

Bioaugmentation: Pre-treatment of Biosolids in Anaerobic Digestion and Fermentation

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TRADEWORKS
ENVIRONMENTAL

What is the Ydro Process®?

The Ydro Process® is a bioaugmentation technology that increases the overall performance of biological treatment processes.

- The solution/technology includes the Ydro Process® microbial product, along with data analysis.
- The microorganisms are facultative, naturally occurring, non-GMO, and are freeze dried on a bran carrier
- The application of the Ydro Process® enables maximum performance and efficiency of the Anaerobic Digestion process, resulting in increased digestion rate and efficiency, leading to overall optimization.



How Does the Ydro Process[®] Work?

The Ydro Process[®] microorganisms produce their own enzymes in their metabolic process, treating the contaminants as food, converting them ultimately to VFA's and biogas

Operating conditions

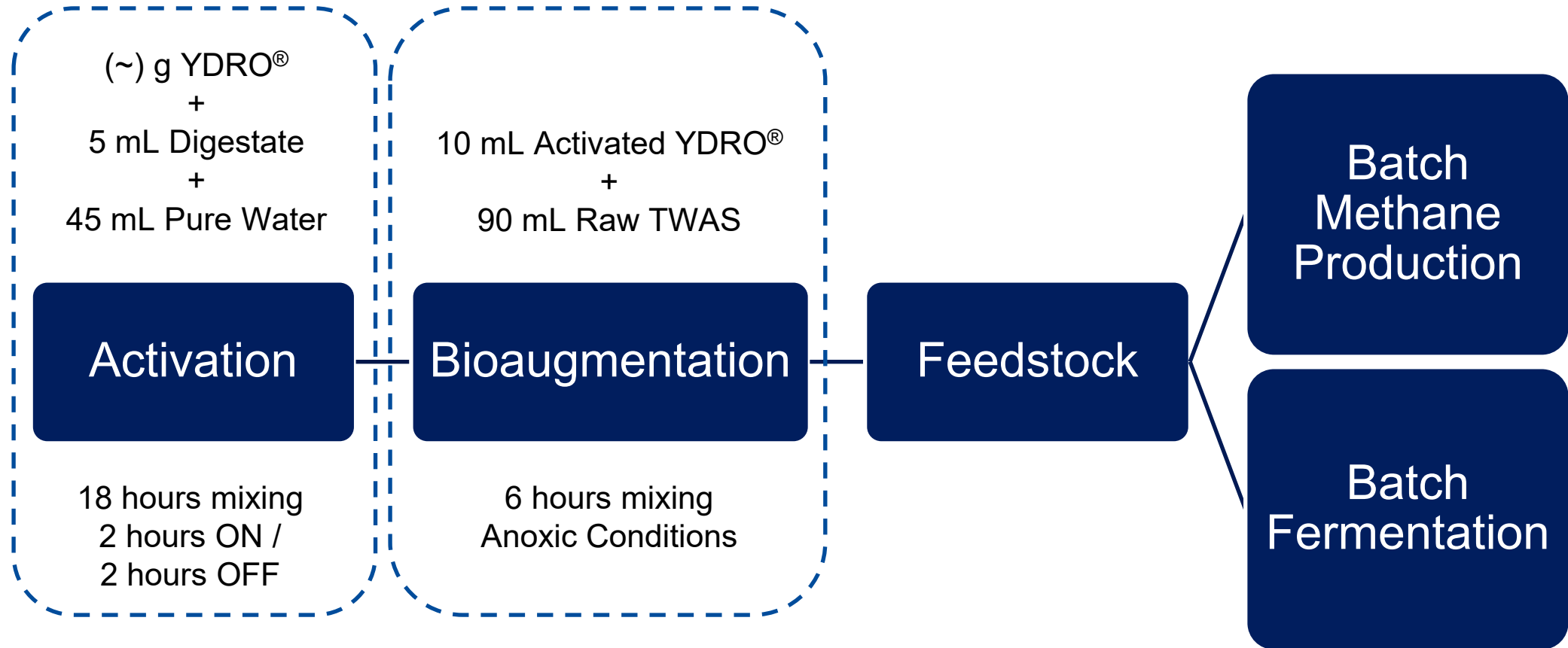
- Facultative stage – Microbial hydrolysis stage
It is a pre-digestion step as means of feedstock pre-treatment
- Anaerobic stage
Enhancement in shift of kinetics enable for higher production rate of biogas and methane

Ydro Process[®] Integration

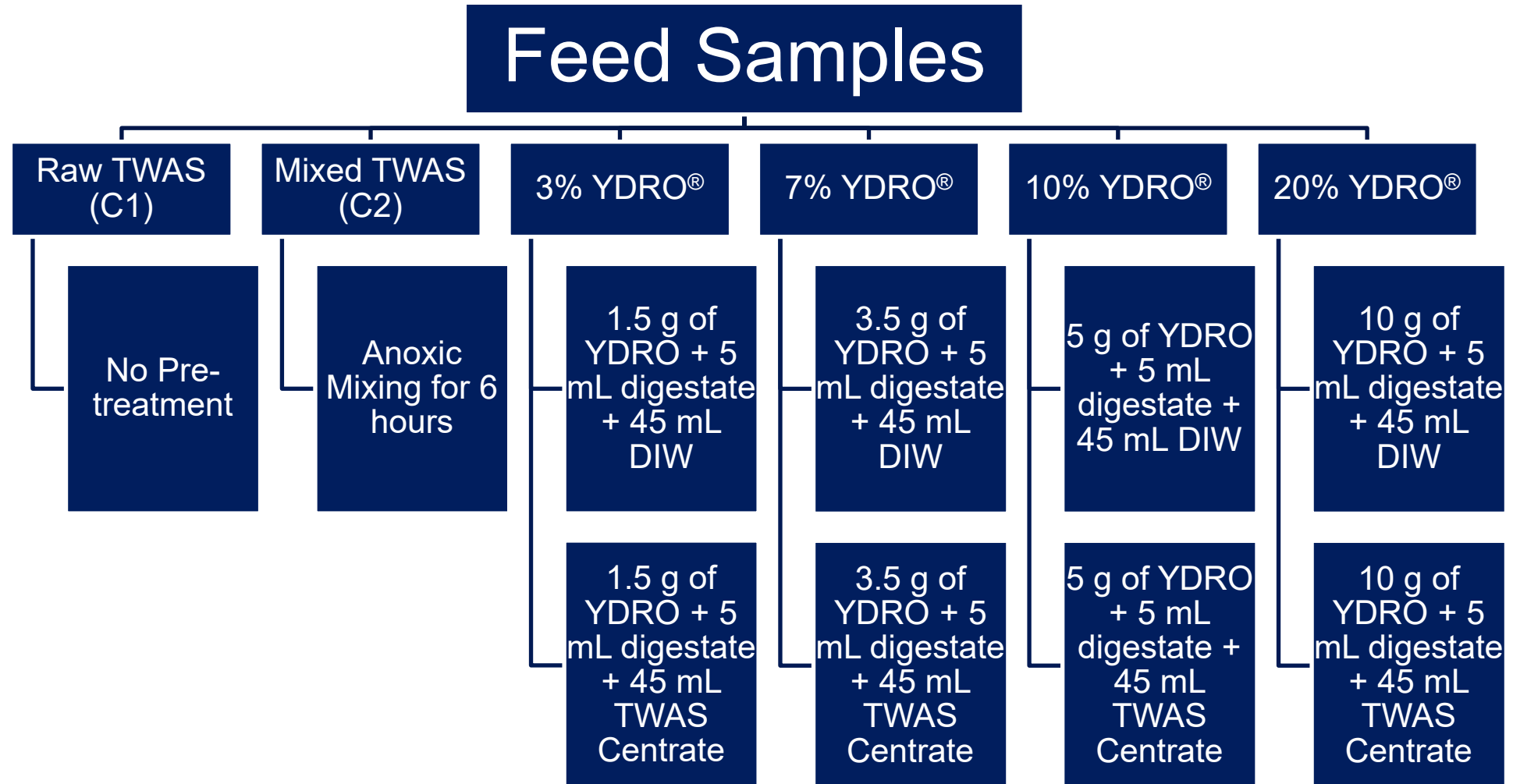
Continuous use of the Ydro Process[®] microorganisms is essential for maintaining improved performance conditions, that can result in:

- Increase in COD – VSS to biogas conversion rate
- Increase in methane content
- Reduction in HRT
- Overall optimization of the AD system

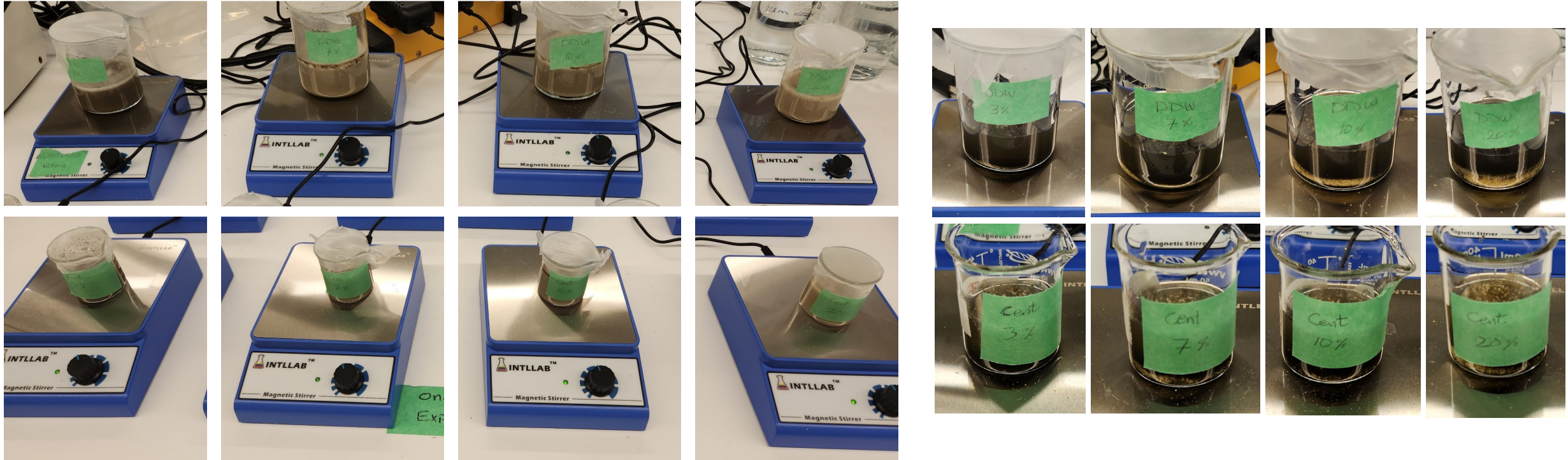
Experiment Layout



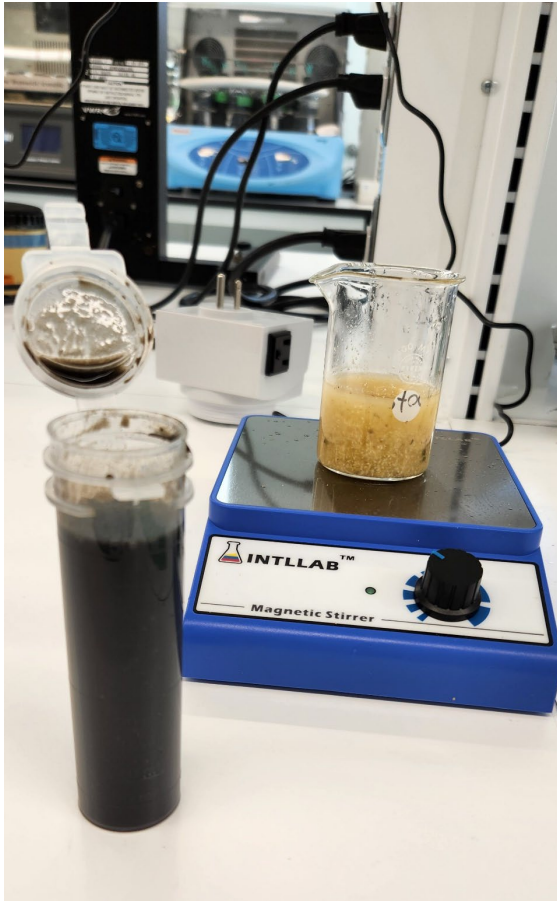
Batch Experiments - Feedstock



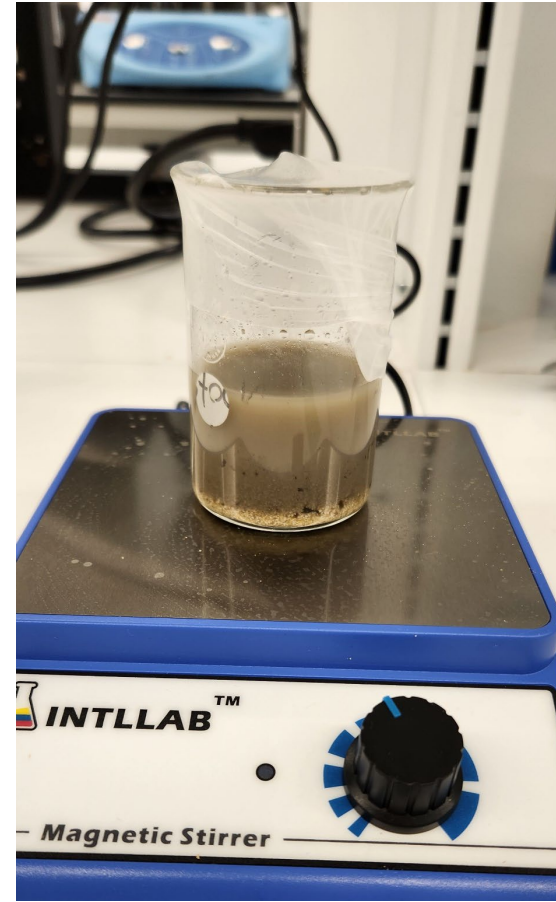
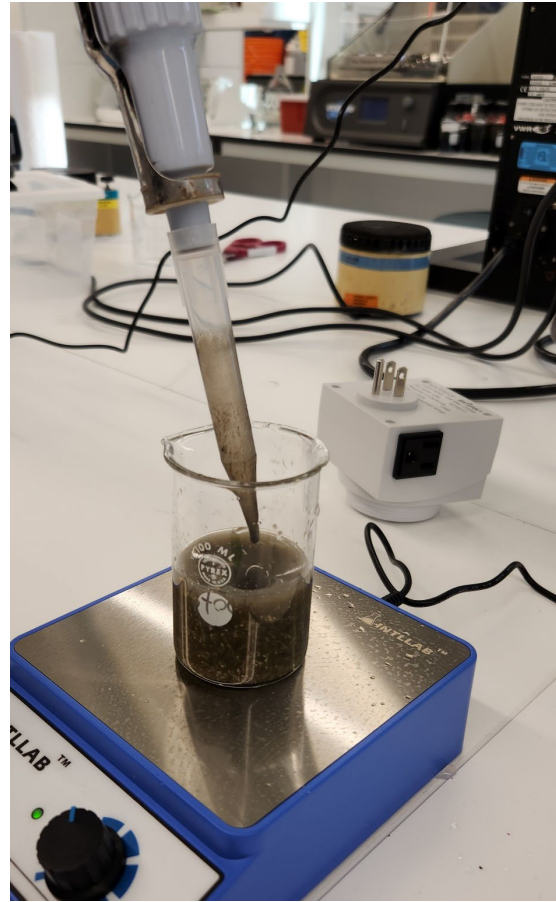
YDRO[®] Activation and Bioaugmentation



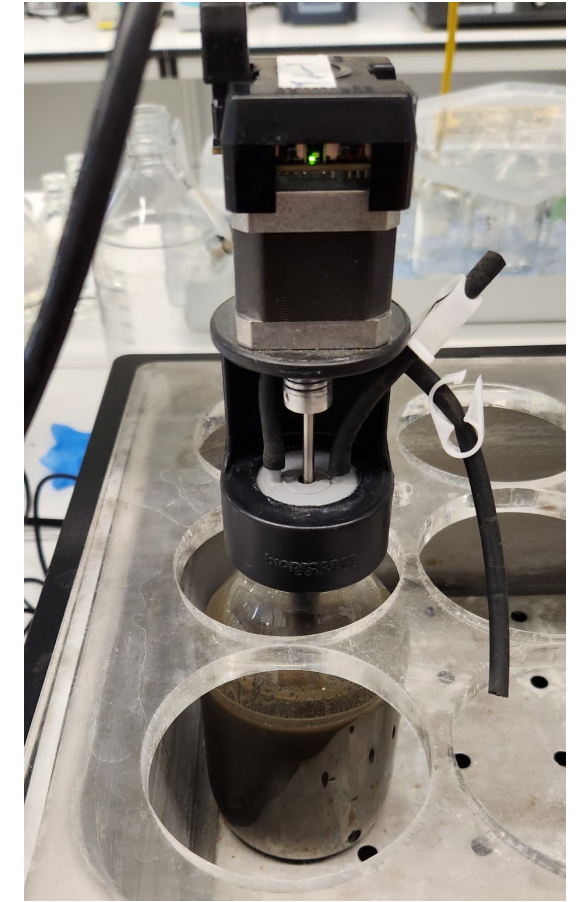
YDRO[®] Activation and Bioaugmentation



Digestate Addition

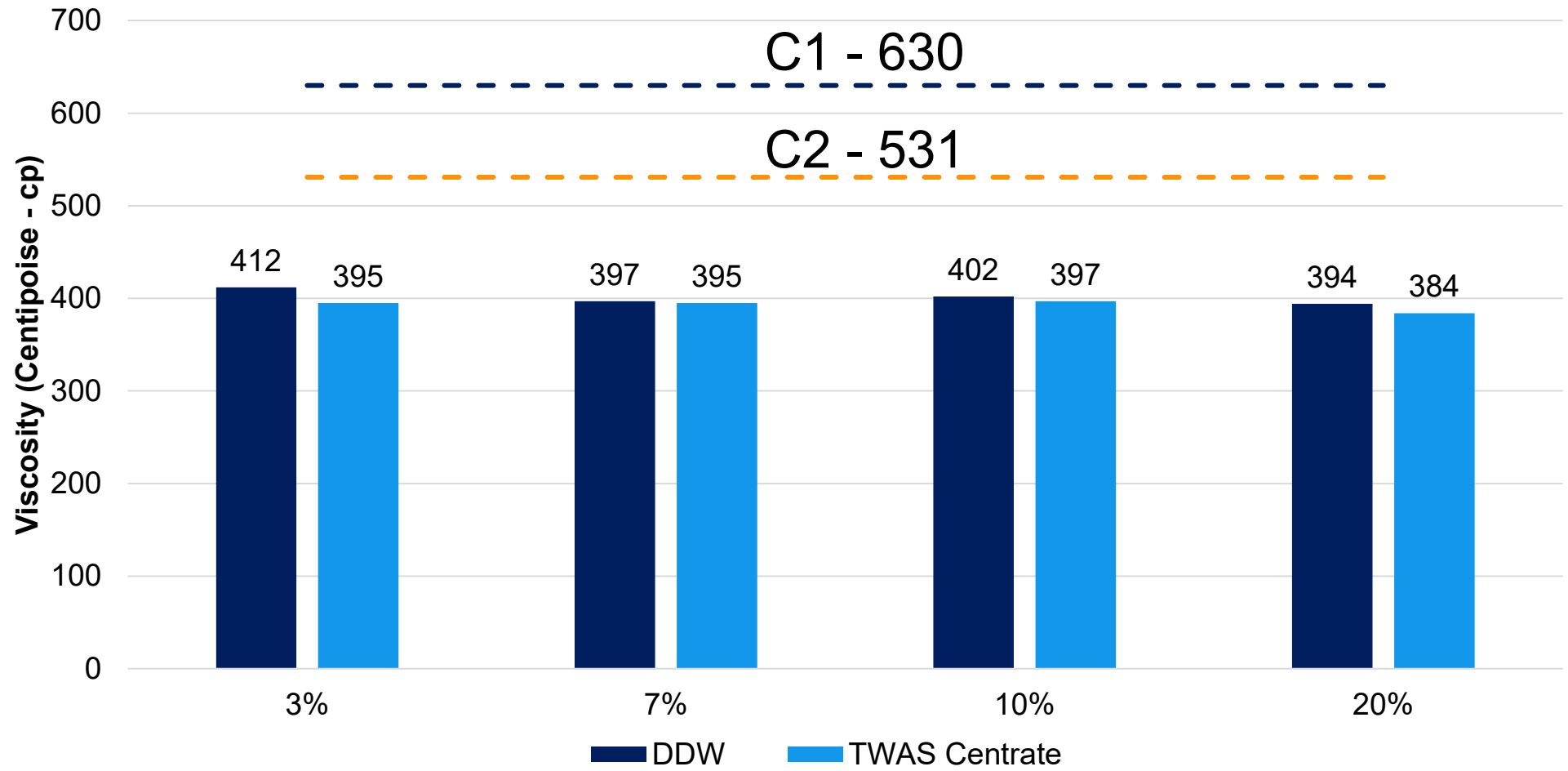


Activation



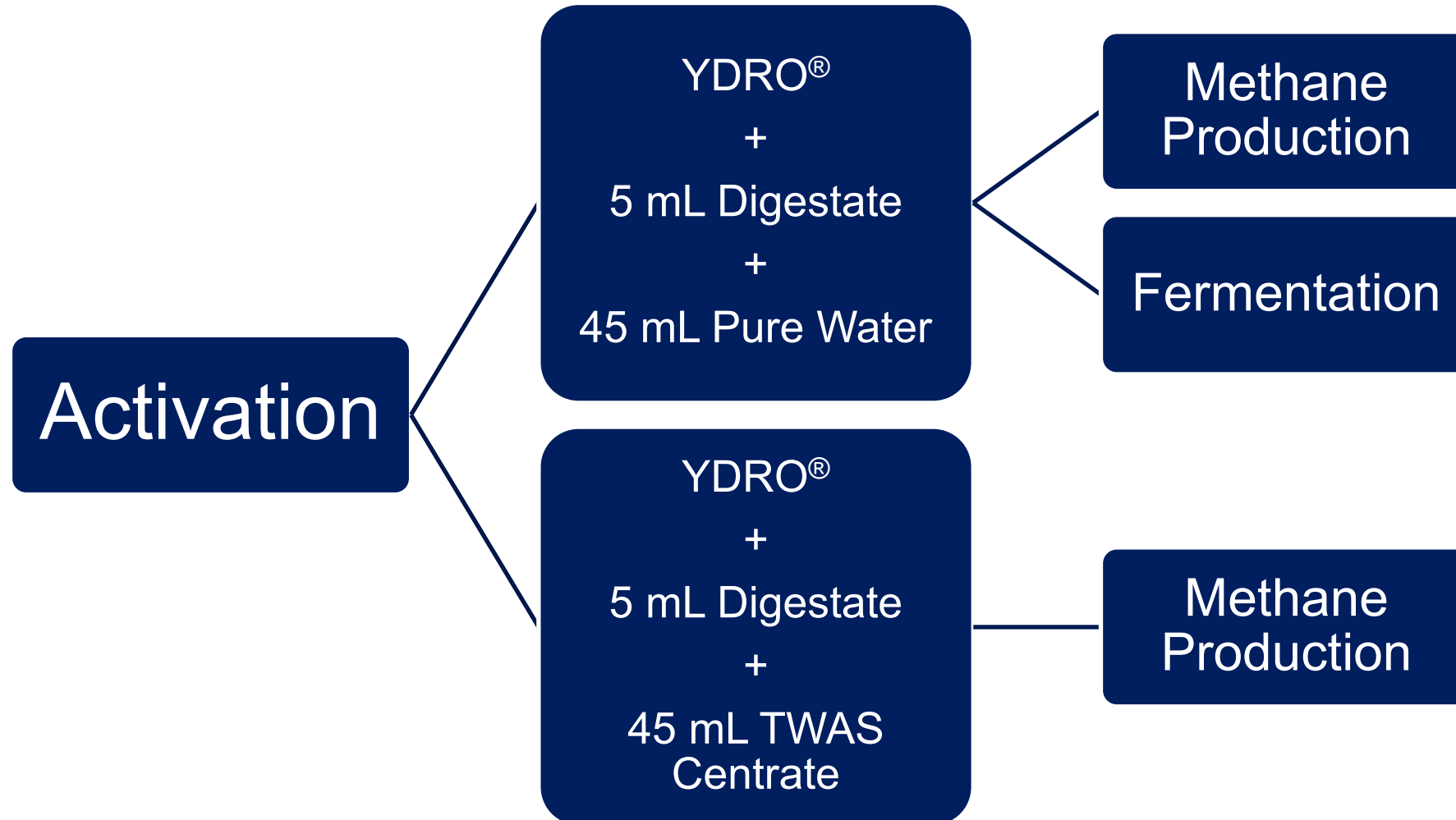
Bioaugmentation

Feedstock Viscosity



(~35-37% improvement over C1)

Experimental Design – Batch Experiments

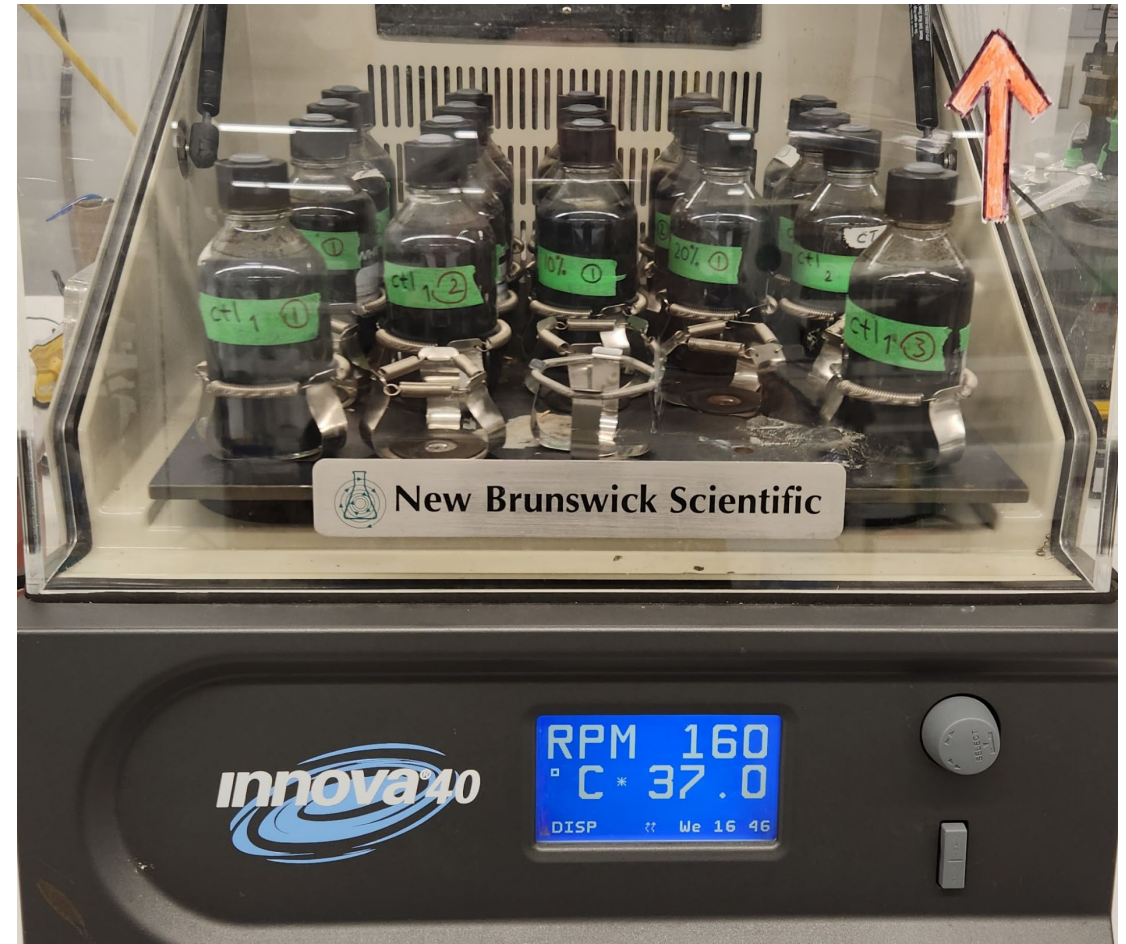


Batch Methane Production Design

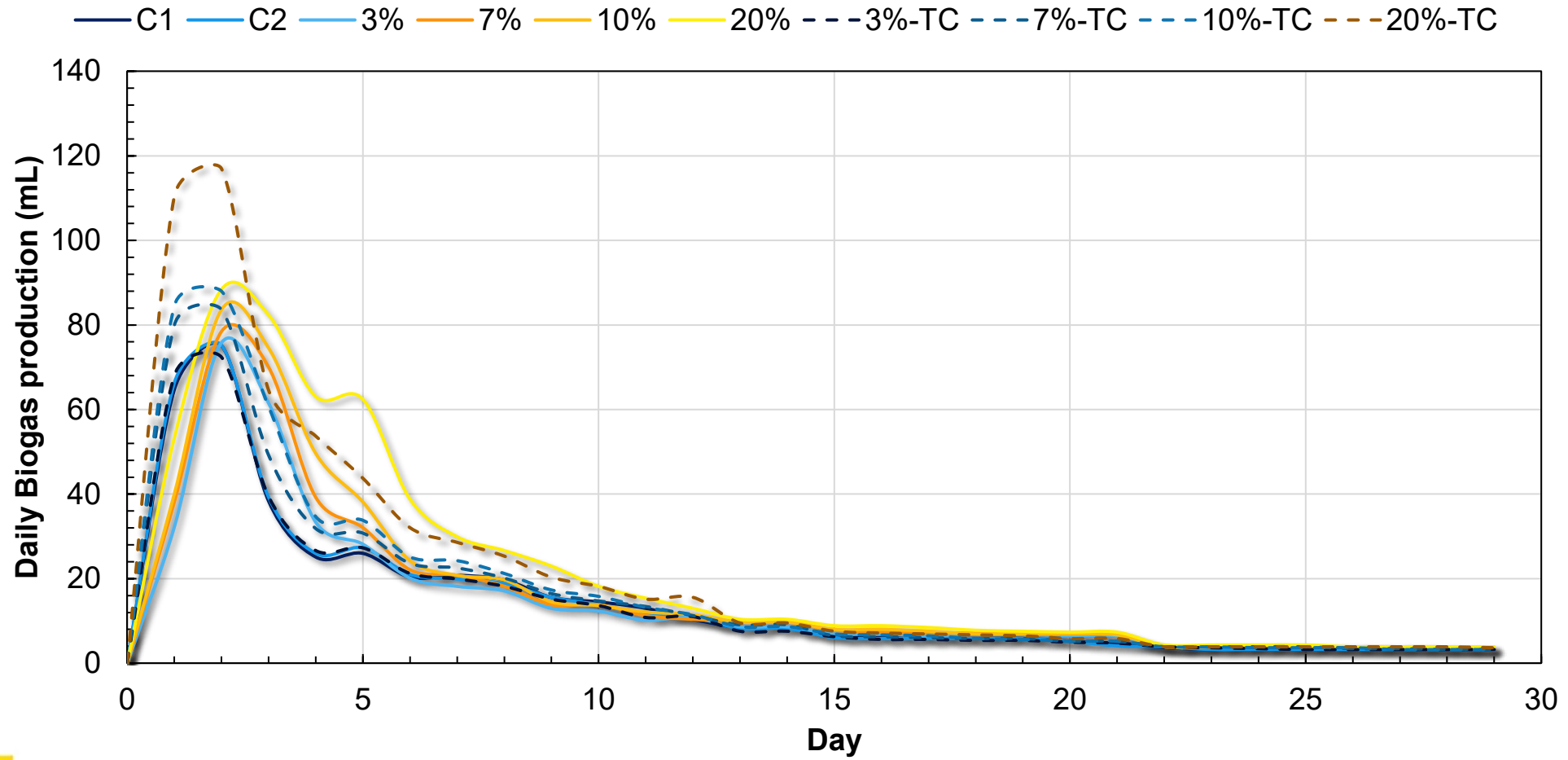
Parameter	Value
TWAS TCOD (g/L)	58.9
Seed VSS (g/L)	9.94
Total Bottle Volume (mL)	250
F/M Ratio (gTCOD/gVSS)	1
Volume of Seed (mL)	214
Volume of Feed (mL)	36

Parameter	TWAS
TCOD (g/L)	58.9
SCOD (g/L)	3.3
VFA (g/L)	0.31
TS (g/L)	40.3
VS (g/L)	30.8
TSS (g/L)	34.3
VSS (g/L)	25.4

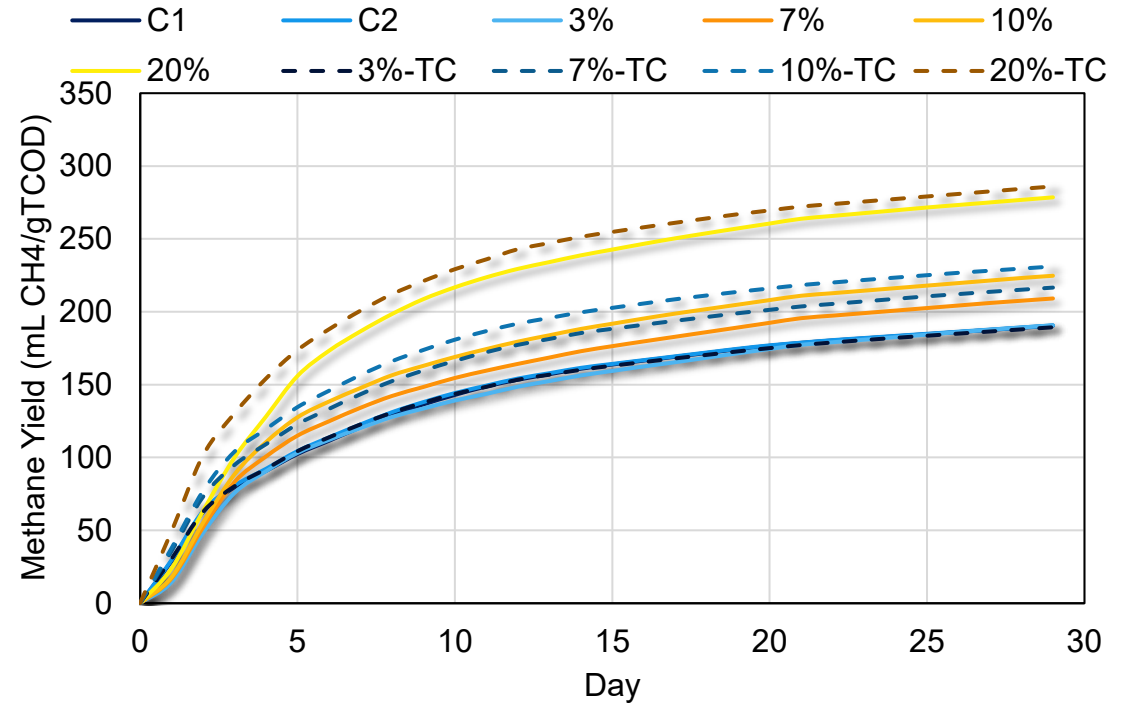
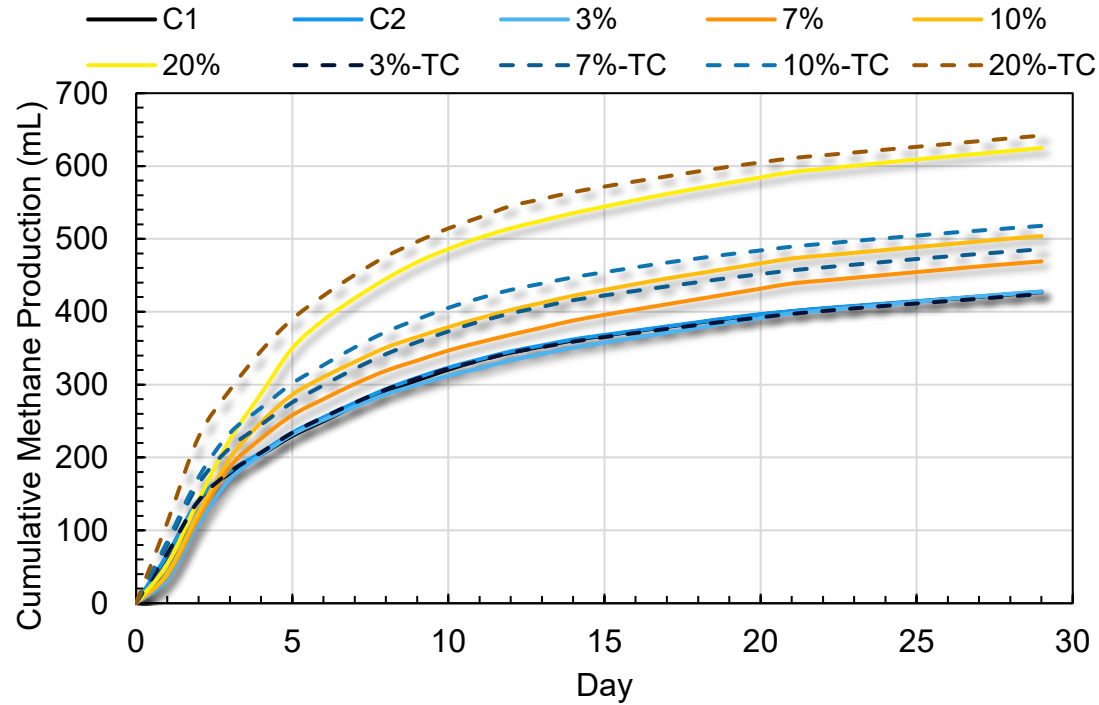
Batch Methane Production



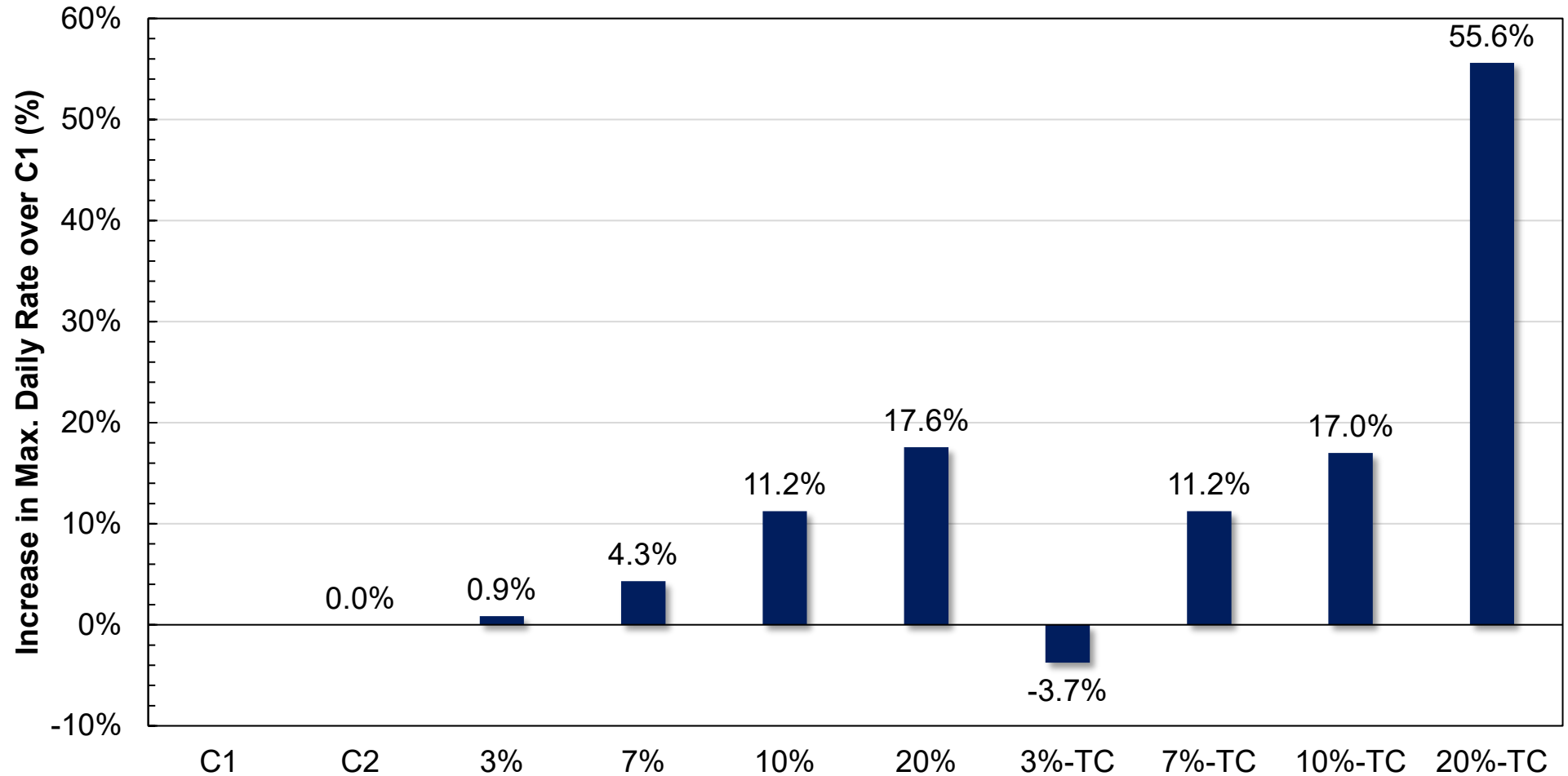
BMP Results – Daily Methane Production



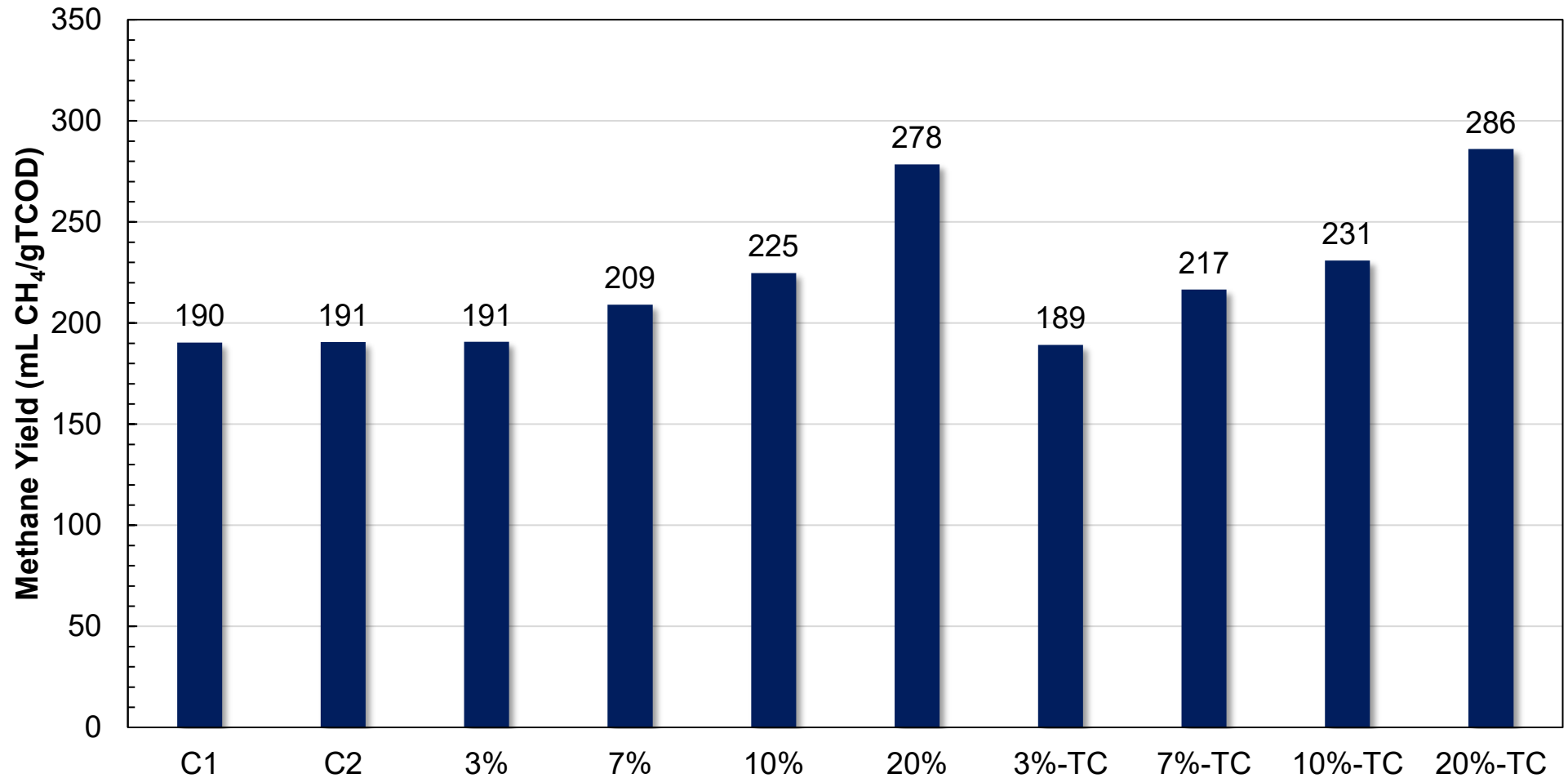
BMP Results – Methane Production and Yield



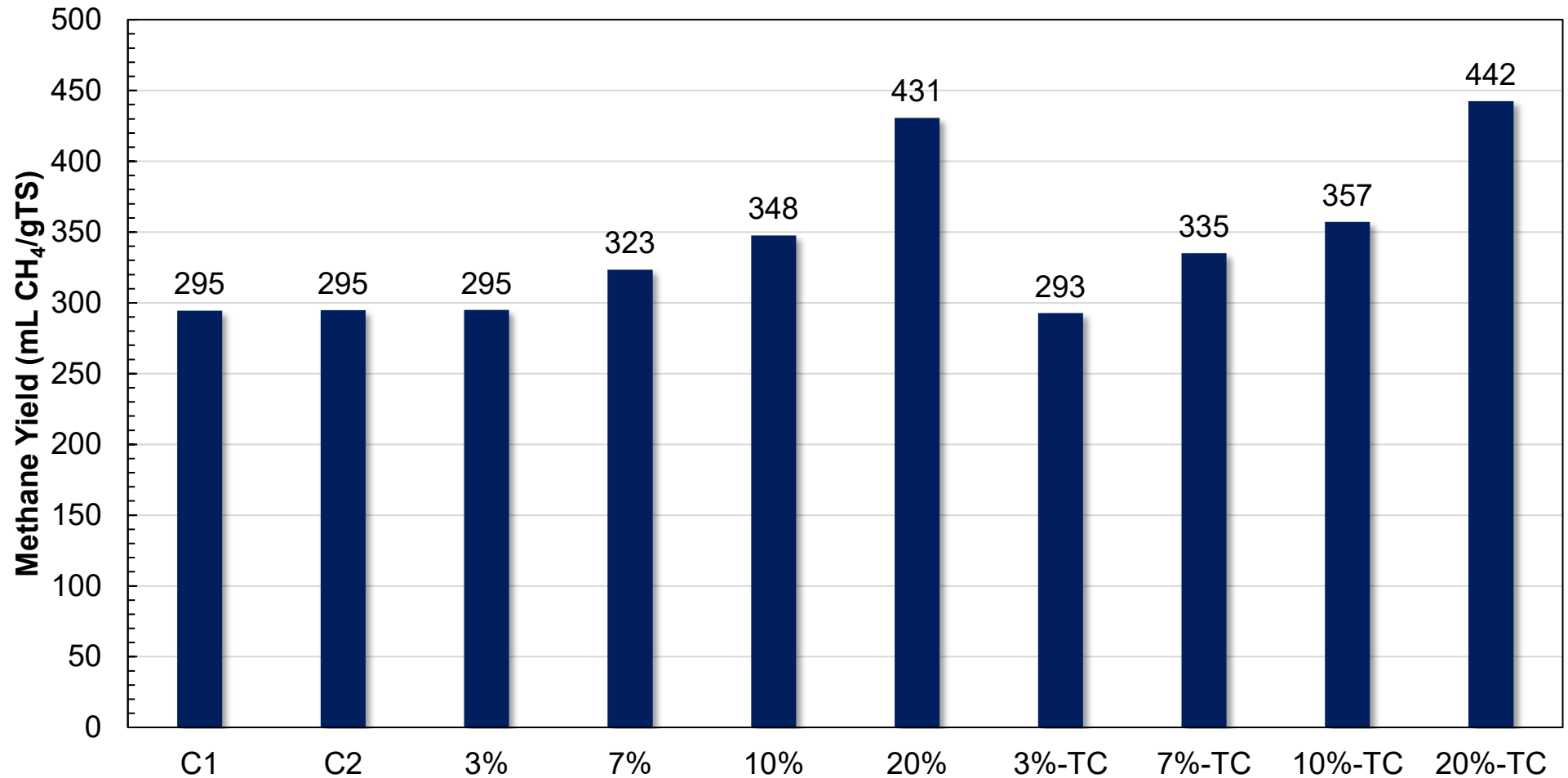
BMP Results – Increase in Max. Daily Rate



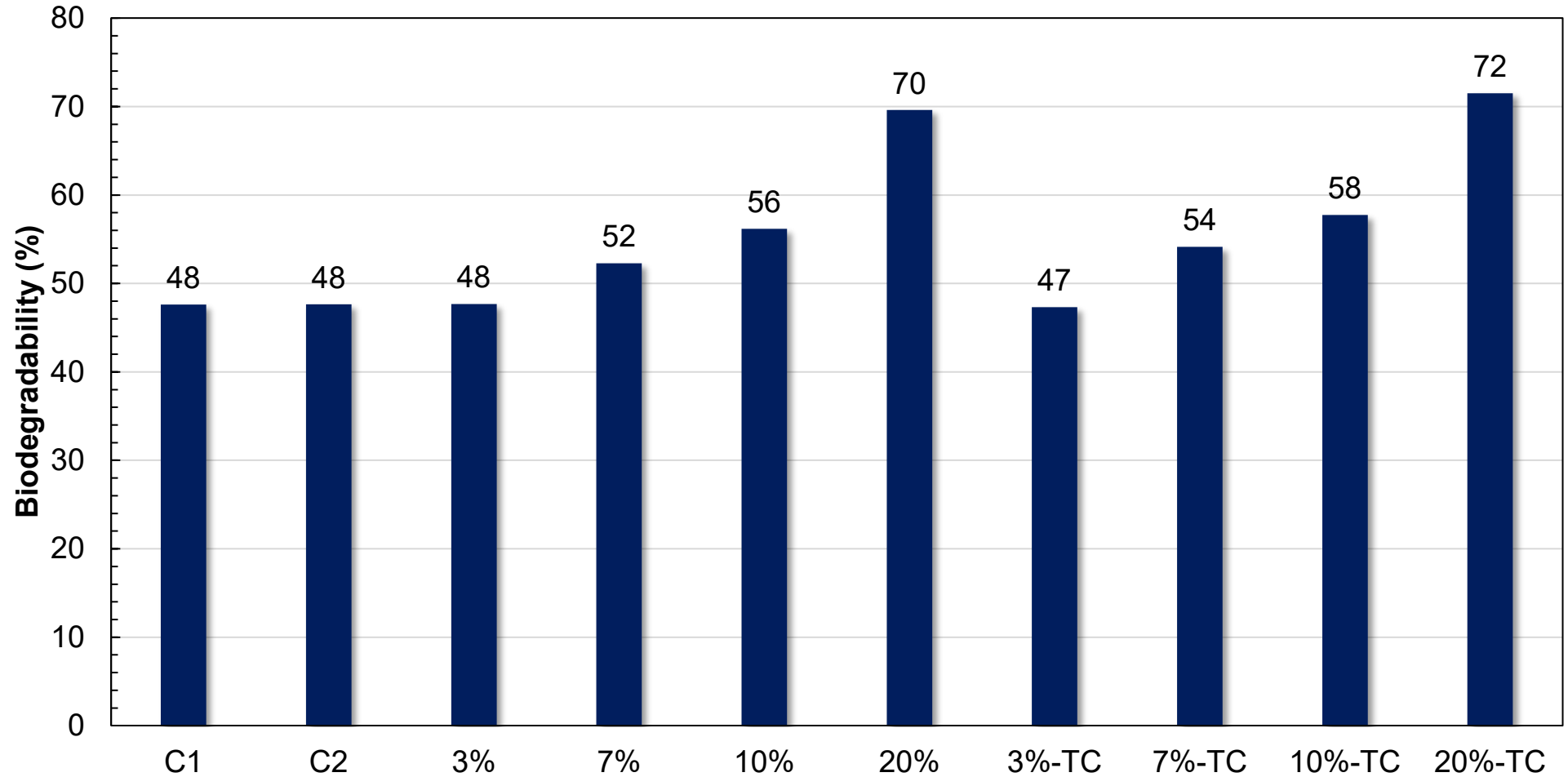
BMP Results – Methane Yield per gTCOD



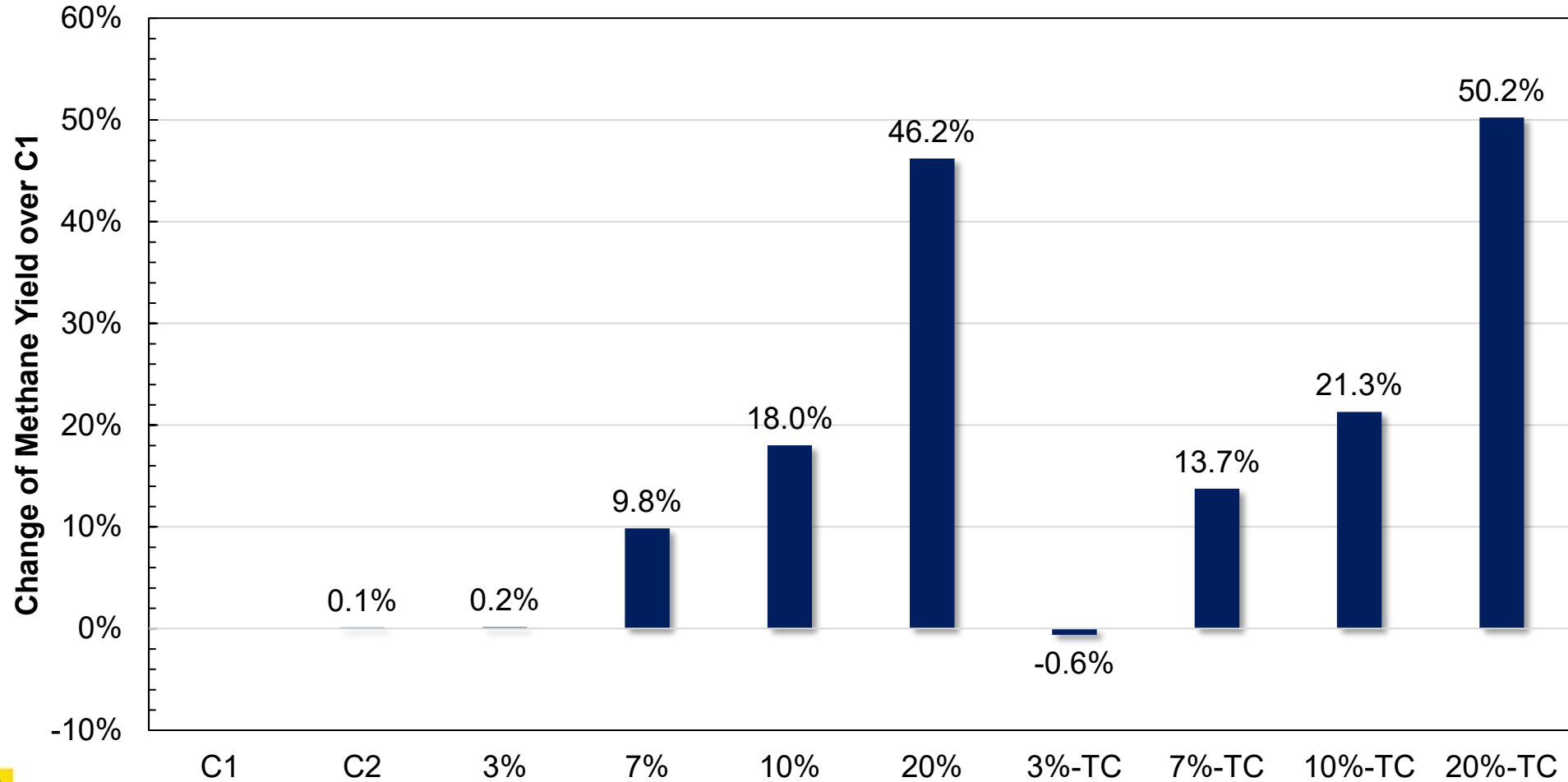
BMP Results – Methane Yield per gTS



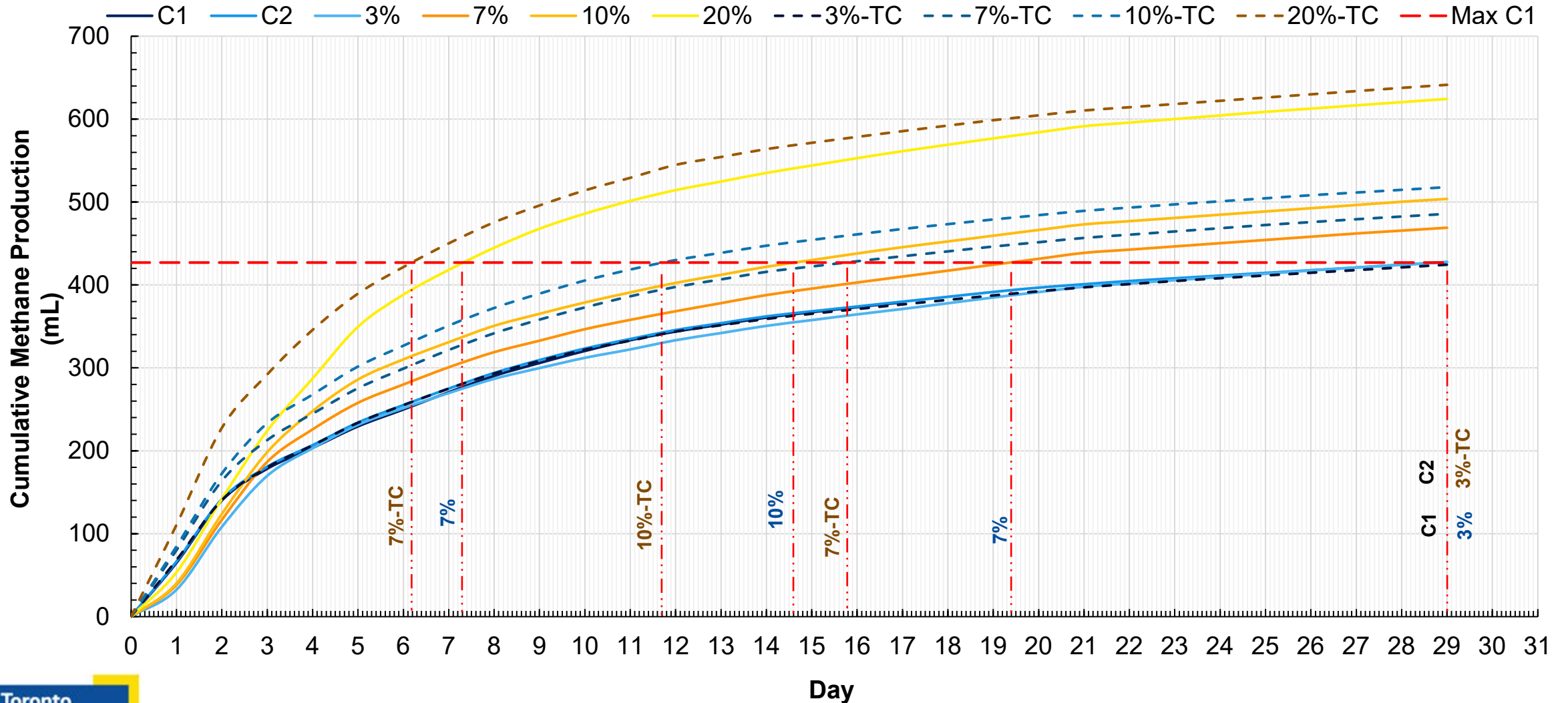
BMP Results – Biodegradability



BMP Results – Increase in Methane Yield



BMP Results – SRT Reduction



BMP Results – SRT Reduction

Sample	Equivalent SRT (days)	% reduction in SRT
C1	29	-
7% DDW Activation	19.4	33%
7% TWAS C. Activation	15.6	46%
10% DDW Activation	14.5	50%
10% TWAS C. Activation	11.6	60%
20% DDW Activation	7.3	75%
20% TWAS C. Activation	6.2	79%

Batch Fermentation

Batch Fermentation Design

65 mL
(90% TWAS
+
10%
YDRO®)
(DDW
activated)

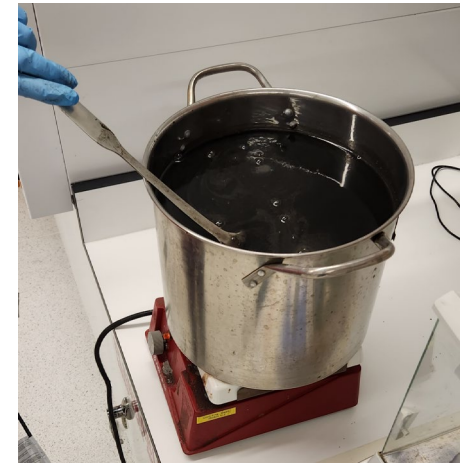
Feedstock

Seed

335 mL
Heat
pretreated
@ 70 °C for
30 minutes

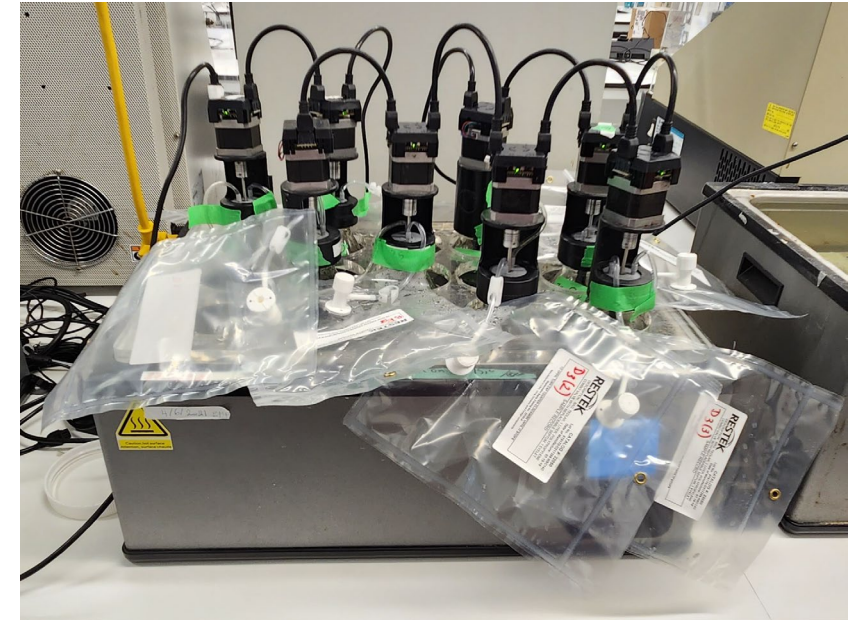
**Fermentation
Batch**

37 °C
pH = 5.5
72 hours test
Anaerobic mixing

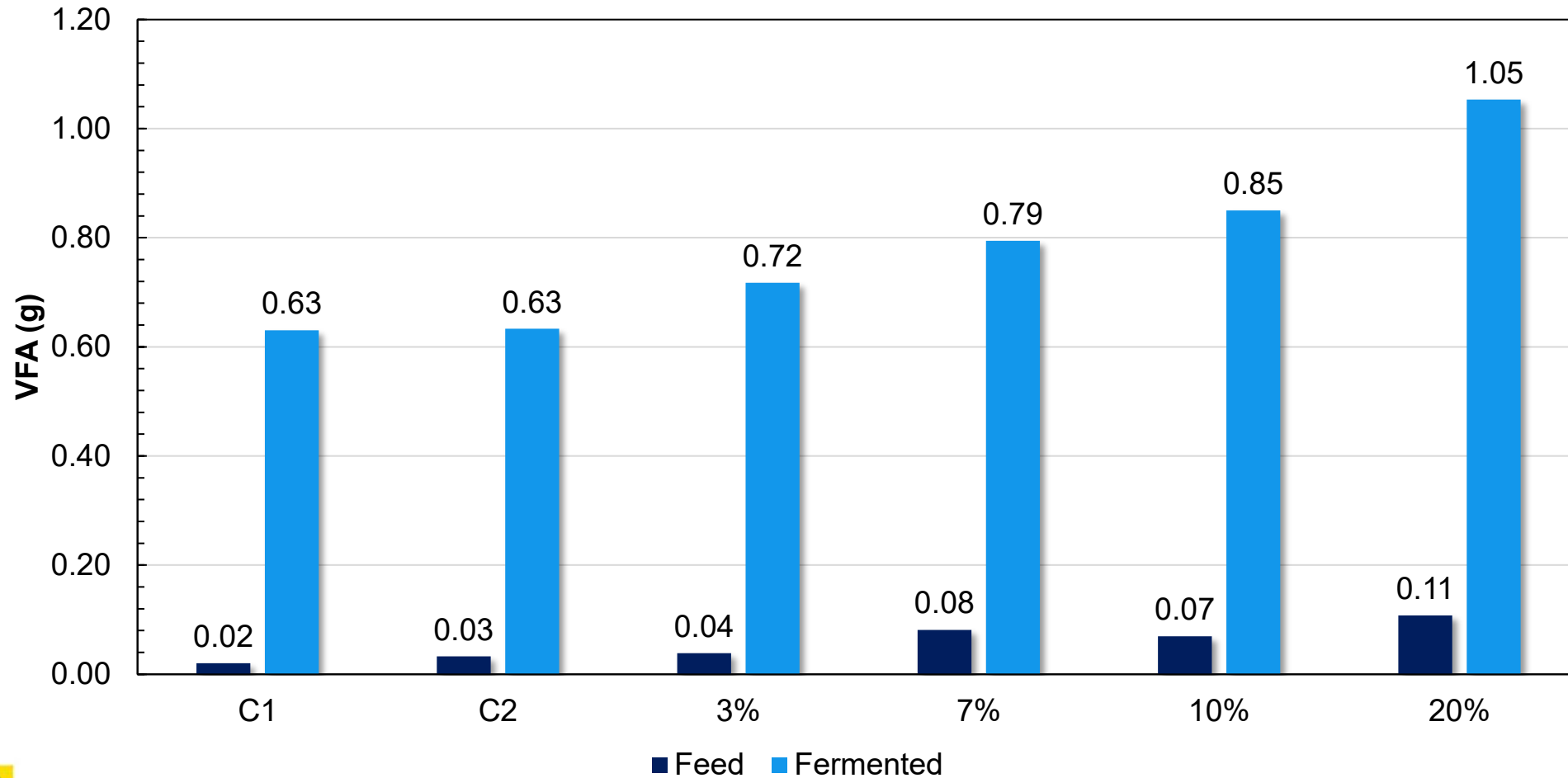


Batch Fermentation Design

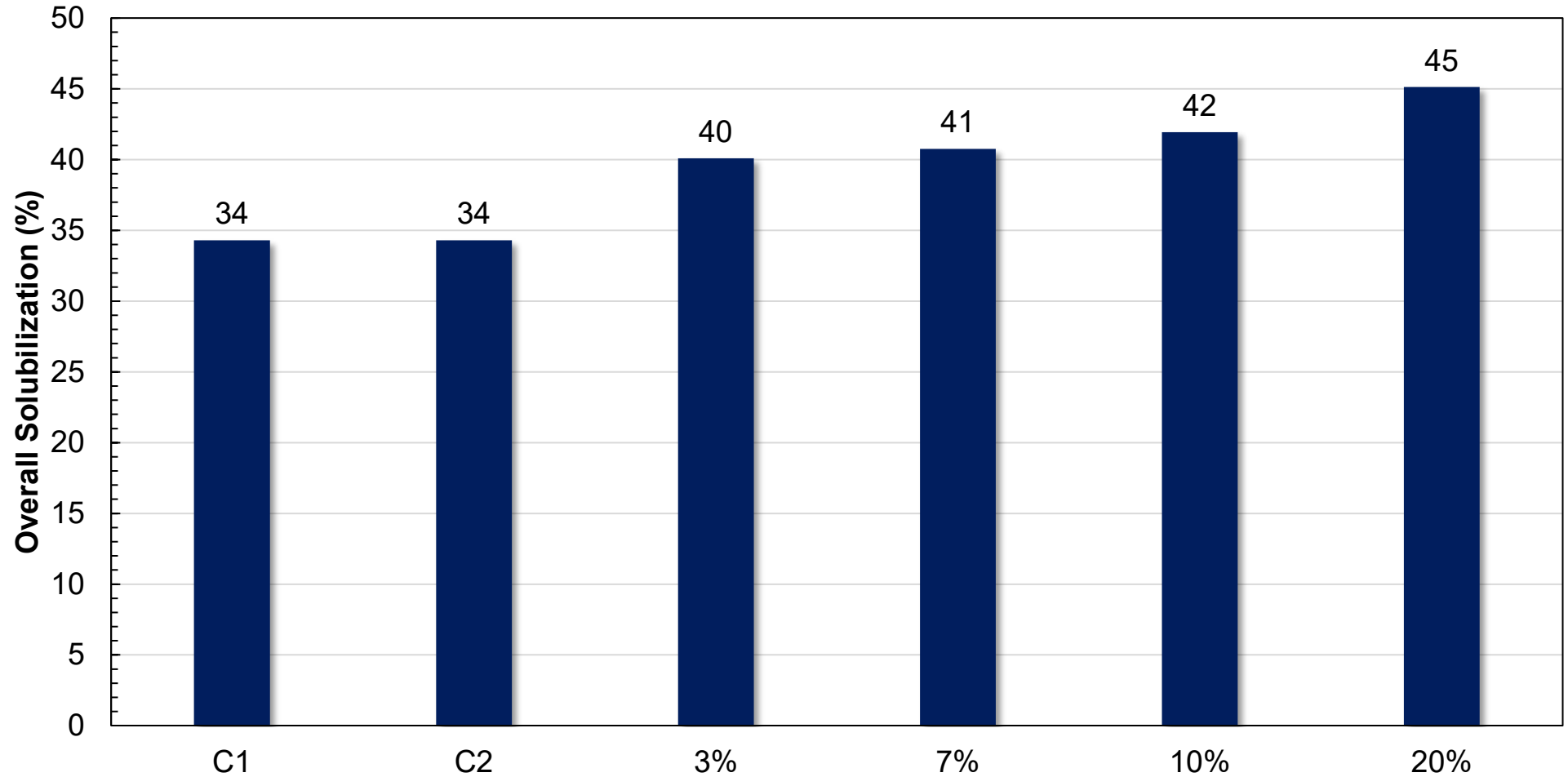
Parameter	Value
TWAS TCOD (g/L)	58.9
Seed VSS (g/L)	11.3
Total Bottle Volume (mL)	400
F/M Ratio (gTCOD/gVSS)	1
Volume of Seed (mL)	335
Volume of Feed (mL)	65



Fermentation Results – VFA Masses



Fermentation Results – Overall Solubilization



Thank you!