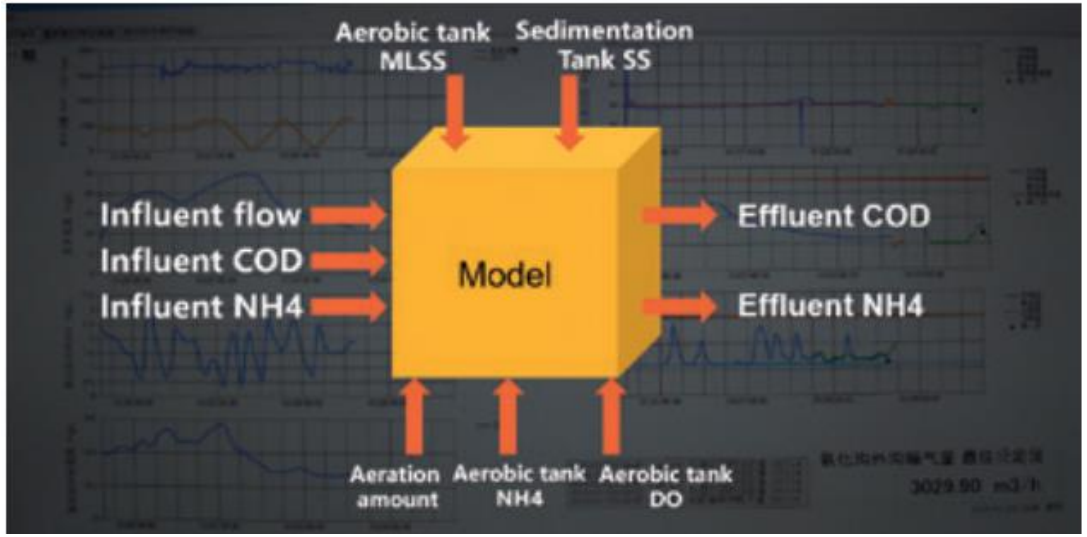


1. Optimise in the operation complexity of backwash and chemical cleaning sequences
2. Reduce operating cost related to energy and chemical

Direct Potable Reuse Facilities

Another Application: Sewage Treatment Energy Optimisation

- Data-Driven Modelling for Optimisation (DDMO) can be used to optimise the air-blowing rate in aeration tanks of a wastewater treatment plant.
- The interlink between a Distributed Control System and DDMO improved the energy-saving effect.
- Blower power consumption (kW/d) was reduced by 25.1%; Power consumption rate (kW/m3) was reduced by 24.7%.



Data model for DDMO

Source: "Data-driven Modeling for Optimization Helps 79,000 t/d Sewage Treatment Plant Reduce Energy Cost while Meeting Stricter Environmental Regulations in China", https://www.yokogawa.com/library/resources/references/successstory-beijing-etechwin-electric/

Conclusion

- Yokogawa’s new machine learning technology can be used to optimise energy usage in potable water treatment facilities.
- The technology can increase the lifespan of membranes while ensuring water quality.
- Combination with traditional monitoring and control technologies helps realise the value and bring the benefit to real.
- The results will contribute to environmental sustainability and a circular economy.