Technology trial summary - Melville Park, 2024

Background

The Department of Primary Industries and Regional Development (DPIRD) collected performance data of a novel technology installed at Melville Park, a boutique cheese factory in Brunswick, Western Australia. This is part of a wider project to validate treatment technologies for agricultural effluent. The treatment system is a passive aeration simultaneous nitrification – denitrification (PASND) batch process and uses a biofilm to reduce nitrogen and carbon in the waste stream.

The treatment process uses a symbiotic relationship between two micro-organisms on a plastic carrier to provide enhanced carbon (reported as Chemical Oxygen Demand – COD) and nitrogen reduction. The main advantages of the system are:

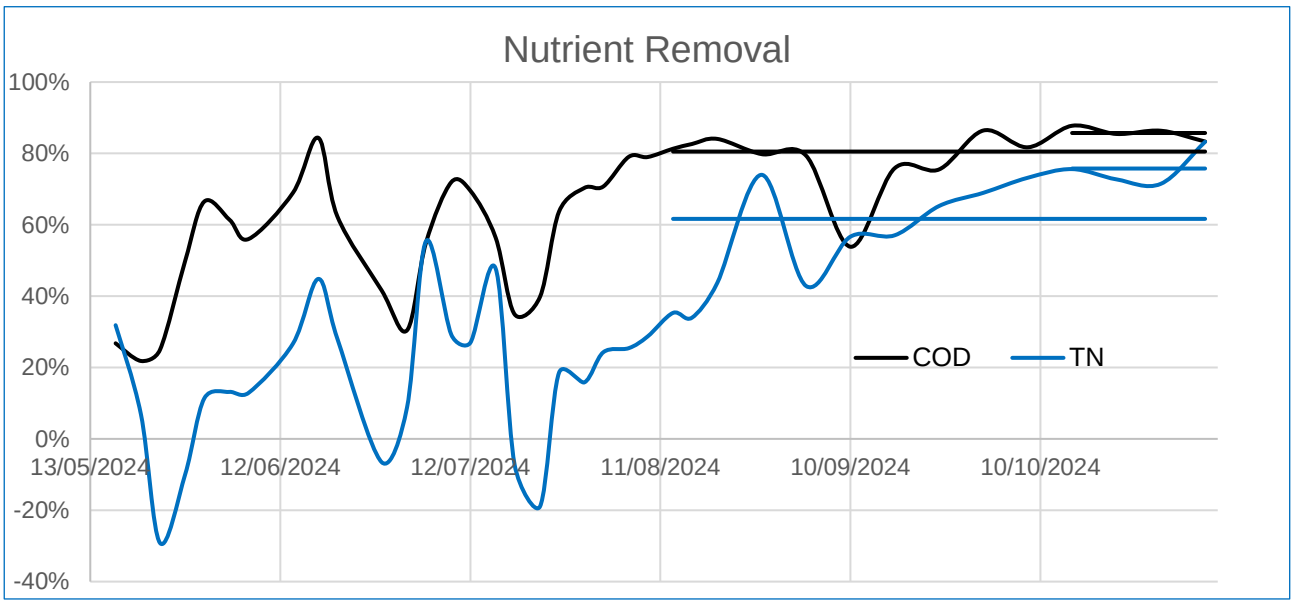
- fewer moving parts result in a lower likelihood of breakdowns.
- no requirements for biological process control allowing for higher autonomy.
- removing the need for mechanical aeration resulting in lower power consumption.
- and oxidising the majority of biomass (sludge) produced in the process, reducing the need for sludge handling and disposal.

Results

Washdown water from a cheese factory was pH corrected before being batch treated in two PASND reactors. A simple controller transferred wastewater between the reactors four times, spending 3 hours in each reactor, resulting in an overall treatment time of 12 hours. The table below gives a summary of treatment performance.

Metric	3 month average	1 month average
COD reduction	81%	86%
BOD reduction	85%	90%
Total Nitrogen (TN) reduction	62%	76%
Power Consumption (kWh/kL)	1.0	1.0

The trial took place over 6 months, however due to startup issues, treatment performance was significantly impaired in the first 3 months as shown below.



Poor treatment performance during start-up was due to the slow development of biofilm and acidic shock loads from failed pH control. Raw wastewater COD ranged from 260 – 1,800 mg/L, with an average of 861 mg/L in the last three months of the trial, and TN in raw wastewater ranged from 17 to 46 mg/L, with an average of 26.7 mg/L in the last three months of the trial.

Autonomy data is not available; however, the agribusiness owner states that the technology is autonomous.

Conclusion

This technology was able to achieve reasonable carbon and nitrogen removal rates without significant process control. A hydraulic residence time of 12-24 hours is common among intensive biological treatment systems: this allows for a reduced footprint similar to that of conventional activated sludge and membrane bio reactors.

Given this is a batch system, sudden changes in raw wastewater quality will result in biological upsets, therefore adequate flow balancing and robust pH adjustment measures need to be in place to establish the PASND process. The owner did not require chemical pH adjustment after the trial.

For more information contact agribusiness@dpird.wa.gov.au