

NORDIWA 2021

28 September – 1 October

Digital conference & exhibition

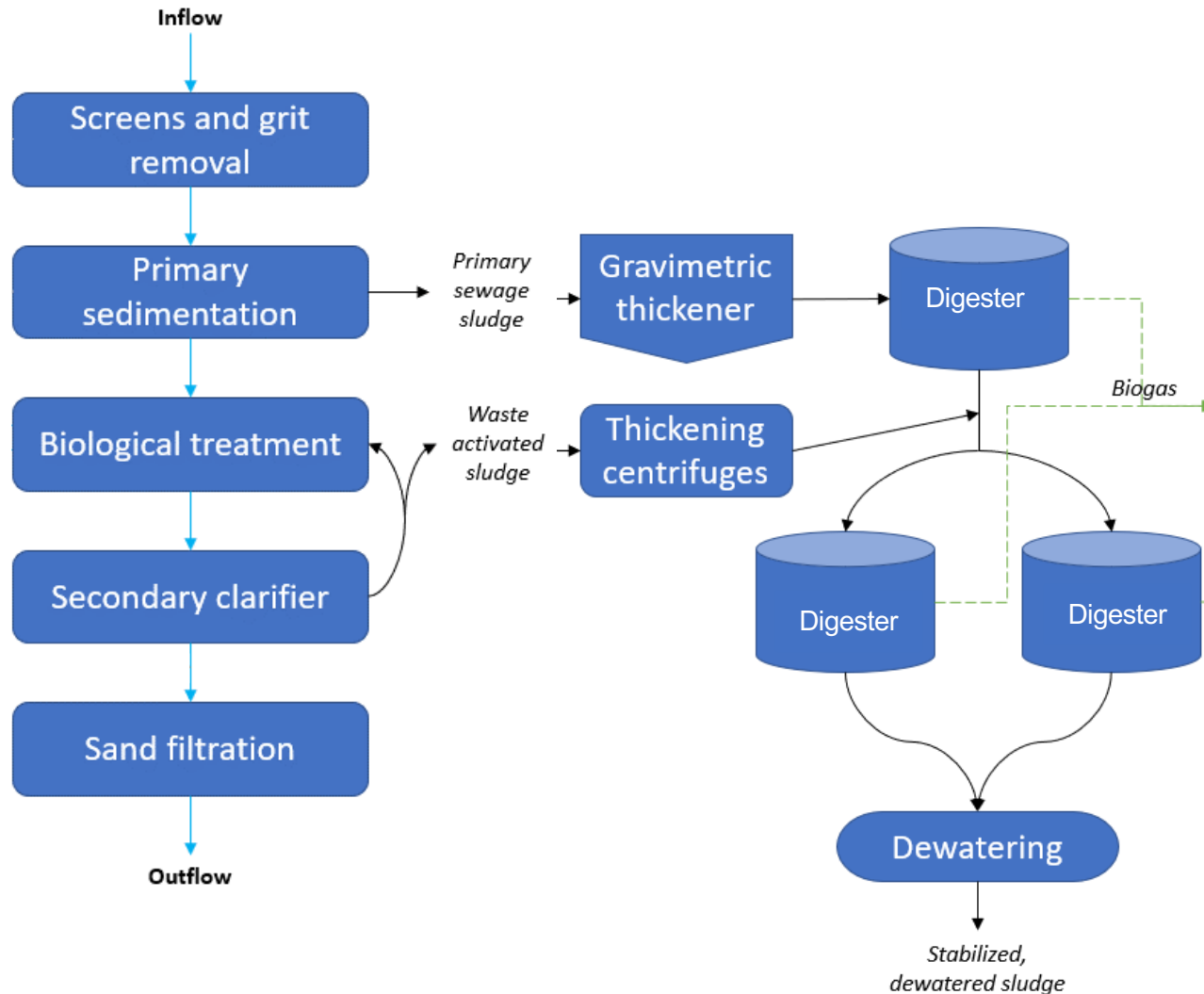
Semi full-scale study - High loaded
mesophilic anaerobic digestion of primary
sewage sludge

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Jesper Olsson



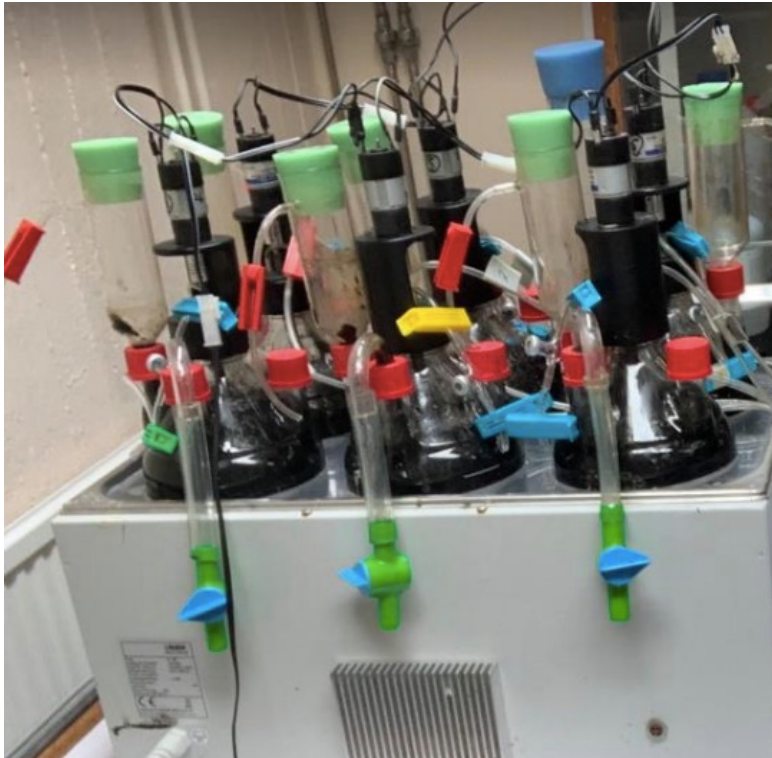

KÄPPALA

Introduction - WWTP



Introduction - Study

Lab scale study



Semi full-scale study



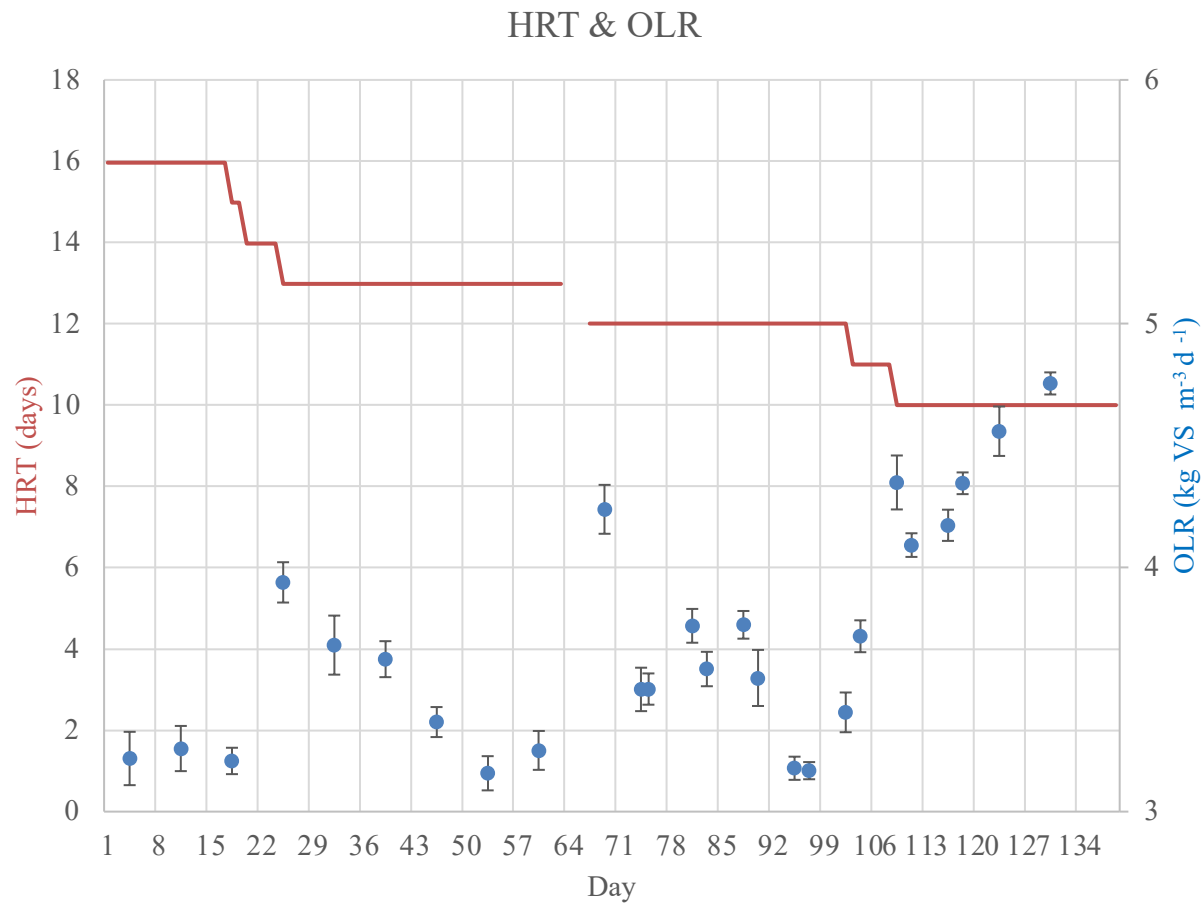
Material and method



Material and method

- Reference level
 - 1st HRT: 16 days, OLR: 3.2 ± 0.1 kg VS / m³, d
- HRT stepwise decrease
 - 2nd HRT: 13 days
 - 3rd HRT: 12 days
 - 4th HRT: 10 days

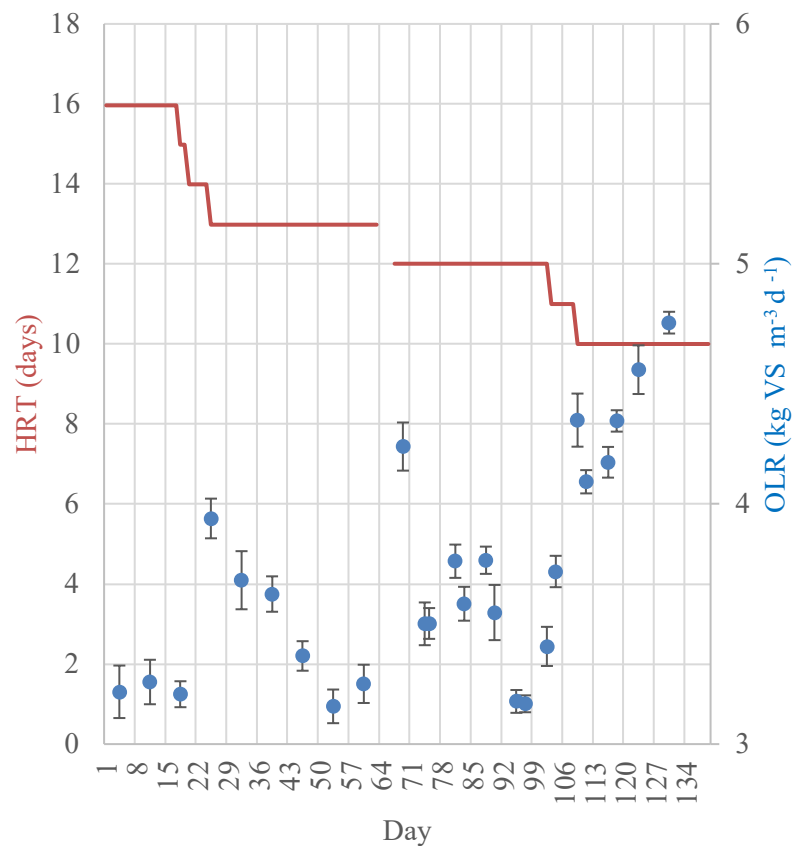
Results – HRT & OLR



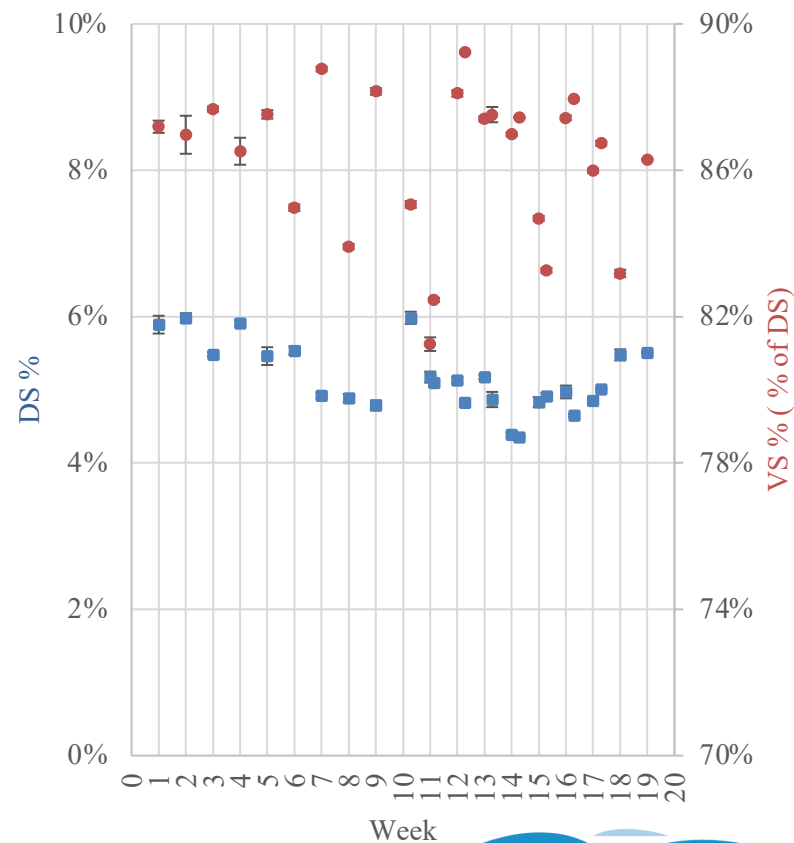
HRT [days]	OLR [kg VS/ m ³ ,d]
16	3.2 ± 0.1
13	3.5 ± 0.2
12	3.6 ± 0.3
10	4.4 ± 0.2

Results – HRT & OLR, DS & VS

HRT & OLR



DS & VS – Primary sludge

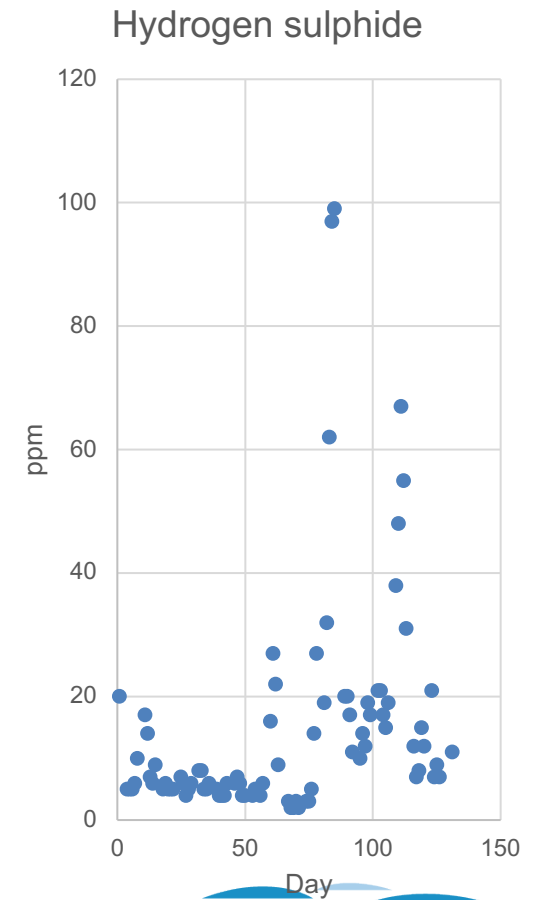
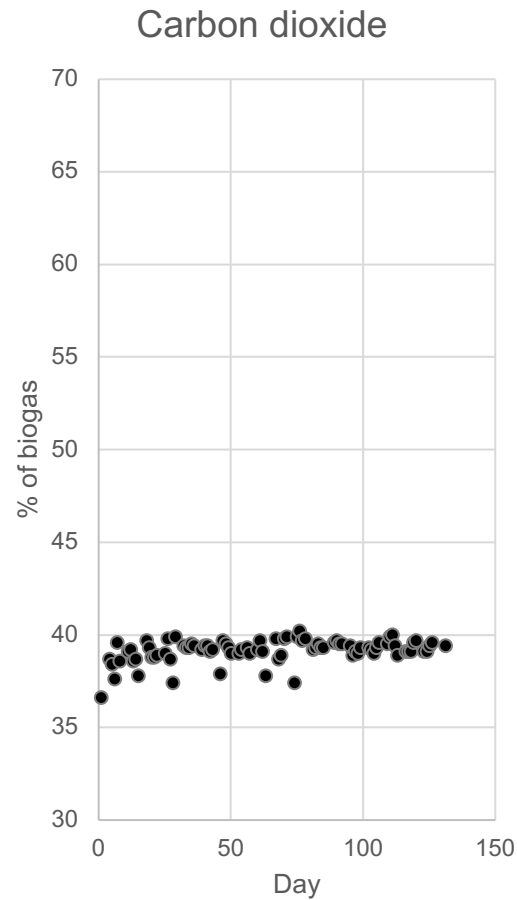
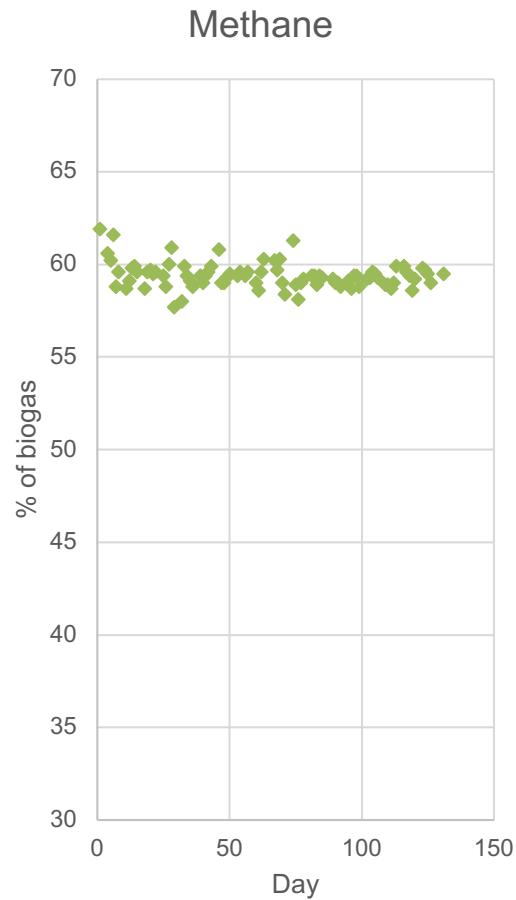


Results – Biogas

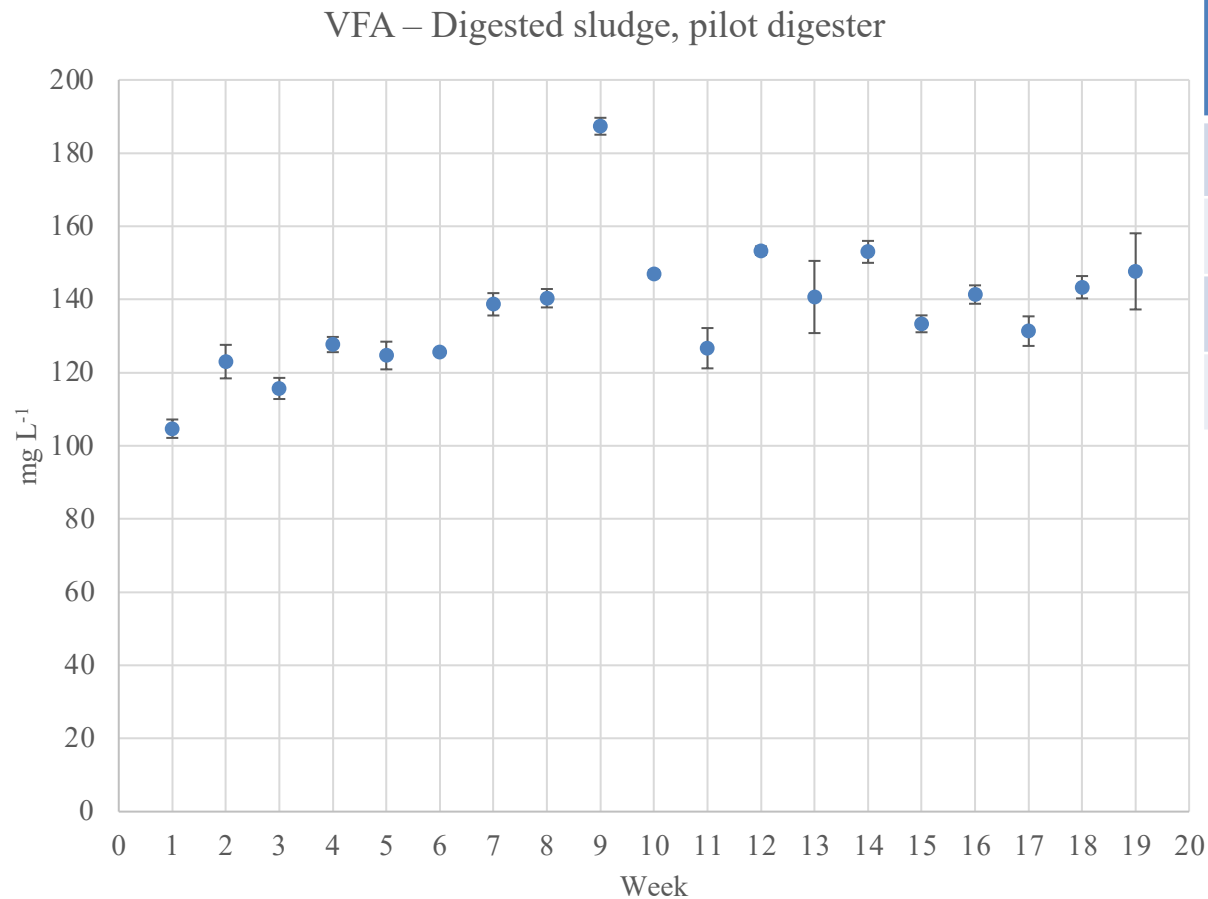
HRT	16	13	12	10
OLR	3.2 ± 0.1	3.5 ± 0.2	3.6 ± 0.3	4.4 ± 0.2
VMP	1010 ± 80	1150 ± 90	1110 ± 70	1340 ± 70
SMP	320 ± 20	330 ± 20	320 ± 15	310 ± 15

- The VMP increased when the OLR increased
- SMP relatively stable even when the OLR increased
 - No distinct difference in increase/decrease
- Stable biogas composition
 - CH₄: Average of 60 %
 - CO₂: Average of 39 %
 - H₂S: Average of 15 ppm, with some spikes

Results – Biogas composition

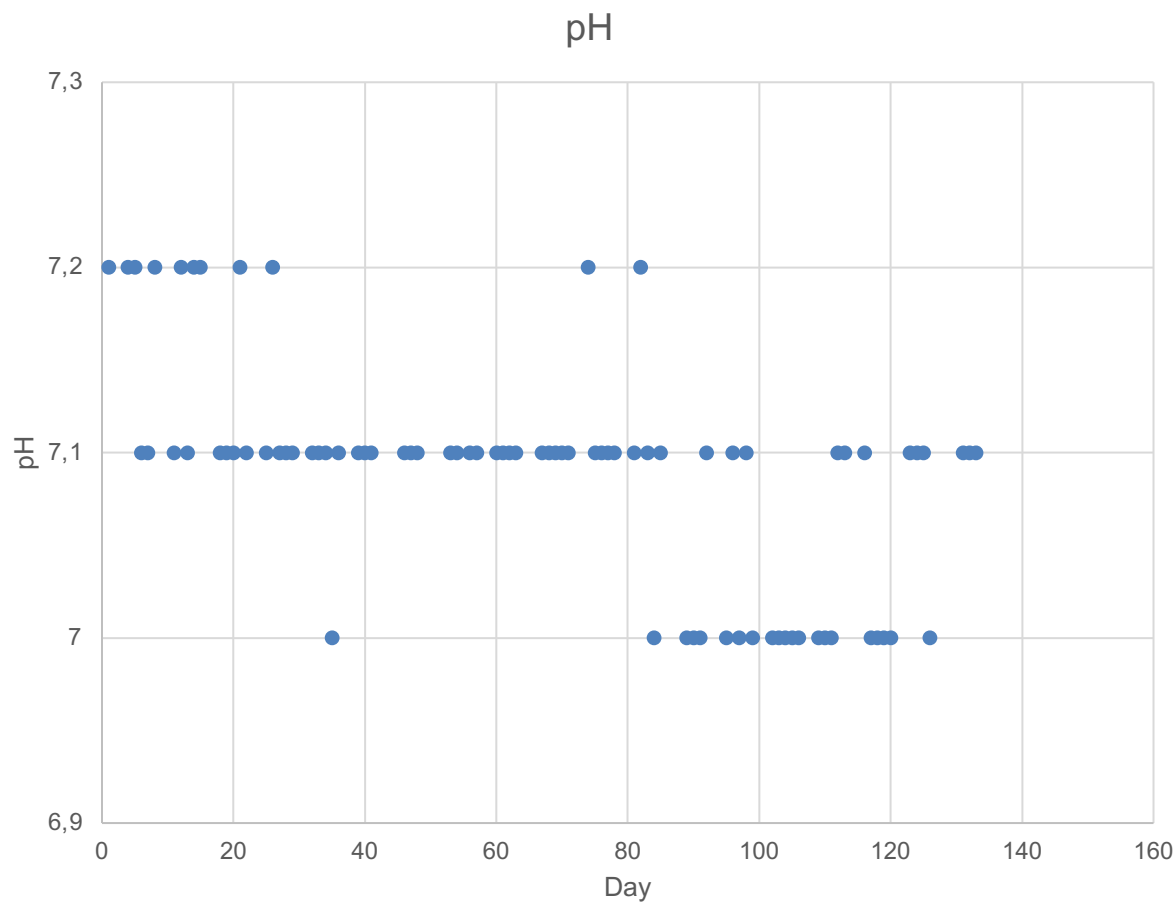


Results – VFA



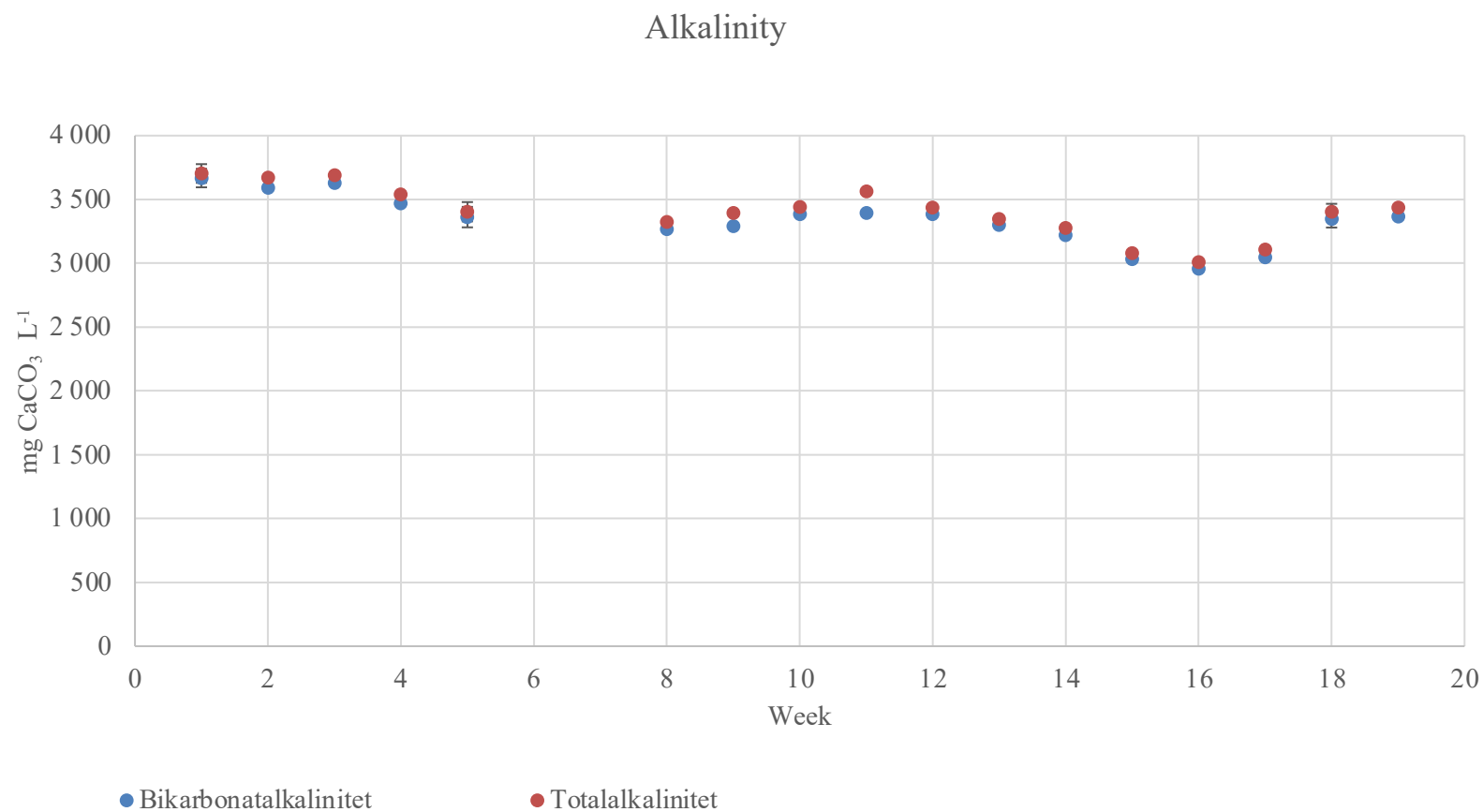
HRT [days]	VFA [mg/L]
16	114 ± 11
13	141 ± 22
12	142 ± 11
10	141 ± 8

pH



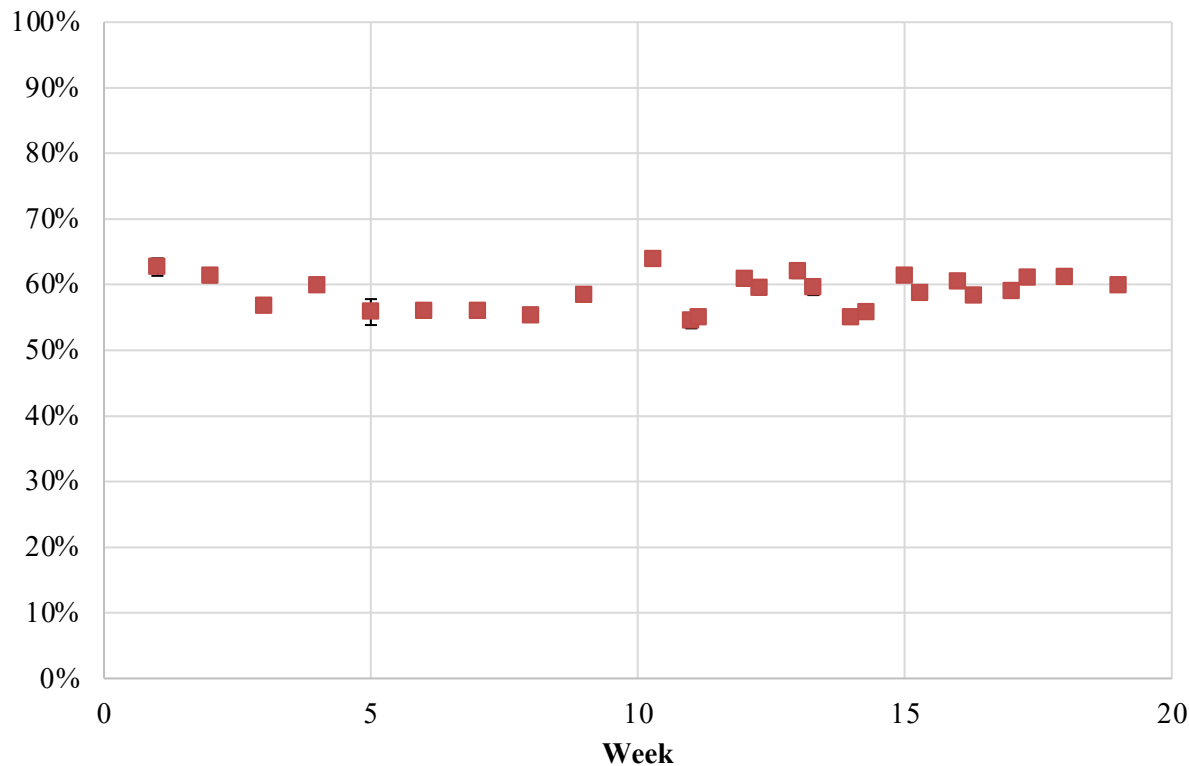
HRT [day]	pH
16	7.2 ± 0.1
13	7.1 ± 0.0
12	7.1 ± 0.1
10	7.1 ± 0.1

Results – Alkalinity



Results – Degree of digestion

Degree of digestion



HRT [day]	Degree of digestion [%]
16	62.0 ± 1.6
13	56.9 ± 2.9
12	58.8 ± 2.7
10	60.0 ± 1.6

Conclusion

- No changes in the SMP, VFA, pH nor biogas comp.
- Stable process with an OLR as high as 4.4 kg VS / m³, d
 - Greater risk for overloading the process since the “upper-limit” of the OLR is closer

Thank you for listening!

