

Continuous mesophilic hydrolysis of sludge after thermal pretreatment

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Background

- ▶ The world's **population is increasing** and concentrating in urban centres
- ▶ An additional 2.1 billion people are expected to be living in cities by 2030, increasing the **waste production**
- ▶ The **fate** of these wastes is **depends on the local context**: they can be collected or not, treated or not and finally used directly, indirectly or end without beneficial use
- ▶ Municipal wastewater and sludge contain **valuable resources** such as water, organic matter, energy, and nutrients (e.g. nitrogen and phosphorus) which can be recovered for many and very diverse economic, social and environmental purposes

3

Background

- ▶ These nutrients are **trapped inside** sludge cells
- ▶ Pretreatment and hydrolysis are ways to **break the sludge cells**, realising nutrients to liquid media

Objective: to test the influence of thermal pretreatment on the continuous mesophilic hydrolysis of dewatered sludge

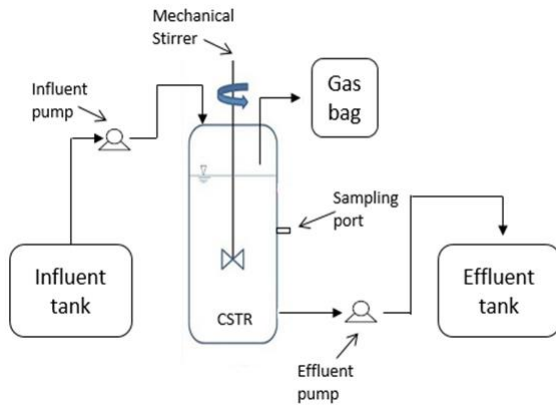
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Methodology

- ▶ Dewatered sludge was collected from a local Wastewater Treatment Plant and it was stored under 4°C until further use
- ▶ Pretreatment of sludge
 - ▶ Sludge was diluted (2% TS) and placed in an oven overnight (100 °C)
 - ▶ After reaching ambient temperature, pH was adjusted to 6
- ▶ Control
 - ▶ Diluted sludge at pH 6

5

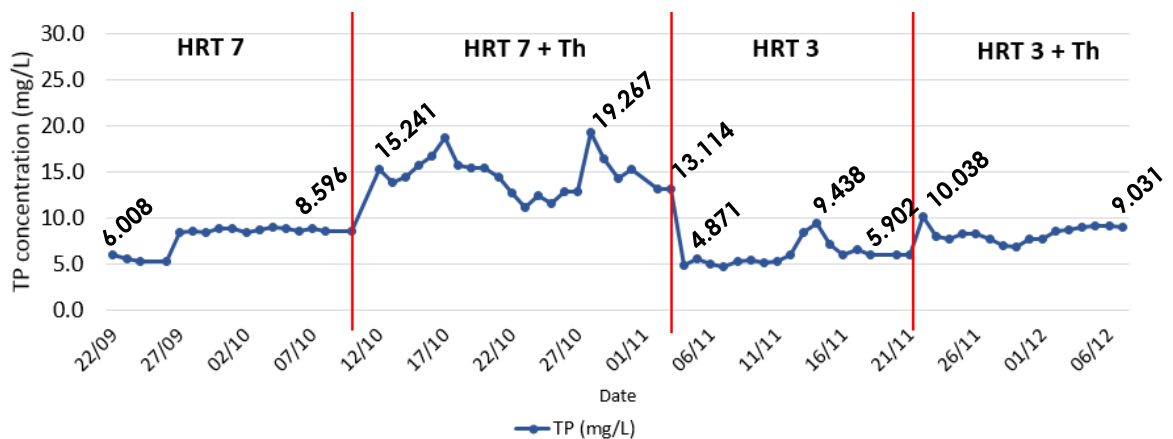
Schematic diagram of CSTR



- ▶ CSRT – 5 l capacity (3.5 l working volume)
- ▶ Temperature (35 °C)
- ▶ Hydraulic retention time (3 and 7 days)
- ▶ Constant agitation (100 rpm)
- ▶ Samples were collected daily – TP, TN, pH

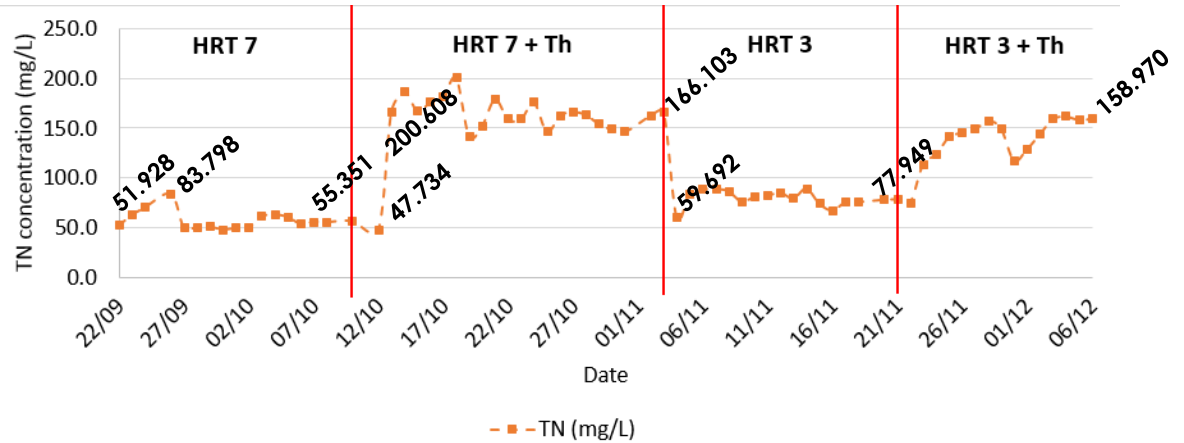
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Total phosphorus



7

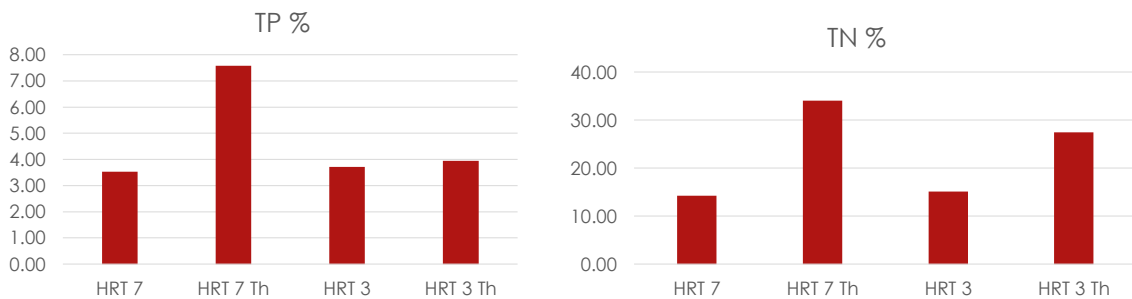
Total nitrogen



8

TP and TN percentage in total

TP and TN were determined through H_2O_2 digestion



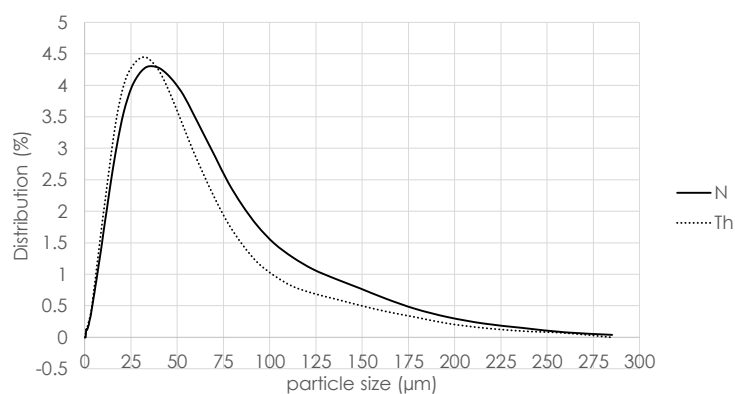
TP = 254.31 mg/L

TN = 589.14 mg/L

LOW EFFICIENCY!

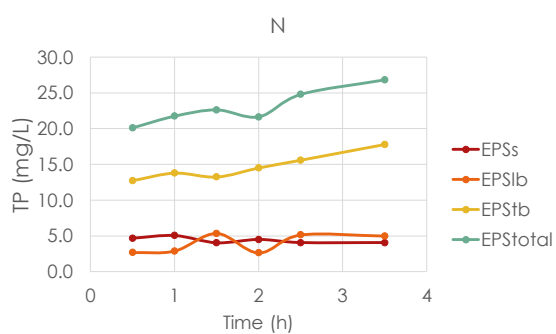
9

TSS and particle size distribution

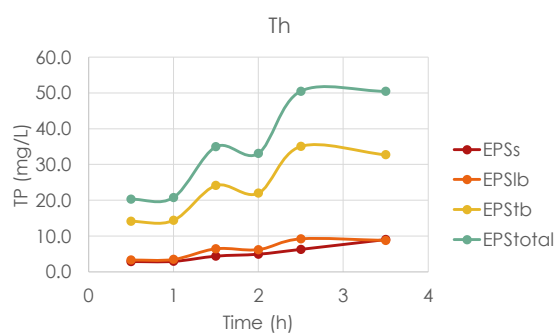


10

TP in EPS



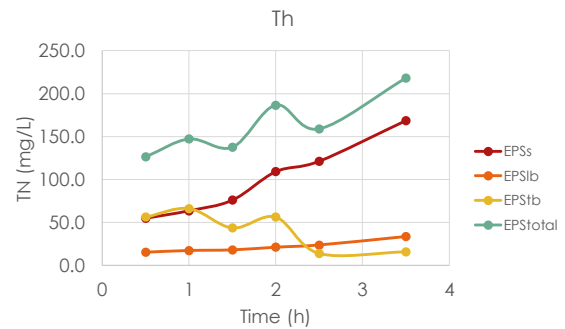
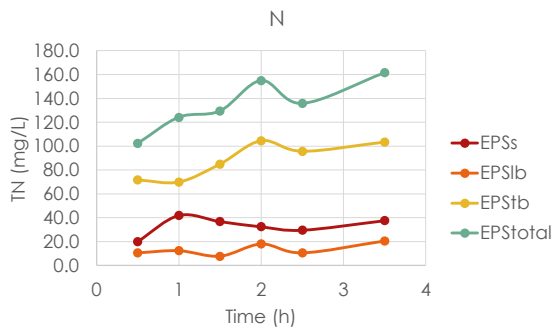
9.03% of TP



13.75% of TP

11

TN in EPS



12

Conclusion

- ▶ The results show an increase in the nutrients concentration in all the analysed scenarios
- ▶ The process happened at low efficiency
- ▶ Possible reasons:
 - ▶ Pretreatment wasn't enough to break sludge cells
 - ▶ Nutrients precipitated on the bottom of reactor

Thank you!



Thanks to CNPq for funding my
research