SCE DRET Findings
May 2019

DR15.18: Demand/Response System for Wastewater Aeration Using On-line Off-gas

OPPORTUNITY

Understand seasonal and daily process conditions at water resource recovery facilities to identify potential ways to reduce operational cost savings.

Water resource recovery facilities typically receive the highest loading flowrate (water to be treated) when the cost of energy is also the highest. The overlap between the peak flowrate and the most expensive energy price intensifies both the cost of treatment and the concurrent greenhouse gas (GHG) emissions.

TECHNOLOGY

How does an innovative on-line off-gas analyzer demand/response system coupled with advanced modeling software maximize the reliability of cost savings projections for WRRF during peak energy demand periods?

Online Monitoring + Off-Gas Analyzer for Wastewater Aeration Monitoring and Modeling

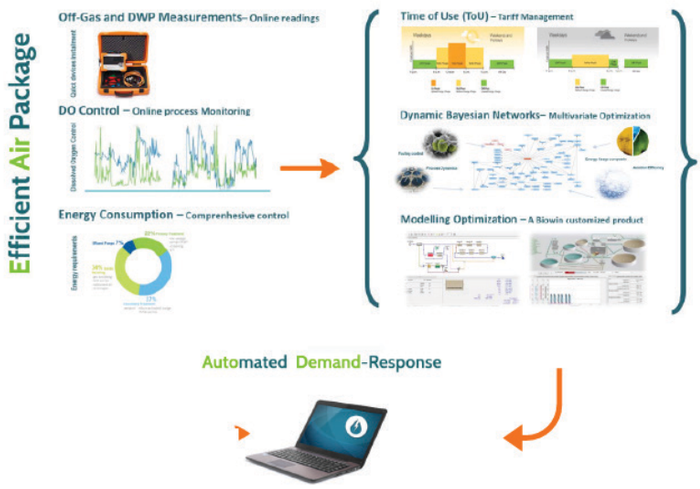

Figure 1: Schematic of the emerging demand/response product for wastewater aeration monitoring using an on-line off-gas analyzer

M&V

Where did Measurement and Verification occur?

Online monitoring and off-gas analyzer readings occurred at two Inland Empire Utilities Agency (IEUA) water resources recovery facilities (RP-4 and RP-5). A tailored model for the plants under study was developed from the collected data. From this, the simulated wastewater facilities are now available to further investigate alternative strategies, or a combination of them, for reducing energy consumption during a peak demand hours.

RESULTS

What cost saving results came from modeling:
1) Variation in dissolved oxygen (DO);
2) Intermittent Aeration;
3) Ammonia Peak Shift (equalization);
4) Influent Flow equalization.

1. Decreasing the DO to 1.5mg/L not only maintains the effluent quality parameters but results in cost savings exceeding 20% in winter and 17% in warmer months.
2. Applying intermittent aeration has an average cost savings of approx. 18%. DO setpoint had little effect (>4%) on overall savings, suggesting aeration is already optimized during periods where intermittent aeration strategy was applied.
3. The results show that implementing ammonia equalization can result in significant cost savings ranging from 20% during winter months, 12% during fall months, and the least savings at 8.8% during spring season. 12-month averaged costs savings are ~12%.
4. Implementing a load delay strategy can result in cost savings ranging from 5-6% during fall months to 16% during the winter months. The simulation of using equalization tanks requires further revision.

DEPLOYMENT

What cost saving strategies can operationally be implemented at IEUA's facilities based on modeling?

Selecting lower DO setpoints and intermittent aeration could be gradually implemented at RP-4 due the simplicity of the strategy plus the potential savings. Delaying the ammonia peak also resulted in cost-savings close to 12% independently of the season or DO setpoint applied and could also be implemented at IEUA's facilities; however, some investment or skilled personnel may be required to deploy such a strategy.