

Abstract - Nutrient Recycling by Lime Treatment

Jordan Phasey¹, Howard Fallowfield and Dries Vandamme

This is an integrated nutrient management that produces marketable products from the waste of a Concentrated Animal Feeding Operation (CAFO). Phosphate is recovered as dry single superphosphate fertiliser. Nitrogen is recovered as dry ammonium nitrate or sulfate. Water is recovered with a low nutrient, solids and pathogen content, suitable for reuse. We use a unique flocculation technology to achieve this outcome. Lime is used to raise the pH of the effluent, leading to the flocculation of solids, while the high pH destroys pathogens. Ammonia is stripped from the effluent and CO₂ is added to reduce the pH of the water prior to reuse. The sludge that is produced is either dewatered with no modification, or is subjected to a series of chemical extraction processes yielding single superphosphate fertiliser.

The process may be used both as a fixed-in-place treatment plant, with simple intermittent operation performed by the farmer, or using mobile plant, treatment may be performed within existing ponds by a contracted third-party. This third-party would mobilise with all necessary equipment to process the water and solids, requiring no new skills on the farm. Simple operation and inexpensive chemicals lead to a process that is extraordinarily low-cost, with a chemical cost of \$0.0225/kL AUD achieved in the proof-of-concept. This process led to 90% recovery of Total Phosphate and 70% recovery of Organic Nitrogen.

Jordan Phasey

Jordan is a scientist and entrepreneur employed by Power and Water Corporation, the water and sewerage services provider for the Northern Territory of Australia. Jordan has been developing this technology for the past 4 years, and after performing the proof-of-concept work in November 2015, identified that agricultural wastewater treatment was a likely market for this technology.

An established entrepreneur, Jordan also owns and operates NT Portable Homes, a small business importing modular accommodation manufactured in China into the Northern Territory.

Howard Fallowfield

Professor Fallowfield is an aquatic microbial ecologist and Professor of Environmental Health at Flinders University. Howard has some 25 year's research experience designing, constructing, operating and evaluating the performance of high rate algal pond (HRAP) systems. His research focus has been the integration of wastewater treatment and renewable energy production utilising algae based systems. Howard is a lead member of the CRC for High Integrity Australian Pork, and is currently piloting integrated anaerobic-aerobic-HRAP treatment of piggery wastewater.

Dries Vandamme

Dr. ir. Dries Vandamme is a postdoctoral researcher at the KU Leuven – University of Leuven in Belgium. He has published various publications on the topic of flocculation and separation of microalgae as a novel source of biomass. He obtained his PhD degree in Bioscience Engineering at KU Leuven in 2013 on the topic of flocculation of microalgae for biofuel production.

