Strippers & Scrubbers – the fight for nitrogen recovery, recycling & removal

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SETTING THE SCENE:

What goes in must come out

Kristy Blakeborough-Wesson, Biomass Fertiliser and Feedstock Co-ordinator, SecAnim

Examining the need for nitrogen in the UK agricultural industry and the current tonnages of digestate potentially available through food waste AD. Then considering:

- The digestate product itself
- Farming confidence
- The future

REMOVAL:

Complete Nitrification and Denitrification of Very High Concentrations of ammoniacal-N in Leachates and Digestates

Howard Robinson, Process Director, Phoenix Engineers

- Innovative process designs have allowed full-scale plants to be designed and operated successfully, in the UK and overseas, for complete nitrification and denitrification of up to 3000mg/l of ammoniacal-N in landfill leachates,
- Digestates have very similar characteristics to leachates, and are presently being tested for treatment by similar processes,
- The availability of readily-degradable organic compounds in digestates may allow full denitrification to be achieved using these as a free carbon source, but issues related to direct toxicity of ammoniacal-N are having to be overcome by innovative process designs.

Sustainable Ammoniacal Nitrogen Removal of Organic Digestate Reject Liquor with the ANAMMOX® Process

Willie Driessen, Global Technology & Product Manager, Paques

- There is an increasing interest in anaerobic digestion of sewage sludge, organic waste and industrial effluents. Dewatering liquors and effluents derived from anaerobic digestion processes contain significant amounts of nutrients.
- The biological ANAMMOX® process is an effective nitrogen removal method consuming up to 60 % less aeration energy as compared to conventional nitrification-denitrification processes.
- Long term operational experience of the ANAMMOX® process treating dewatering liquors from a co-digestion plant are discussed in detail. A start-up was achieved within 3 weeks and biological ammonia removal in excess of 90 % was demonstrated.

Liquor Nitrogen Removal via Energy Efficient Combined Strippers and Biological Processes

Henk Wim de Mooij, Project Manager and Paula Smith, Principal Engineer, Sweco

- Use of combined strippers and biological processes to achieve tough effluent standards in Biowaste nitrogen removal
- Use of DEMON® technology in wastewater treatment
- Two project examples

Subject TBC

James Montgomery,

RECOVERY: **Options for integrated digestate processing at a large AD Plant in the UK.**

Justin Rigden, Andigestion and Pete Smith, Cleansing Services Group

Over the last year, we have assessed a number of technologies for processing our digestate with the aim of:

- Separating nitrogen and phosphorous components from our digestate for individual deployment as targeted fertilizers;
- Significantly reducing the volume of material for transport from the plant.
- Using/disposing of any separated water on-site.

Nijhuis Ammonia Recovery (NAR) operational challenges and lessons learned

John Wilson, Divisional Head – Sewage & Water, Nijhuis

- Overview of Nijhuis Ammonia Recovery (NAR) system
- Operational challenges of ammonia recovery and lessons learned
- Application of NAR for digestate and manure treatment in the Netherlands

AD and Chicken Litter – Realising the Agronomic and Environmental Potential

Andy Bull, Associate Project Manager, Severn Wye Energy Agency

- Chicken litter is a potential pollutant and AD has potential in reducing risks
- The standard solution is to use it as a minority constituent of digester feedstock but the necessary high carbon buffer material is not always available
- Solutions are being developed and the "prize" is most certainly worth pursuing

Use of Acid-tolerant Nitrifying Bacteria to Generate Acid for Ammonia Scrubbers on Animal Facilities

Philip Moore, Soil Scientist, US Dept. of Agriculture

- Scrubbing ammonia from the exhaust air of animal rearing facilities is not cost-effective using typical acids because the value of the nitrogen captured is less than the cost of the acid, hence our objective was to develop a biological system that produced "free" acid.
- Nitrification is an acid-forming process in which two moles of acidity are formed when one mole of ammonia is converted to nitrate.
- We developed an acid-tolerant nitrifying bacterial culture in a laboratory microcosm which was transferred to an ammonia scrubber located on the exhaust fan of a poultry houses and the bacteria produced sufficient acidity to capture 20 kg of nitrogen, indicating this technology was feasible.

Hot Microbubble Injection in Thin Liquid Layers for Ammonia-Water Separation

Pratik Desai, Research & Innovations Director, Perlemax

- Ammonia -Water separations possible at 200-300 fold reduction in processing time
- Ammonia separation possible at low CAPEX/OPEX and in a sustainable way following circular economy principles.

- Processing can be performed using low grade waste heat and workable for high concentrations down to low concentrations with very high removal efficiencies and can work with most ammonia-rich waste streams.

INNOVATION: **Microvi: The Paradigm shift in biological treatment for nitrogen removal**
Ajay Nair, Global Director Commercial & Technical Strategy, Microvi Biotechnologies

- Microvi technology sits at the innovation fulcrum of material science and microbiology to create specific, highly concentrated, low byproduct production and resilient reactors.
- It's unique mechanism for encapsulating specifically isolated, non GMO, allows unprecedented levels of process stability using enhanced metabolic pathways for nitrogen removal and nutrient capture.
- In pilot stage, the process is showing extreme promise in harnessing the alternative, higher efficiency ammonia removal techniques of Nitritation / Anammox in both side stream and main-scale