SNAPSHOT

Crust Management for Optimal Anaerobic Digestion Performance at Meat Processing Facilities

Project Report Reference: 2017-1033 **Date: 30 November 2017**

Project Description

This project was undertaken to determine the effects of different fat levels in abattoir effluent on anaerobic digestion to address a lack of basic data on the performance of anaerobic treatment of wastewater from Australian meat processing plants. The project integrated a literature review, lab scale studies and site data analysis.

The aim of this project was to determine the range of operational factors which contribute to the successful commissioning and continued operation of a covered anaerobic lagoons (CAL) by understanding the fate of input effluent. The specific objectives of this project were to:

1. Identify industry-wide operational issues which contribute to the formation of floating crust/scum.
2. Understand the characteristics of abattoir effluent which increase the likelihood of floating crust/scum onset.
3. Determine operational measures which can mitigate crust build-up at both pre and post anaerobic lagoon treatment.
4. Establish key recommendations for the management of fats, oils and greases (FOGs) in waste streams to assist industry in determining ideal plant operation to achieve optimal crust management and biogas production.

Project Content

A detailed waste mapping exercise was carried out on one site. High-fat waste streams for subsequent lab scale trials were selected based on the results of the mapping exercise. The lab scale studies took on two points of foci: 1. To examine the effects of different fat levels in abattoir effluent on anaerobic digestion under controlled conditions of optimum mesophilic temperatures (38°C) and stirring while maintaining optimum alkalinity and 2. To investigate the effect of temperature and agitation on crust/foaming layer development.

Project Outcome

The combination of literature review and engagement with a total of three sites shows that there are four key industry-wide operational issues which contribute to the formation of crusts on CALs. These relate to:

1. Inadequate primary pre-treatment which fail to reduce wastewater fat levels;
2. Poor waste stream management practices leading to spills and shock loadings to the CAL;

3. Lack of process monitoring of the CAL resulting in physical and chemical parameters outside the optimum range thereby affecting the anaerobic digestion process;
4. Installation of poorly designed CAL technology which is unable to degrade high strength abattoir wastewater at desired organic loading rates and hydraulic retention times.

The results of the lab scale trials using wastewater from an existing full-scale CAL in combination with field observations of CAL performance indicates that fat must be removed from the effluent to a level of < 300 - 400 mg/L and temperature maintained above 28-30°C. Alternatively, CAL technology which incorporates heating and stirring systems with the addition of chemicals to maintain optimum levels of alkalinity are required to degrade high-fat waste streams with FOG levels greater than 500mg/L.

Benefit for Industry

The outcomes of the project have identified the following key criteria for the management of FOGs in waste streams to assist industry in determining ideal plant operation to achieve optimal crust management and biogas production:

1. **Effective primary treatment of the wastewater** including the use of:

// Screens (include static, vibrating, rotary, and screw presses) as the first stage of primary pre-treatment to remove solid material including fat particles, paunch and manure from the wastewater;
// Well –designed savealls which remove fat effectively;
// Adequately operated dissolved air flotation (DAF) systems.

2. **Good waste stream management practices** to avoid excessive loading rates which can lead to continuous crust formation. Shock loads can cause an accumulation of degradation products and by-products.
3. **Routine process monitoring of the CAL** to ensure key physical and chemical parameters are operating within the optimum range thereby ensuring efficient degradation and maximal biogas production.
4. **Installation of correctly designed CAL technology**. The CAL technology should take into account the degree of recirculation for mixing and ability to maintain optimum mesophilic temperature.