



CETAQUA
CENTRO TECNOLÓGICO DEL AGUA

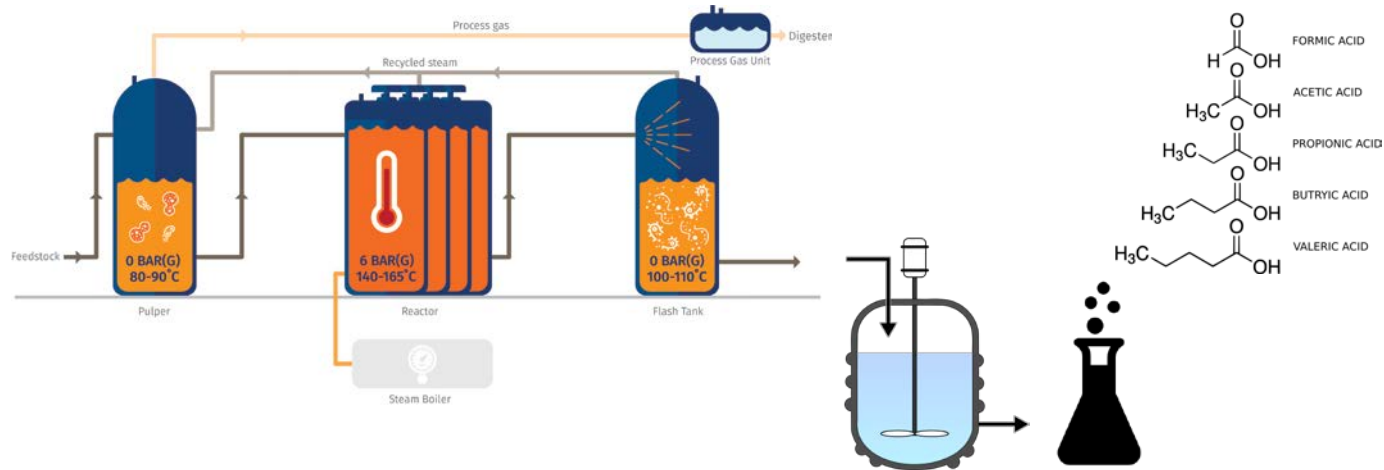
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Sustainable Solid Waste Management
15-18 June 2022, CORFU (Greece)

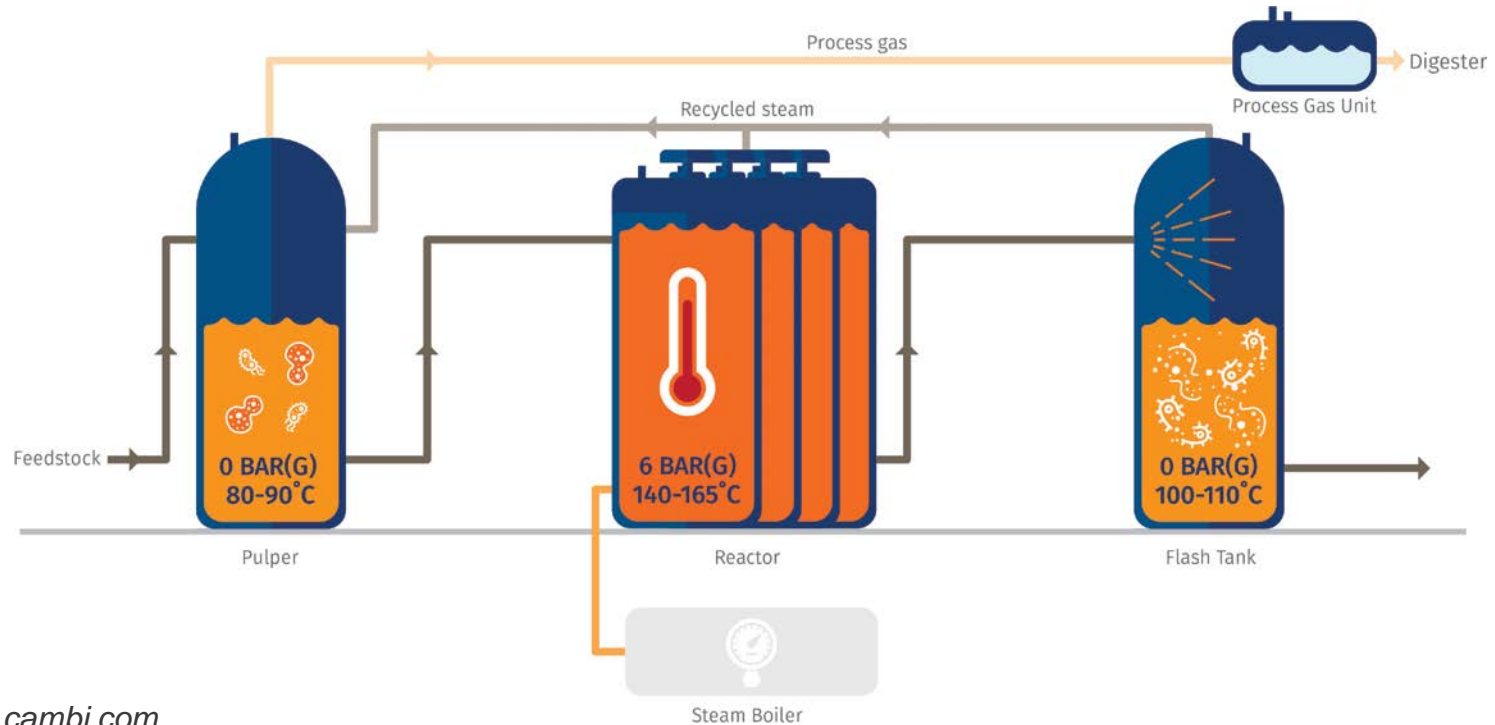
Thermal hydrolysis pre-treatment has no positive influence on VFA production from sewage sludge

Ander Castro, CETAQUA and USC (ander.castro@cetaqua.com)

S. Balboa and J. M. Lema, University of Santiago de Compostela

V. Paramá, B. Álvarez, C.M. Castro-Barros and A. Taboada-Santos, CETAQUA





Source: *cambi.com*

Review

Cell
P R E S S

Special Issue – Applied Microbiology

Waste to bioproduct conversion with undefined mixed cultures: the carboxylate platform

Matthew T. Agler¹, Brian A. Wrenn², Stephen H. Zinder³ and Largus T. Angenent¹

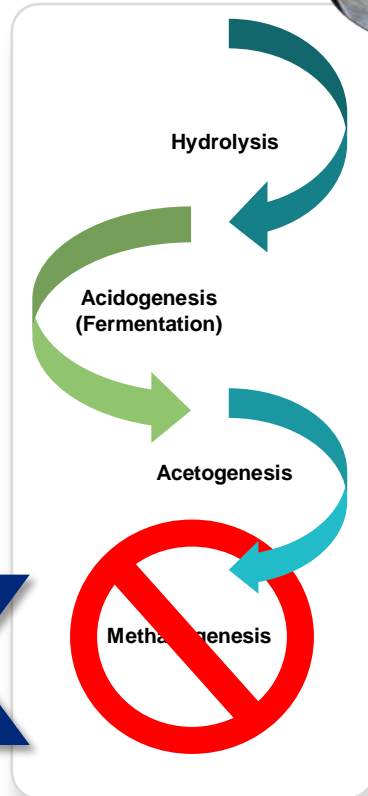
¹ Department of Biological and Environmental Engineering, Cornell University, Riley–Robb Hall, Ithaca, NY 14853, USA

² Department of Civil and Environmental Engineering, Temple University, 1947N. 12th Street, Philadelphia, PA 19122, USA

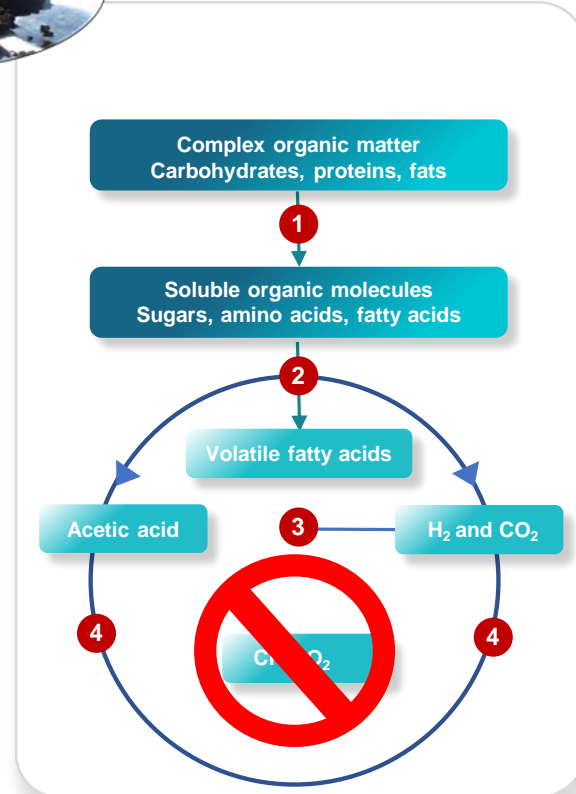
³ Department of Microbiology, Cornell University, Wing Hall, Ithaca, NY 14853, USA

Review

Trends in Biotechnology February 2011, Vol. 29, No. 2

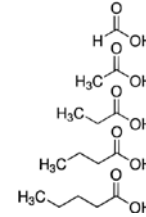


pH < 6 or > 8.5
and/or
OLR > 5
kg COD/m³·d



VFA

High added-value products
(less than 6 carbon atoms)



Two production routes

- Petrochemical industry (97%)
- Biological processes (3%)



Wide range of applications

- Chemical industry
- Pharmaceutical industry
- Food industry
- Bioplastic production



Sewage sludge: suitable substrate to produce VFA

Essential change of trend
towards biobased production



High market demand

VFA market value: biogas
value x5

To evaluate the **effect** of **thermal hydrolysis** on the **volatile fatty acids production** from sewage sludge





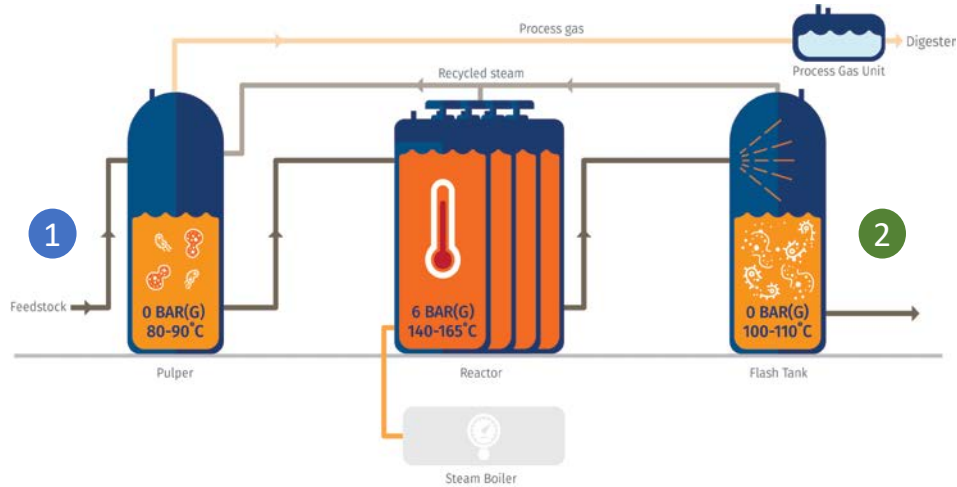
BATCH MODE (0.5 L)

- Acidification test
- Biomethane Potential Test

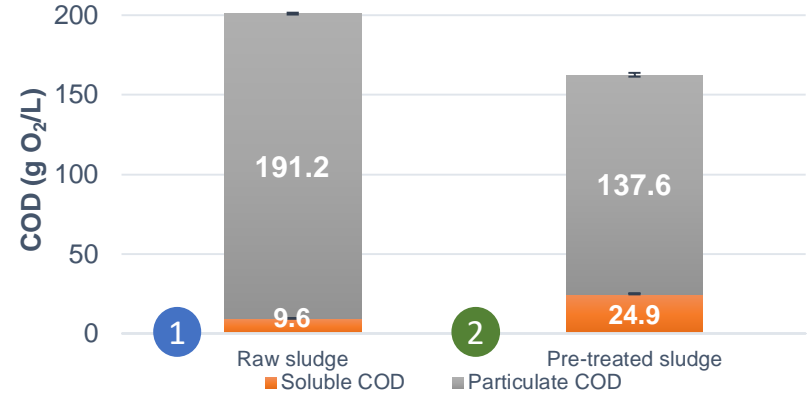
CONTINUOUS STIRRED TANK REACTORS (5 L)

- pH 8.5
- HRT 10 d

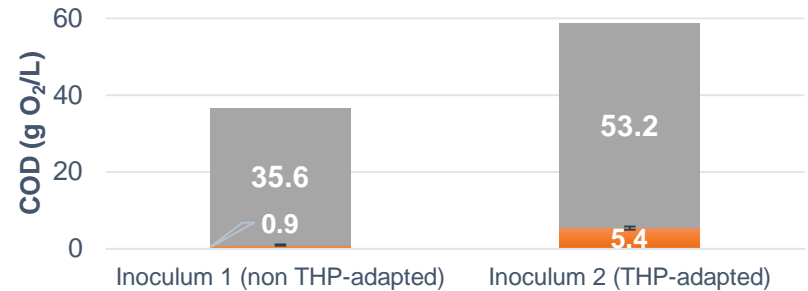
Is the same effect observed in both modes of operation?



Substrate characterization



Inocula characterization

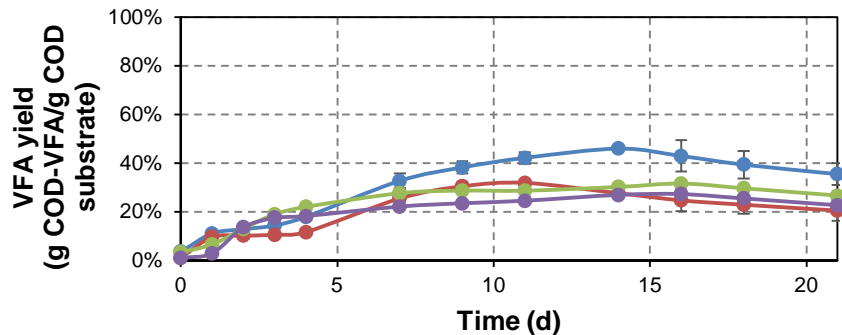




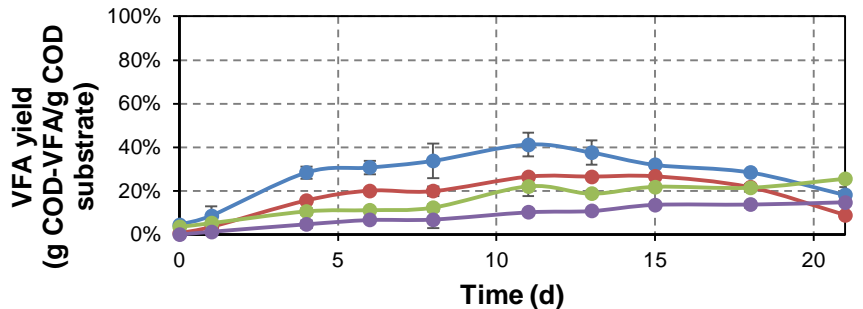
Acidification test execution:

- Adapted AMPTS II device (for liquid sampling)
- Bottles with working volume of 0.5 L (triplicate)
- Mesophilic range (37 °C)
- F:M = 2 g COD substrate/g VS inoculum
- Addition of BES (3 g L⁻¹)
- pH adjusted to 8 and 10 with NaOH 50% (v/v)

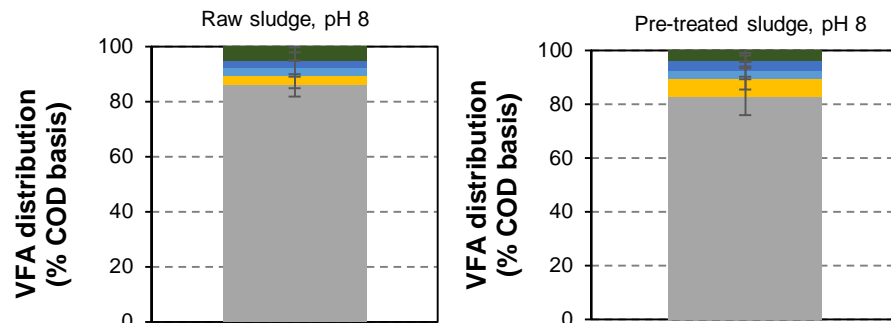
Inoculum 1



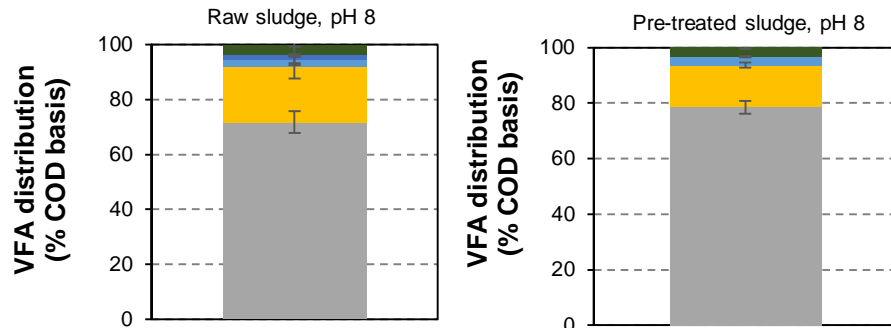
Inoculum 2



Inoculum 1



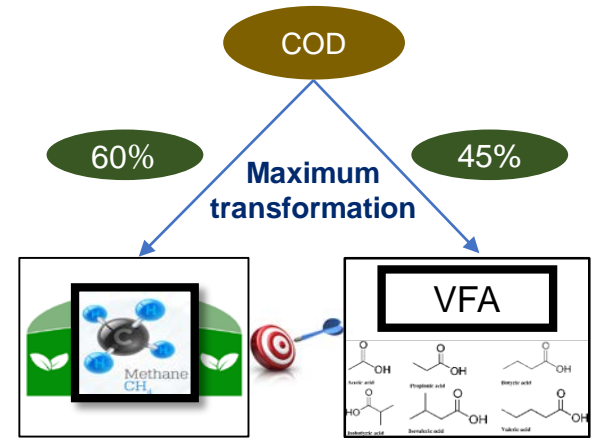
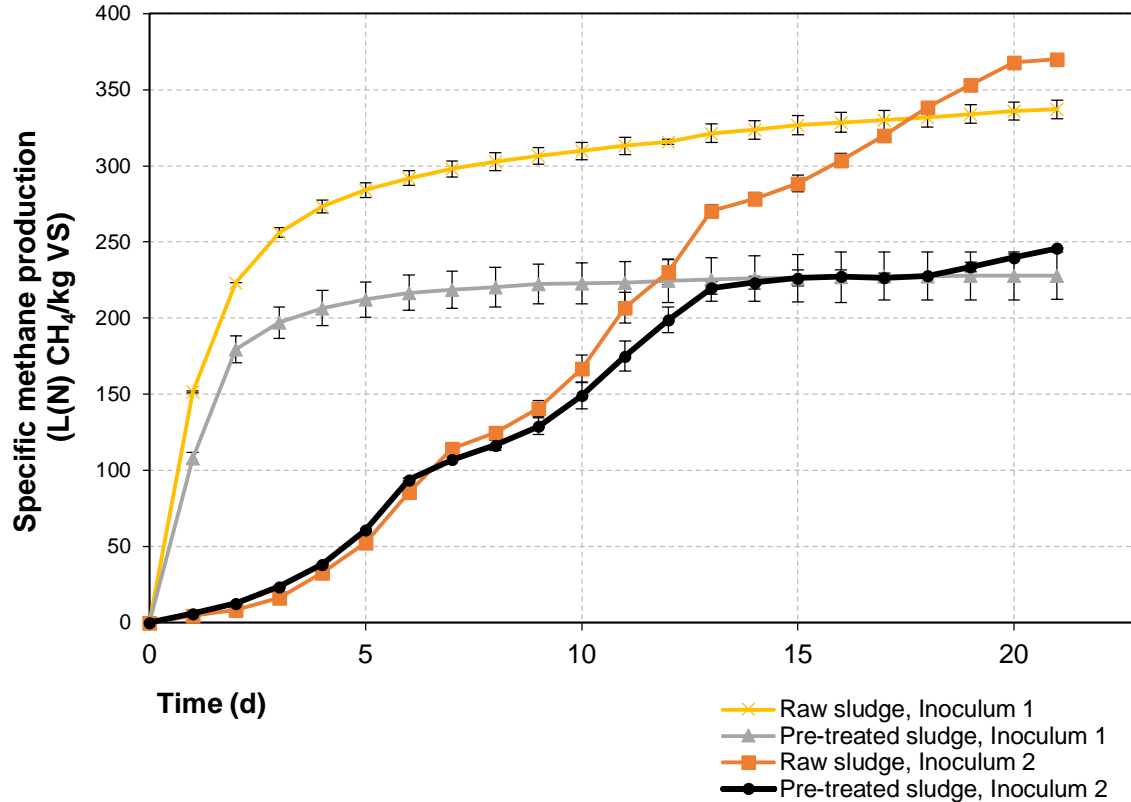
Inoculum 2





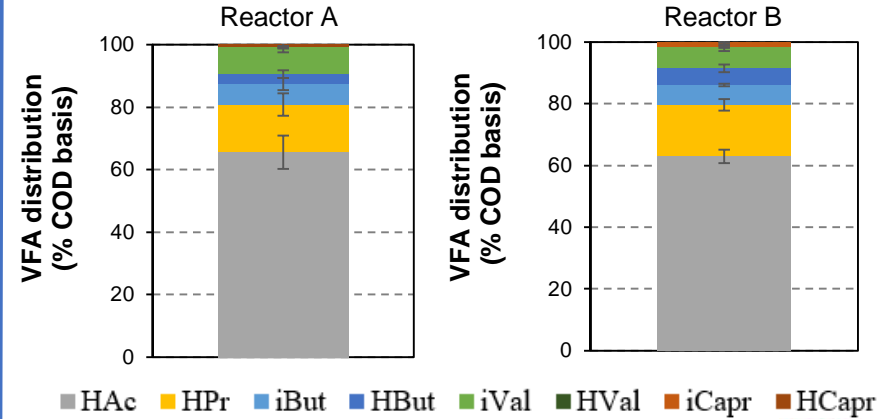
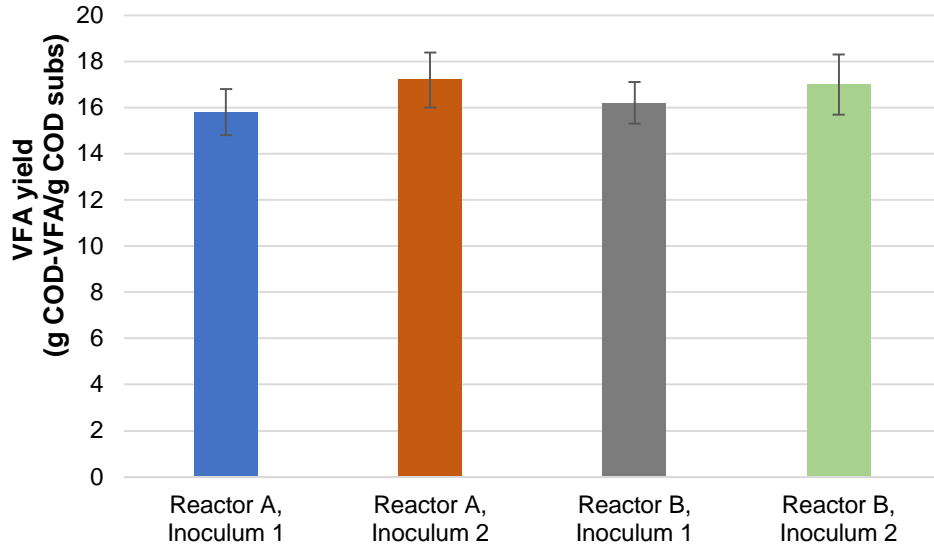
BMP test execution:

- AMPTS II device
- Bottles with working volume of 0.5 L (triplicate)
- Mesophilic range (37 °C)
- ISR (Inoculum to substrate ratio): 2 g VS inoculum/g VS substrate
- Neutral pH
- Protocol described by Holliger et al., (2016)



120 days of operation:
pH 8.5, HRT 10 d, substrate dilution to 60 g COD/L

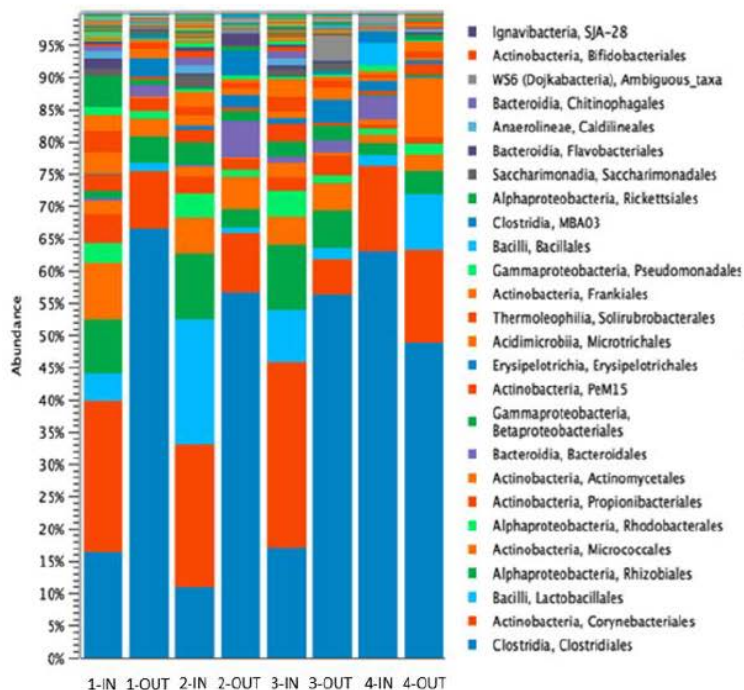
- Reactor A (fed with raw sludge)
- Reactor B (fed with pre-treated sludge)



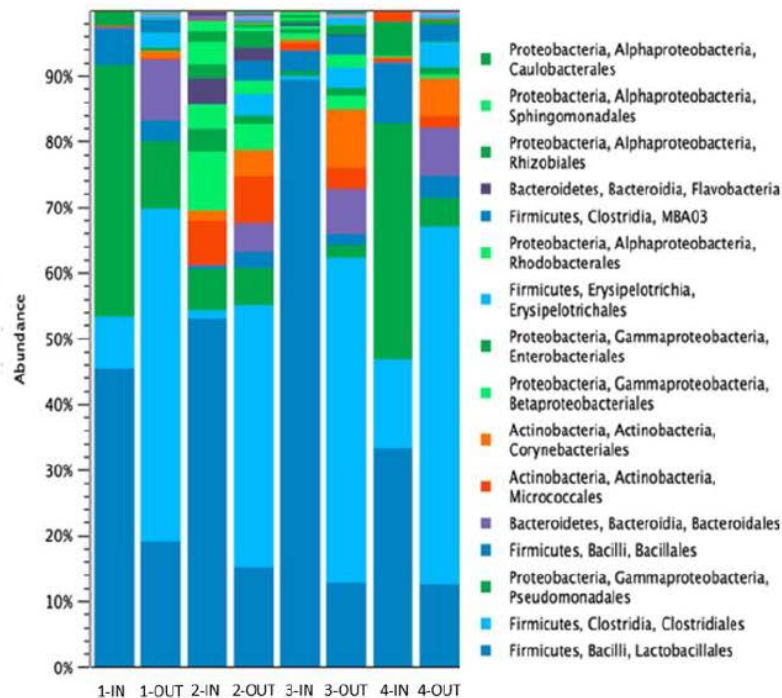
No significant difference between VFA yield obtained with raw and pre-treated sludge with either of two inoculums. VFA distribution mixes are also comparable



Reactor A (raw sludge)

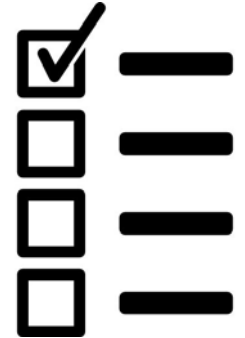


Reactor B (pre-treated sludge)



THP implies lower diversity of populations in reactor inlets but in the outlets the predominant populations are the same (Clostridiales order more than 50% abundance)

- ❑ **THP has a negative influence on VFA yield in batch test**, being that effect also visible in BMP tests with methane as final product.
- ❑ **THP has no influence on VFA yield in continuous mode**, which resulted substantially lower than in batch conditions regardless the inoculum used.



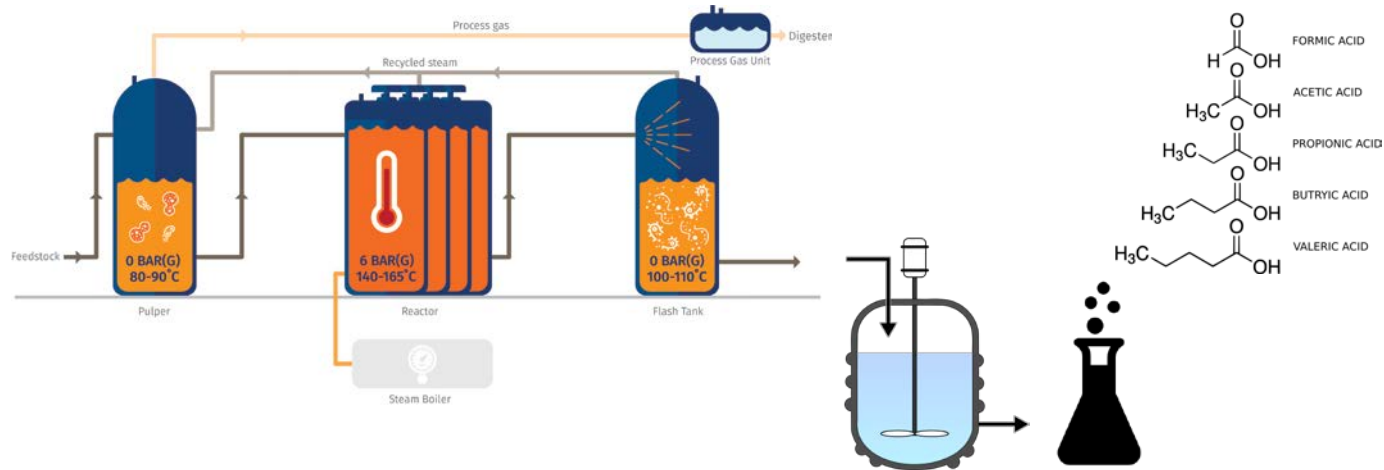


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Research.
Collaboration.
Thinking forward.