

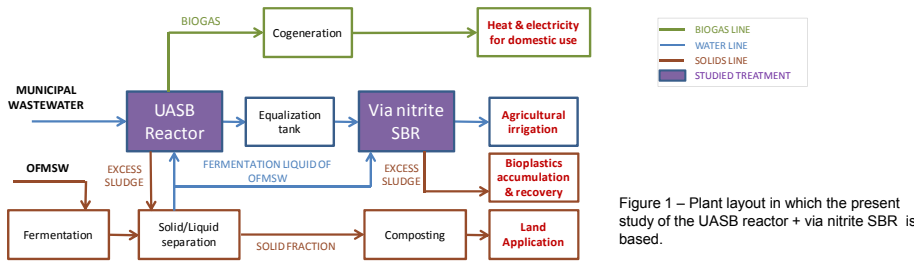
Short Term Scientific Mission (STSM) 2014

UASB-type + short cut SBR bioreactors to treat domestic wastewater and food waste

June 21st, 2014 | September 12nd, 2014

Objective

To study the **feasibility** of using a **UASB + via nitrite SBR** (with bioplastics accumulation) system to treat **municipal wastewater + Fermentation liquid of Organic Fraction of Municipal Solid Waste (FL-OFMSW)** as depicted in Figure 1.



Methodology

Two reactors were operated (UASB reactor and SBR reactor) where solids, organic compounds, nutrients and biogas were analyzed according to the Standard Methods.

UASB reactor. Conditions:

- Working volume: 16 L
- Temperature ~ 25°C
- HRT = 10h
- Feed: municipal wastewater + FL-OFMSW.

Via nitrite SBR reactor. Conditions:

- Working volume: 26 L
- SBR cycle 4h (3h reaction)
- Feed: Effluent generated in the UASB reactor.
- FL-OFMSW used to denitrify and accumulate PolyHydroxy Alkanoates (PHA)
- Inoculum: biomass from another via nitrite SBR treating reject water

Results

UASB operation

The UASB reactor provided a **COD removal efficiency** around **84%** and the treated effluent COD concentration was on average 82 mg/L. The methane yield was **0.22 m³ CH₄ / kg COD removed**, similar to the theoretical one.

Via nitrite SBR operation

- The effluent from the UASB reactor was treated in a SBR under a nitrogen loading rate of **0.1 kgN/(m³·d)**.
- The reactor was initially operated at **low dissolved oxygen concentration** (set point of 1.5 mg O₂/L), where a delay in the **oxidation of NH₄⁺-N to nitrite** was observed due to **competition with PHA accumulation**.
- When DO set point was set at 4.5 mg O₂/L, no delay in nitrification was observed (see Figure 2).
- An average **PHA accumulation rate** of **9.8 mg COD/(gVSS·h)** during feast conditions was monitored in the SBR reactor.

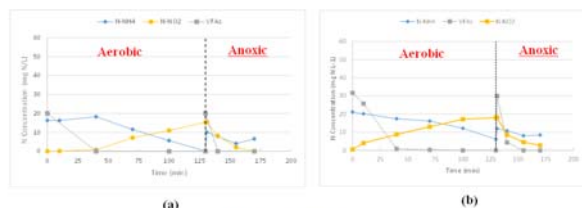


Figure 2 – Comparison of a representative SBR cycle at dissolved oxygen set point of 1.5 mg/L (Figure 2a) and at 4.5 mg/L (Figure 2b)

Highlights

- 84% of COD removal in a UASB reactor treating municipal wastewater and FL-DOW.
- Effluent of the UASB reactor treated in a via nitrite SBR at a nitrogen load of 0.1 kg N/(m³·d)
- PHA accumulation rate of 9.8 mg COD/(g VSS·h) during feast conditions in the via nitrite SBR

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