



## Anaerobic digestion of liquid products following hydrothermal carbonisation of faecal sludge at different reaction conditions

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### ABSTRACT

The hydrothermal carbonisation (HTC) conversion of wet wastes, such as sewage sludge, generates a carbon-rich material (called 'hydrochar'), and an aqueous fraction with a small release of gas. The liquid fraction is high in soluble chemical oxygen demand, from 10 to 50 g/L, and could not be discharged to the natural environment without treatment. This study investigates the anaerobic digestibility of this HTC liquid stream from different HTC temperatures and retention times (140°C–200°C for 30–240 min). It is focused on biogas production in order to improve the energy input of the HTC process and to improve process sustainability. The results demonstrated that liquid products from the lower HTC temperatures gave better biogas production. The biogas yield from the 140°C HTC filtrate digestion was 0.45–0.86 L/L reactor/d, while 0.33 L/L reactor/d was obtained from 170°C and 0.31–0.45 L/L reactor/d from 180°C HTC filtrates. The lowest anaerobic digestion (AD) efficiency was recorded for the treatment from 200°C with biogas yield of 0.07 L/L reactor/d. The data also show that low AD hydraulic retention time (HRT), typical of high rate fixed biomass digesters can be used to treat the HTC filtrate. Halving the AD HRT to 0.9 d resulted in 1.8–6.8 times greater biogas yield.

**Keywords:** Anaerobic digestion; Hydrothermal carbonisation; biogas; Sewage sludge; Wastewater treatment

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