

Treatment of dairy processing effluent using IASBR Technology

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Abstract

Due to the abolition of milk quotas in Ireland in 2015, it is predicted that there will be an increase in dairy processing activities. This project investigates more efficient ways of treating dairy processing wastewater, specifically the use of intermittently aerated sequencing batch reactors (IASBRs).

1. Introduction

The dairy industry is one of the most polluting industries globally, generating an average of 2.5 litres of wastewater on average per litre of milk processed [1]. In Ireland, the dairy industry is experiencing rapid growth due to the abolition of European milk quotas in 2015, with increases of up to 50% in milk processed being predicted by 2020.

This project is investigating the potential of Intermittently Aerated Sequencing Batch Reactor (IASBR) technology for treating wastewater from dairy processing plants in a sustainable and cost efficient manner. The IASBR is a novel technology, developed at NUI Galway, and has been previously used to treat other types of high strength industrial wastewater, as well as municipal wastewater.

The aim of this project is to investigate whether the IASBR technology can be used to treat dairy processing wastewater effectively and more efficiently in terms of energy and cost. Additionally, working alongside project partners UCC, the microbiological communities in the bioreactors will be examined at various points in the IASBR cycle to fully understand the mechanisms of nutrient removal which occurs in the IASBR.

2. Dairy Plant Visits

This project is industry-oriented, with many large dairy producers in Ireland involved from its inception. An extensive survey was carried out, involving visits to six dairy processing plants around the country. These visits incorporated dairy plants producing a variety of products, and included a mixture of large and small plants. Information such as water use data, plant processes, and current wastewater treatment system was collected from each plant. In addition to data collection, effluent samples were provided by each of the dairy processing plants.

3. Results from Wastewater Characterisation

The effluent samples provided by dairy processing plants were tested to determine the levels of nutrients and organic matter they contained.

The results indicate that there is a large variation in wastewater composition between different plants. These variations, in both flow rates and composition, have previously been identified as one of the major problems faced by environmental managers of dairy processing wastewater treatment plants. The concentrations of BOD₅ and COD found for each plant are shown in Figure 1. Further analysis was performed to determine the concentrations of TOC, PO₄-P, total phosphorus, NO₃-N, NO₂-N and total nitrogen in each sample.

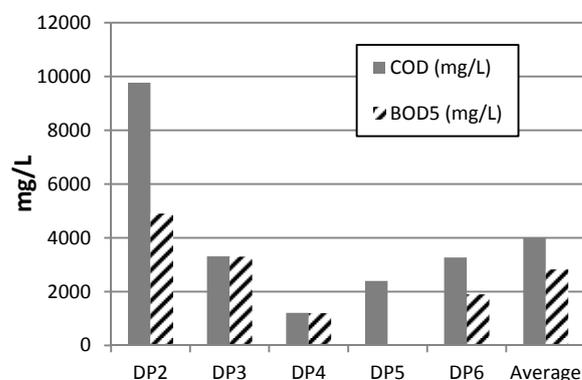


Figure 1: Effluent COD and BOD₅ concentrations from dairy plant visits (DP = dairy processing plant)

4. Future Work

A laboratory scale IASBR unit is currently under construction in the Environmental Engineering lab at NUI Galway. The unit consists of three IASBRs, each with approximately 8 liters working volume. The system is fully automated, controlled by a programmable logic controller (PLC). The unit will be initially using synthetic dairy wastewater, based on the results of the characterization testing. Following an initial stabilization period, the system will be used to treat dairy processing wastewater from a local dairy processing plant.

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References

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