Recovery and utilisation of nutrients for low impact fertiliser

Demonstration site fact sheet - Sneek

Sneek: One-step fertiliser production

Nutrient and energy recovery from black water through hyper-thermophilic digestion

This demonstration site has been one of the first pilot projects introduced in the Netherlands to treat vacuum collected black water. It was built in 2005 in Sneek, Lemmerweg-Oost, and is managed under the leadership of DeSaH. The black water of 32 houses is treated in a UASB reactor. Within Run4Life, the collection and treatment system of the site are upgraded by implementing a new type of vacuum toilet, having extreme low water consumption, and Hyper-Thermophilic Anaerobic Digestion (HTAD) technology. Both of these innovative technologies are implemented for the very first time in this context on a large scale. The new toilets developed by JETS halve the water consumption compared to conventional vacuum toilets, which results in a highly concentrated black water stream. Key feature of the new toilet is a microprocessor controlled flushing system that gives possibility to select an eco-flush for urination as well as individual adjustment of flushing water volume on user preferences and water supply pressure. The HTAD of high concentrated black water will allow recovery of safe liquid and solid NPK fertilisers while simultaneously producing energy in a one-step process since the process is operated at pasteurisation temperatures (55-70°C). Special focus will be on the production of safe fertilisers. The HTAD is developed by WUR and implemented at DeSaH.

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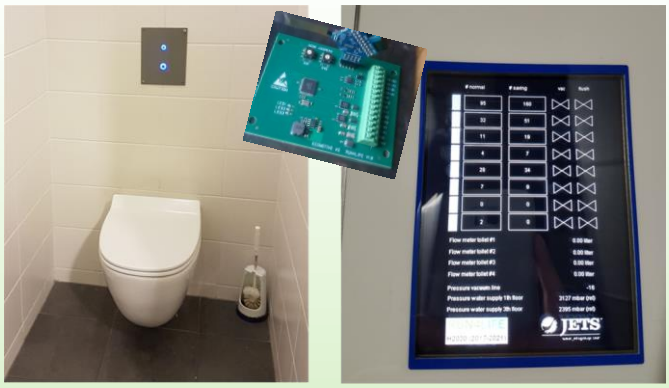

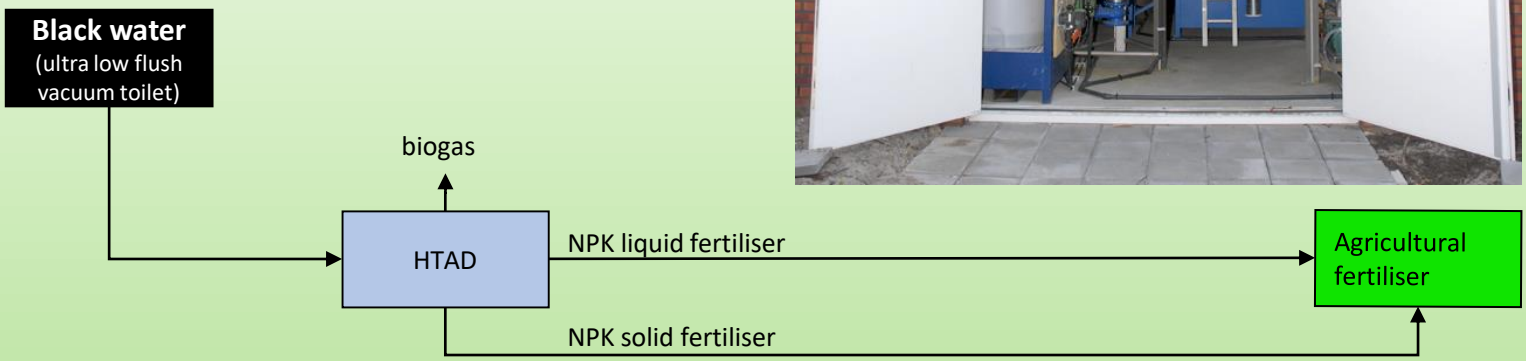

Safe liquid and solid NPK fertilisers in a one-step treatment process

The strategy of this demosite is to collect segregated wastewater from an ultra-low flush vacuum toilet. The highly concentrated black water is stored in a vacuum collection tank and subsequently fed into the Hyper-Thermophilic Anaerobic Digestion (HTAD) reactor. During this anaerobic process COD is removed, nutrients are mineralized and biogas is formed. The biogas, mainly composed of methane and carbon dioxide, can be used as a bioenergy source to heat the anaerobic digestion and the connected houses. The effluent of the HTAD reactor is divided in a solid and liquid fraction. Most of the nutrients are present in recoverable form (e.g. ammonium and phosphate) in the liquid effluent, or as precipitates in the solid fraction. Both effluents will be used as NPK fertiliser products which are directly applicable in agriculture. In addition it will be explored if calcium phosphate can be harvested as a separate product, as well as novel ammonium recovery methods.

During HTAD of black water the high temperature (55-70°C) safely hygienises the effluent, whereas anaerobic digestion at mesophilic temperatures (35-38°C) does not sufficiently inactivate pathogens. Furthermore, HTAD has enhanced stabilisation of organic matter at reduced retention times due to the higher operational temperature. Because of the inactivation of pathogens and the shorter retention time, resulting in a lower footprint, HTAD is an ideal production method for hygienic low impact fertiliser.

Key features of HTAD demo-site:

- ✓ Newly developed ultra-low flush vacuum toilets
- ✓ Recovery of liquid and solid NPK fertiliser products from wastewater in a one-step process
- ✓ Biogas recovery from wastewater
- ✓ Option to recover CaP and N-fertiliser will be explored

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Contact:
Paraschos Chatzopoulos
P.Chatzopoulos@desah.nl