

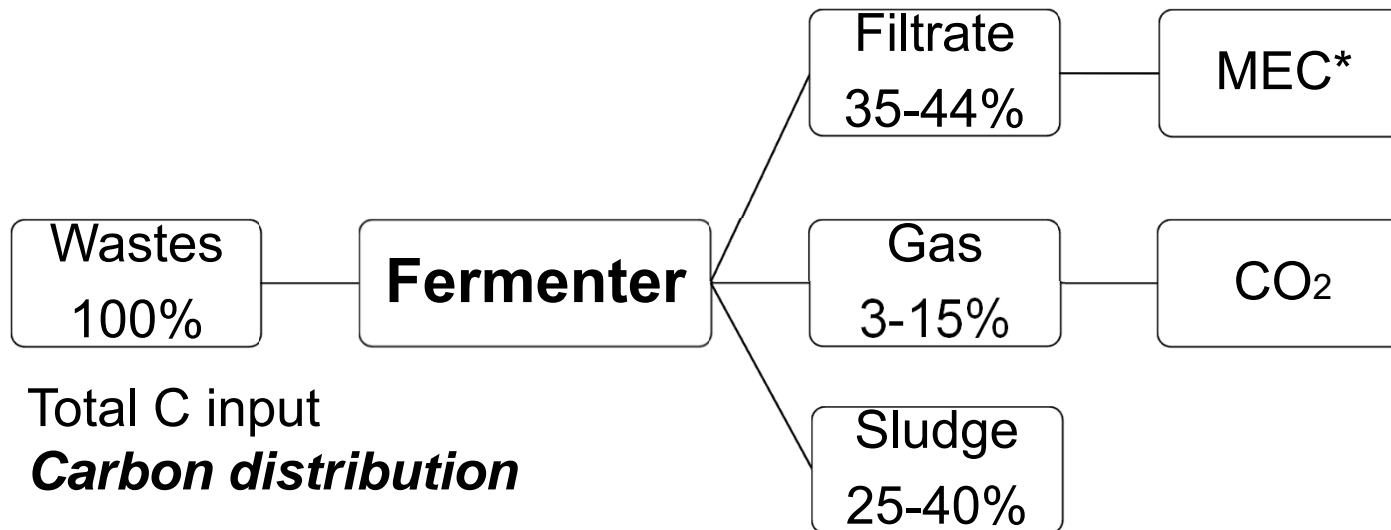
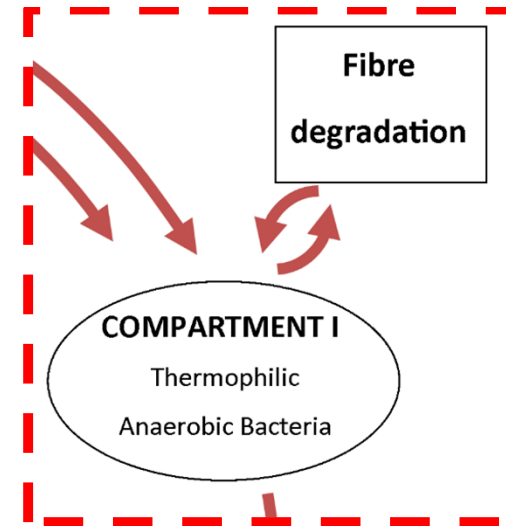
Carbon and nitrogen recovery by hydrothermal oxidation

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Hydrothermal oxidation

Biodegradation efficiency is low:
Proteolysis: 70%;
Fiber: 44%.



Total C input
Carbon distribution

*MEC: Microbial electrolysis cell

Hydrothermal oxidation



Filtrate 35-44%	VFAs, soluble nitrogen, and others
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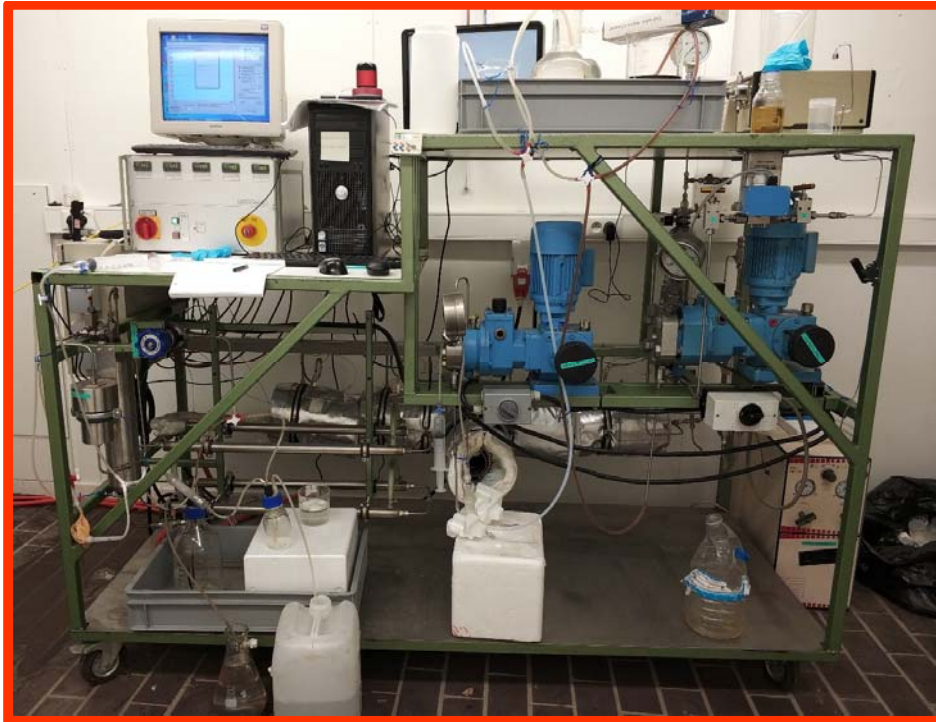
Continuous reactor



Sludge 25-40%	Cellulose, xylan, lignin, insoluble nitrogen, VFAs, and others.
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Batch reactor





Continuous reactor

Temperature (°C)	Residence time (s)	OER*
300	<u>48</u> , 58, 68	1
340	38, <u>48</u> , 58	1.5
360	38, <u>48</u> , 58	3
380	28, 38, <u>48</u>	4

*Oxygen equivalence ratio



Batch reactor

Temperature (°C)	Residence time (s)	OER*
300		0,5
400	60	1
450	300	1.5
500	600	2

Sample analysis:

Gas samples:

- ◇ Micro-GC

Liquid effluent:

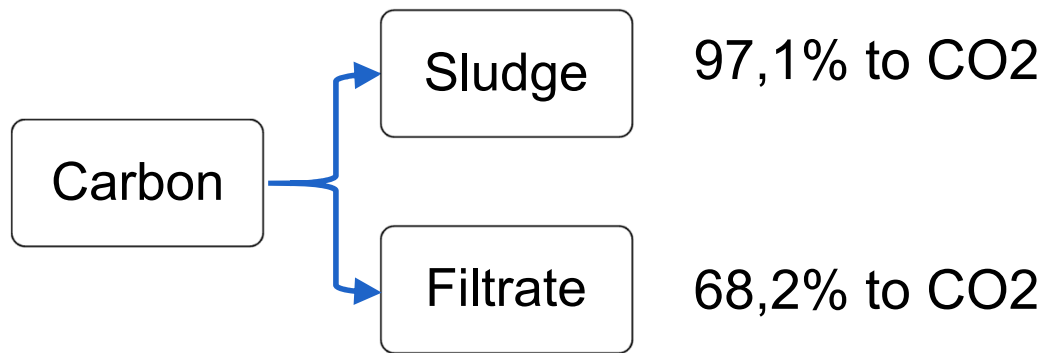
- ◇ TOC analyzer
- ◇ Elemental analyzer
- ◇ NANOCOLOR® kits
(ammonia, nitrite, nitrate)
- ◇ GC-MS
- ◇ GC-FID
(VFAs)



RESULTS – CARBON DISTRIBUTION

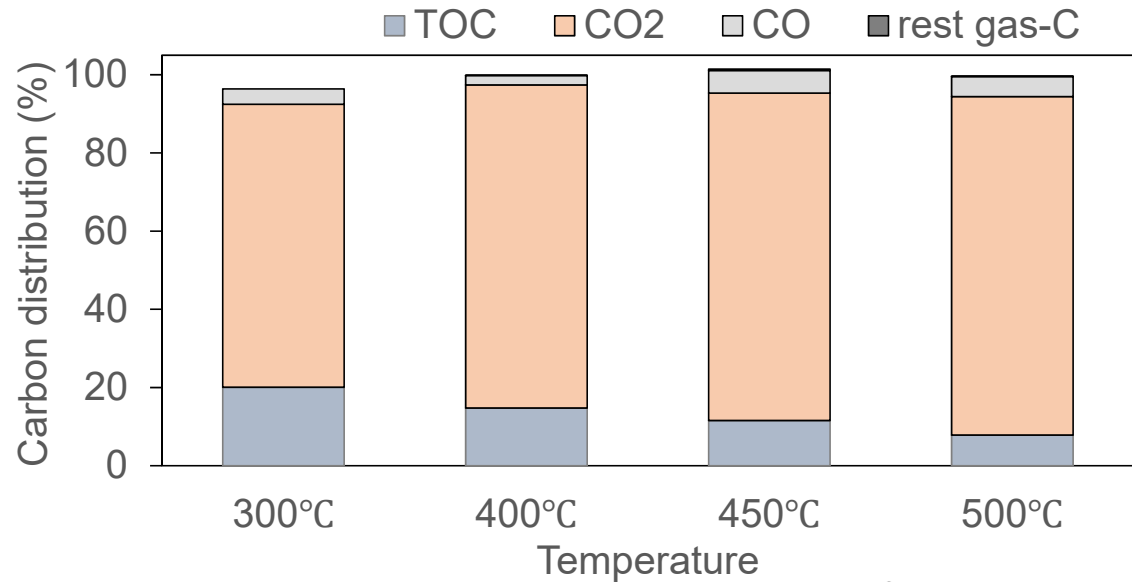
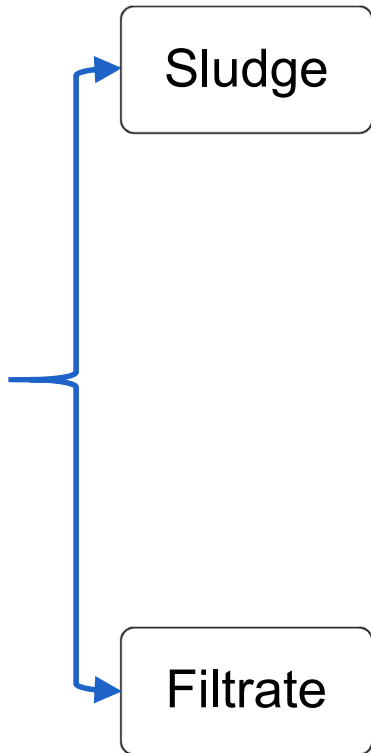
Total C input

Carbon distribution



Acetic acid is the main residual for both feed.

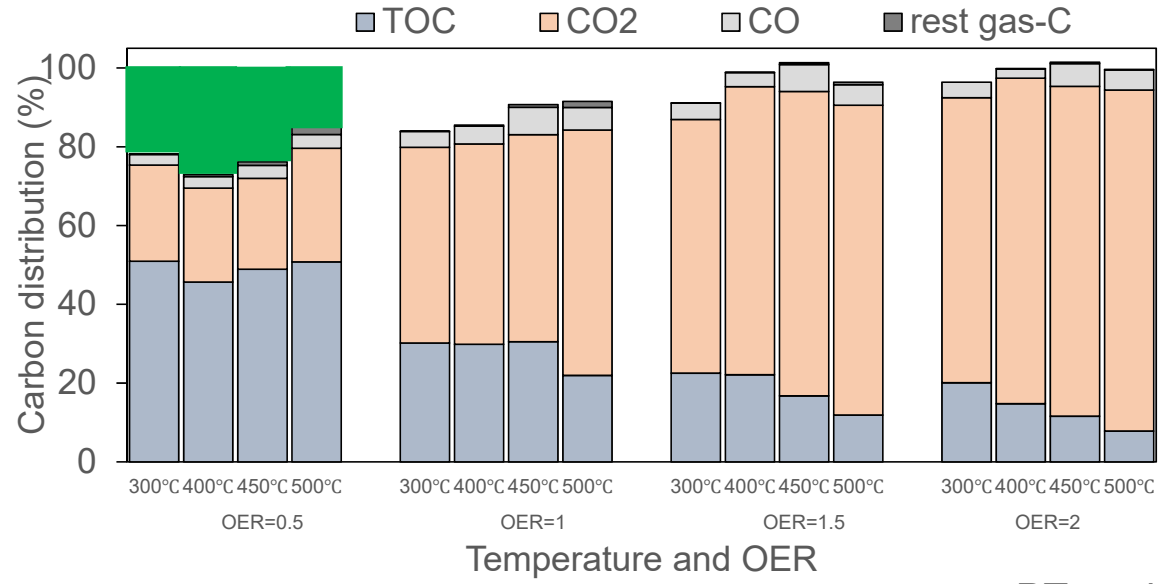
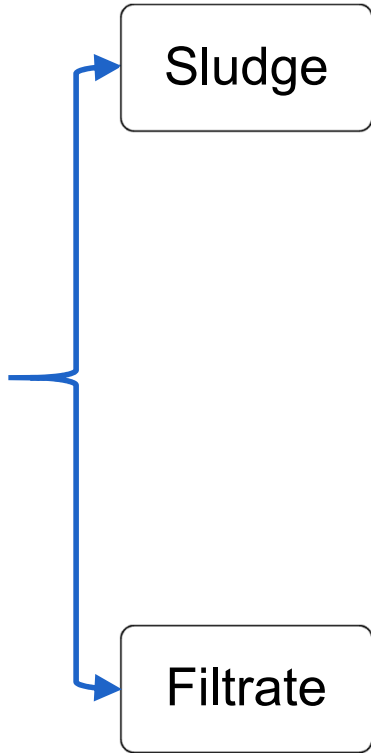
GAS



OER=2, RT=1min

Almost all converted into CO₂, few cases with ethylene < 0,03 vol%

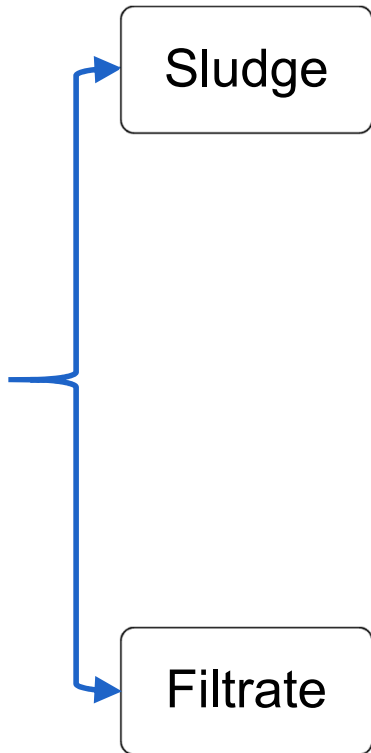
SOLID



RT=1min

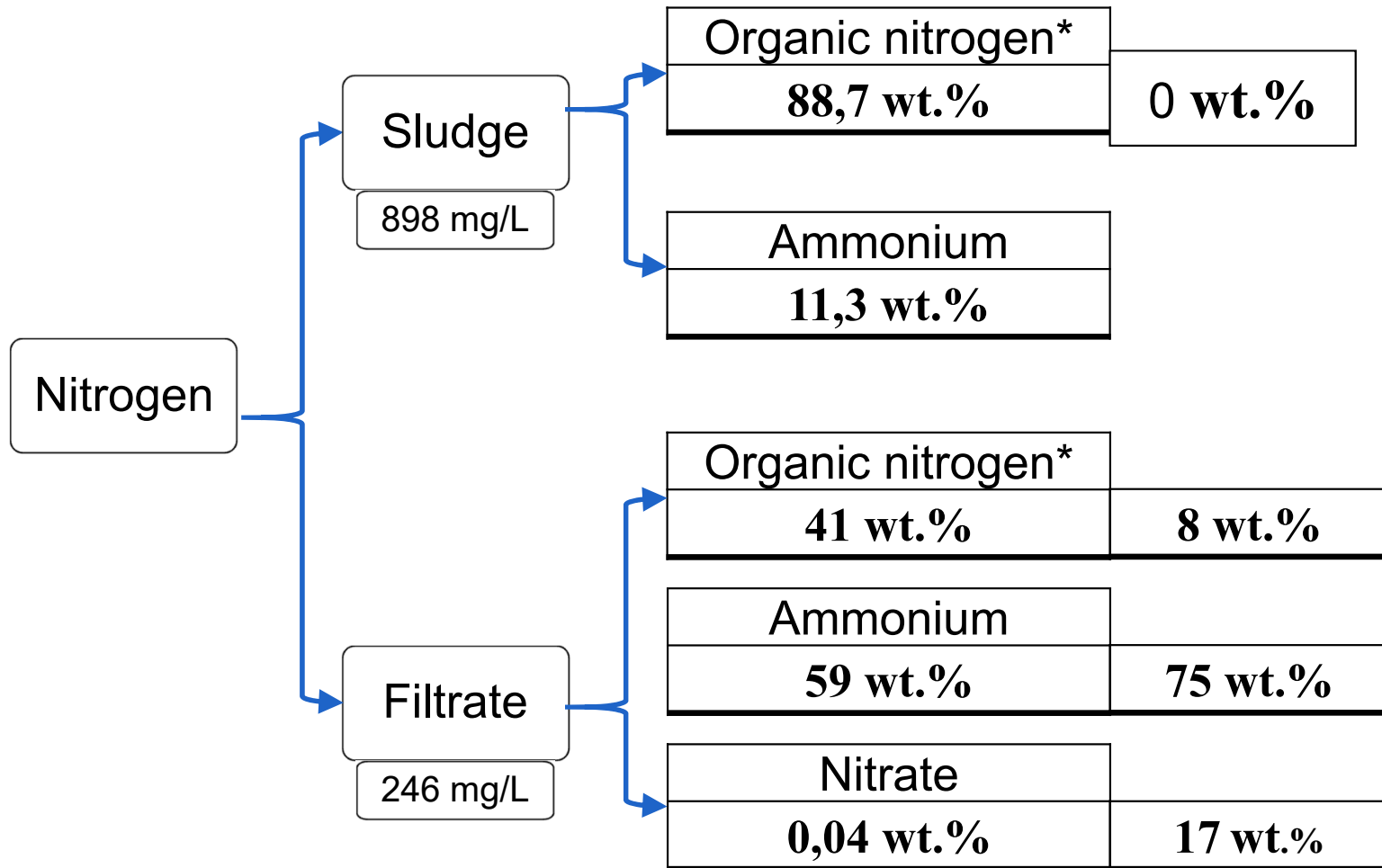
No solids produced.

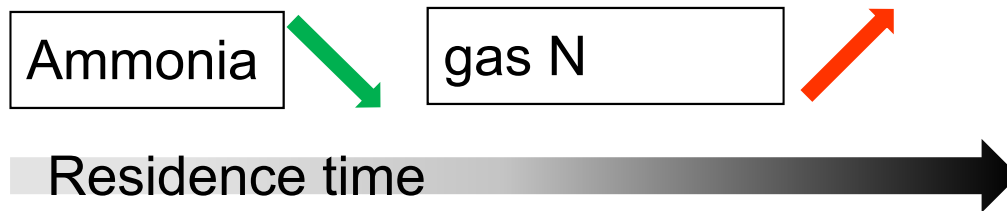
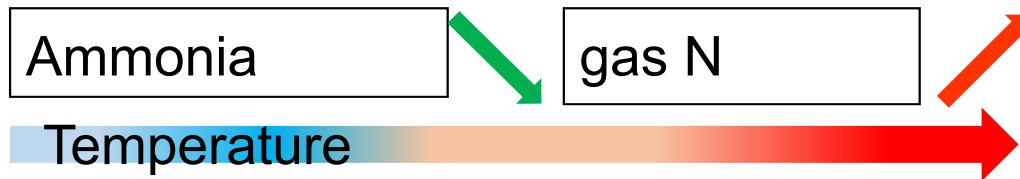
Liquid



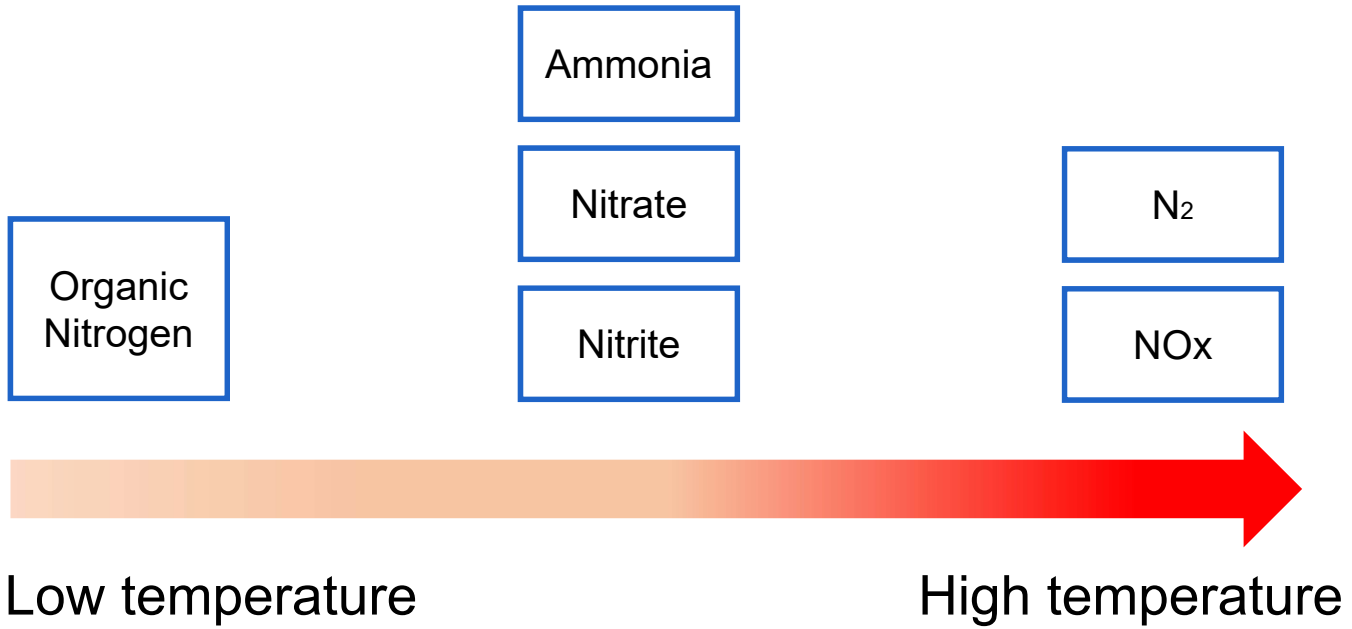
Volatile fatty acids are main residuals for both feed, and acetic acid is one of the main compound.

RESULTS – NITROGEN DISTRIBUTION





Ammonia 35,2%	LOST N 63,6%
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Nitrogen distribution

CONCLUSION

- Temperature, residence time and OER all have positive correlation on carbon conversion.
- Nitrogen distribution varies with temperature. Temperature have to be preciously controlled to avoid conversion of nitrogen to gas phase.
- 400 °C, OER=2, >1MIN could be one of the optimized conditions for carbon and nitrogen recovery.



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