SLUDGETECH 9–13TH JULY 2017

EXPANDING BIOGAS POTENTIAL WITHIN THE PULP AND PAPER INDUSTRY
The 'EffiSludge for LIFE' project

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SCOPE

To demonstrate the advantages to **modify conventional operation of waste activated sludge (WAS) systems** at pulp and paper mill sites lowering energy demand and carbon footprint. Based on previous pilot work, this will be achieved by

- Reducing sludge age in the WAS basin
- Increasing the organic loading rate (OLR)
- Processing biosludge via anaerobic digestion (AD)
- Generating biomethane
- Recirculating N and P from rejected water post AD

CURRENT STATUS

To minimize sludge handling costs, an high sludge retention time (SRT) is maintained (Figure 1). **This requires prolonged aeration time in return of a low sludge production**.

The generated sludge has a poor biomethane potential due to aerobic digestion occurring (Table 1).

MATERIALS AND METHODS

Pilot work

2 basins (aeration + sedimentation) of 150 l to simulate WAS system conditions. Operated for 220 days with OLR (1-30 kgCOD/m^3/d) – HRT (4-20 d).

Full scale WWTP + AD in Norway

Existing WWTP at Norske Skog mill at Skogn, treating 20 000 m^3/d, with under construction AD plant treating WAS + fish waste (25 million liquid biogas per year). Operation to start by end of 2017.

Pilot (top) and WWT with AD plant under construction site at Skogn (bottom).

EffiSludge CONDITION

To maximize energy recovery from WAS, low sludge retention time is maintained (Figure 2). **This allows high energy saving and provides a sludge profitable for AD.**

By recirculating rejected water from AD, part of the N and P load required by the WAS (Table 2).

Figure 1

Conventional WAS system at pulp and paper mill (Norske Skog at Skogn)

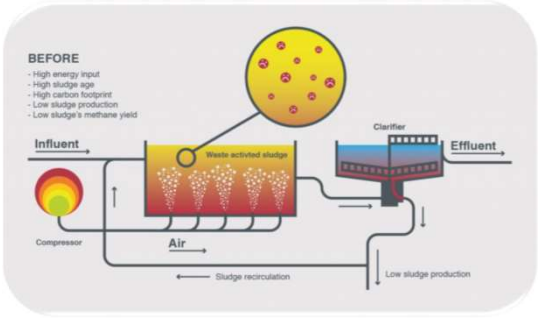

Figure 2

Innovative WAS system at pulp and paper mill (Norske Skog and Biokraft's AD plant at Skogn).

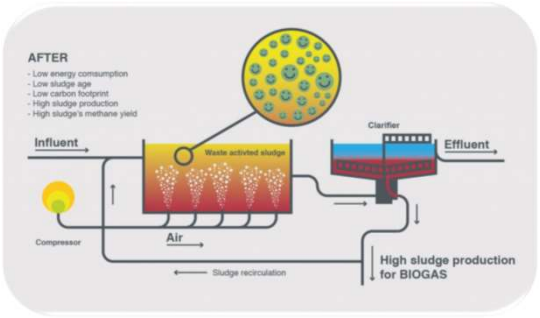

Table 1

Noske Skog WWT working condition today. Data are based on monthly average with sample collected on a daily base.

PARAMETERS	MEASURED VALUES
Sludge age	18 days
Energy demand	25 MWh/d
WAS production	0.22 kgSS/kgCOD$_{red}$
Nutrients dosing	700 kgN/d + 150kgP/d
WAS usage	Low value (Incineration + landfill)
Carbon footprint	15 tonCO$_{2eq}$/kg newsprint

Table 2

Norske Skog WWT working condition to be achieved by 2019. Data are based on previous pilot work and modelling.

based on pilot work

PARAMETERS	EXPECTED VALUES
Sludge age	<10 days
Energy demand	<15 MWh/d
WAS production*	0.35-0.45 kgSS/kgCOD$_{red}$
Nutrients dosing	0 kgN/d + 50kgP/d
WAS usage	High value (Biogas + fertilizer)
Carbon footprint	8 tonCO$_{2eq}$/kg newsprint

RESULTS

EffiSludge conditions apply to the Skogn case, are expected to provide an **annual carbon saving of 3500 tonnes CO$_2$** (due to energy saving and nutrients recirculation). Additional carbon saving could be achieved based on the specific sludge disposal practice. WAS quality and composition will be monitored over time to identify how STR and OLR will impact sludge microbial composition.

ACKNOWLEDGMENTS

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