

DairyWater

Sustainability and resource efficiency for the Irish dairy processing industry

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Introduction

2016 saw another unprecedented year for the Irish Dairy sector with milk production hitting a record high of 6.7 billion litres. This year was also the third year of the DairyWater project, which aims to develop innovative solutions for the efficient management of water consumption, wastewater treatment and energy usage within the Irish dairy processing industry.

This year, the first graduation of a DairyWater researcher took place as Emma Tarpey completed her Masters study at NUI Galway. Additionally, preliminary results from the other research tasks have been disseminated to the scientific community through conferences and journal publications.

For further information, go to: www.dairywater.ie or follow the project on twitter: @dairywater

DairyWater Workshop 1

The main event this year for DairyWater was the first workshop, which was held on the 9th March 2016 in NUI Galway, entitled '*Achieving sustainability for the Irish dairy processing industry*'.

Environmental experts, from both the Irish dairy processing industry and Irish research institutes, presented on a number of current challenges that face the Irish dairy processing industry, particularly related to water and wastewater treatment efficiencies. Additionally, researchers within the DairyWater project presented their research activities to date and its potential impact for industry. There was a total 36 attendees at the event, including dairy processing industry representatives, farmers and researchers from Irish universities and institutes.



Industry and academia attendees at the first DairyWater workshop, which took place on the 9th March 2016 in NUI Galway.

DairyWater research activities

Ecological structure in laboratory-scale IASBR

The first two phases of laboratory-scale testing of the intermittently aerated sequencing batch reactor (IASBR) system have been completed at NUI Galway. The results indicate the optimum parameters, which will be used in the pilot-scale system. Furthermore, the effectiveness of the system for the removal of nitrogen and phosphorus from dairy wastewater has been proven.

In addition to investigating the performance of the IASBR system, a key factor to establish is the microbial community structure in tandem with the nutrient removal capacities of the reactor. Microbial ecology studies were performed at University College Cork on IASBR activated sludge samples during both synthetic and industrial wastewater treatment trials. Biomass profiling under synthetic influent conditions revealed a significant impact of the relative reactor aeration rates on the underlying microbial ecologies. The figure below presents a summary of the broad, phylum level biomass community compositions for each aeration rate. Interestingly, each distinct activated sludge profile corresponded with different nutrient removal efficiencies in the bioreactors. Further analyses are ongoing which aim to compare microbial ecology profiles between synthetic and industrial wastewater in an effort to link the activity of specific communities to the nutrient removal profiles.

The project team would like to acknowledge the funding provided by the Department of Agriculture, Food and the Marine for the DairyWater project (Ref.: 13-F-507)



New researcher joins the DairyWater team

Peter Leonard, a recent graduate of NUI Galway, joined the DairyWater research team in September 2016. Peter has a BSc (Hons.) in Biochemistry, where his final year project was to express TEV protease in different *E. coli* expression strains under varying conditions to achieve optimal protein expression. He will join the team as a Masters student under the supervision of Prof. Xinmin Zhan and Dr William Finnegan. The main aim of his research is to investigate the performance of a pilot-scale IASBR system.

Other research highlights from Year 3

Prof. Xinmin Zhan hosted LivestockWaste2016 and Dr Jamie Goggins hosted CERI2016. DairyWater's Emma Tarpey, Kelly Fitzhenry and Dr William Finnegan presented their work at both events.

An investigation into the environmental impact associated with the manufacture of milk powder and butter has been compiled and published in *Science of the Total Environment*.

Laboratory-scale testing of the pulsed UV and low pressure UV systems is well underway, with the first set of results to be published in 2017.

The results of batch experiments of ammonium and phosphate removal efficiency of Nano-zeolite show its potential on fast immobilisation of nutrients.

The pilot-scale IASBR is under construction and it is expected to be in operation in the first half of 2017.

