

Recovery and utilisation of nutrients for low impact fertiliser



Technology fact sheet – Bioelectrochemical system (BES)

Flat plate BES: innovative microbial process for nitrogen recovery

Within Run4Life, innovative bioelectrochemical systems (BES) have been (further) developed to recover nitrogen, in the form of ammonium (NH_4^+), from anaerobically treated toilet wastewater (black water). These technologies take advantage of the ionic flux occurring from anode to cathode chamber in a BES reactor, driven by the exo-electrogenic degradation of organic matter at the anode.

Several challenges have been tackled, including: (i) adapting an electroactive anodic biofilm to high NH_4^+ concentrations; (ii) selecting the best performing BES reactor design and materials for selectively recovering NH_4^+ ; (iii) optimizing the operational conditions with no energy input for the Microbial Fuel Cell (MFC) and with low energy input for the Microbial Electrolysis Cell (MEC).

One BES technology is being scaled-up at demonstration site in Vigo. The selection was mainly made based on system performance with regard to influent COD and N concentration and cost issues.

Key facts

- Direct nitrogen recovery as fertiliser
- Low energy demand process
- Microbial driven process, tolerant to high nitrogen concentration
- Nitrogen removal and recovery
- Associated COD removal

Application in Run4Life demo sites

- Inputs: anaerobically treated black water, nitric acid. For MEC also electricity.
- Outputs: ammonium nitrate, liquid effluent.
- Applied in Vigo.

Images on the right: diagram of nitrogen recovery BES flat-plate concept (top) and laboratory set-up at Leitafacilities (bottom).

