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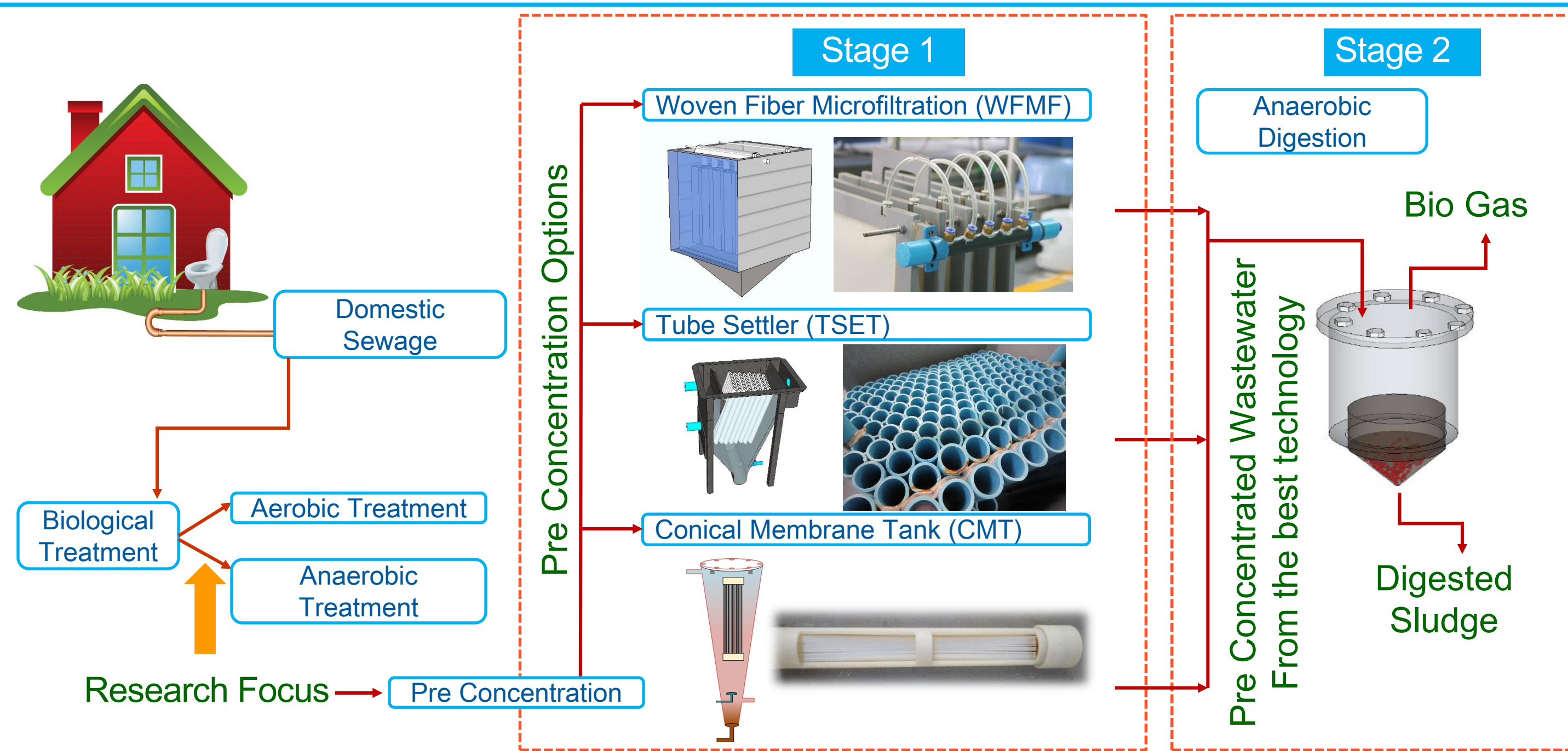
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INTRODUCTION

This study compares the performance of three different pre-concentration technologies; woven fiber microfiltration (WFMF), tube settler (TSET) and conical membrane tank (CMT) that can apply to, concentrate the domestic sewage prior to the anaerobic treatment. The main goal of the pre-concentration is to concentrate as much as possible of the wastewater organic matters in a separate stream, which can later be used for energy recovery.

The pre-concentration performance was evaluated in terms of chemical oxygen demand (COD), suspended solid (TSS) concentration and the energy consumption for the operation. WFMF was able to concentrate 21 to 24.2 g COD/m³. d of COD, while CMT had 17.5 to 19.7 g COD/m³. d. TSET indicated that the lower COD pre-concentration performance with 0.005 m³/m².h and 0.01 m³/m².h loading rates as 1.8 and 2.6 g COD/m³. d. In terms of TSS accumulation, WFMF and CMT resulted in more than 90% while TSET had 63%. In terms of the effluent quality, the WFMF was able to remove 68% of COD while CMT has 77%. This could have a potential of reuse application of the permeate water for agricultural purpose. Thus, the WFMF was found to perform better among the three technologies in terms of domestic sewage pre-concentration for anaerobic digestion.

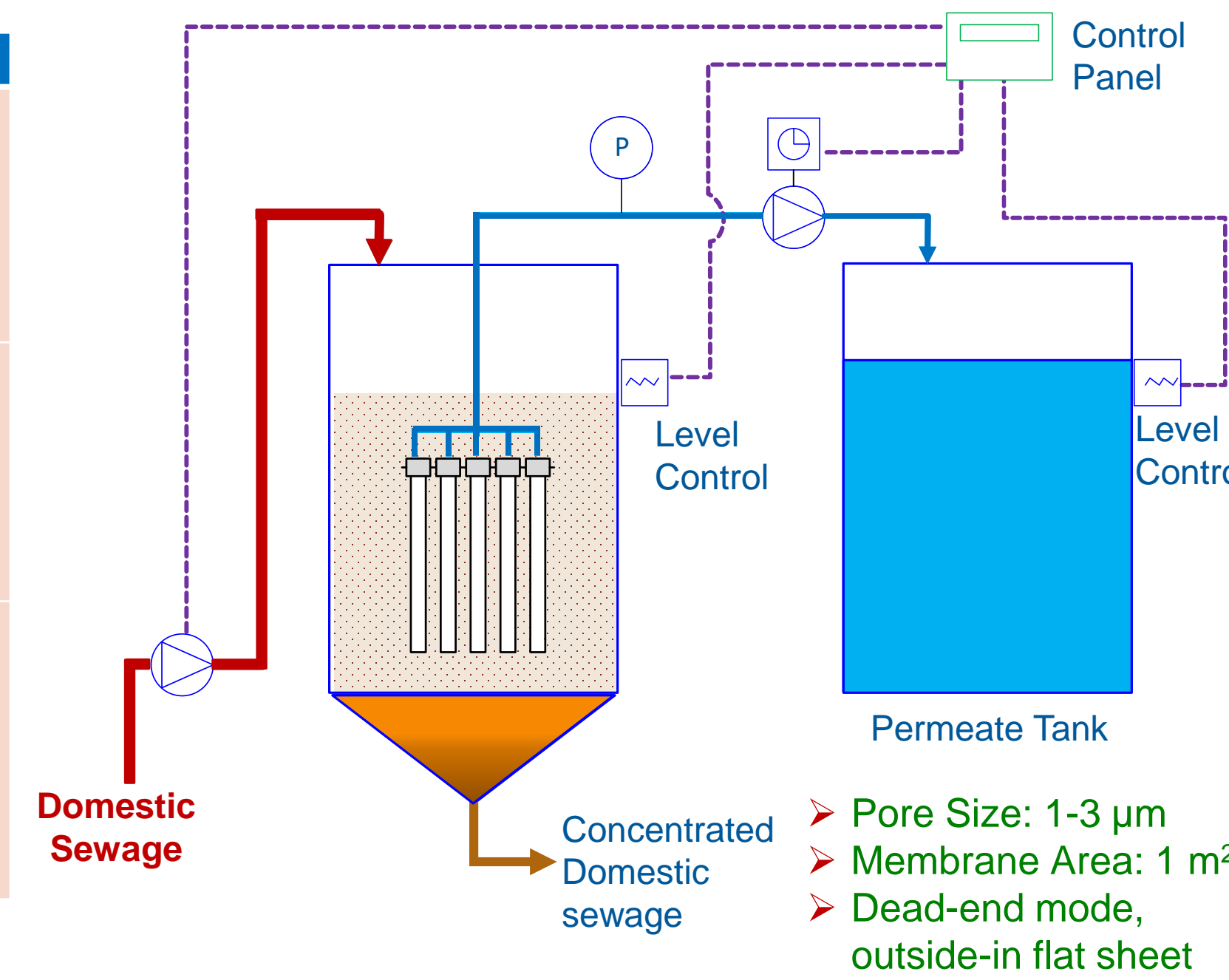
METHODS



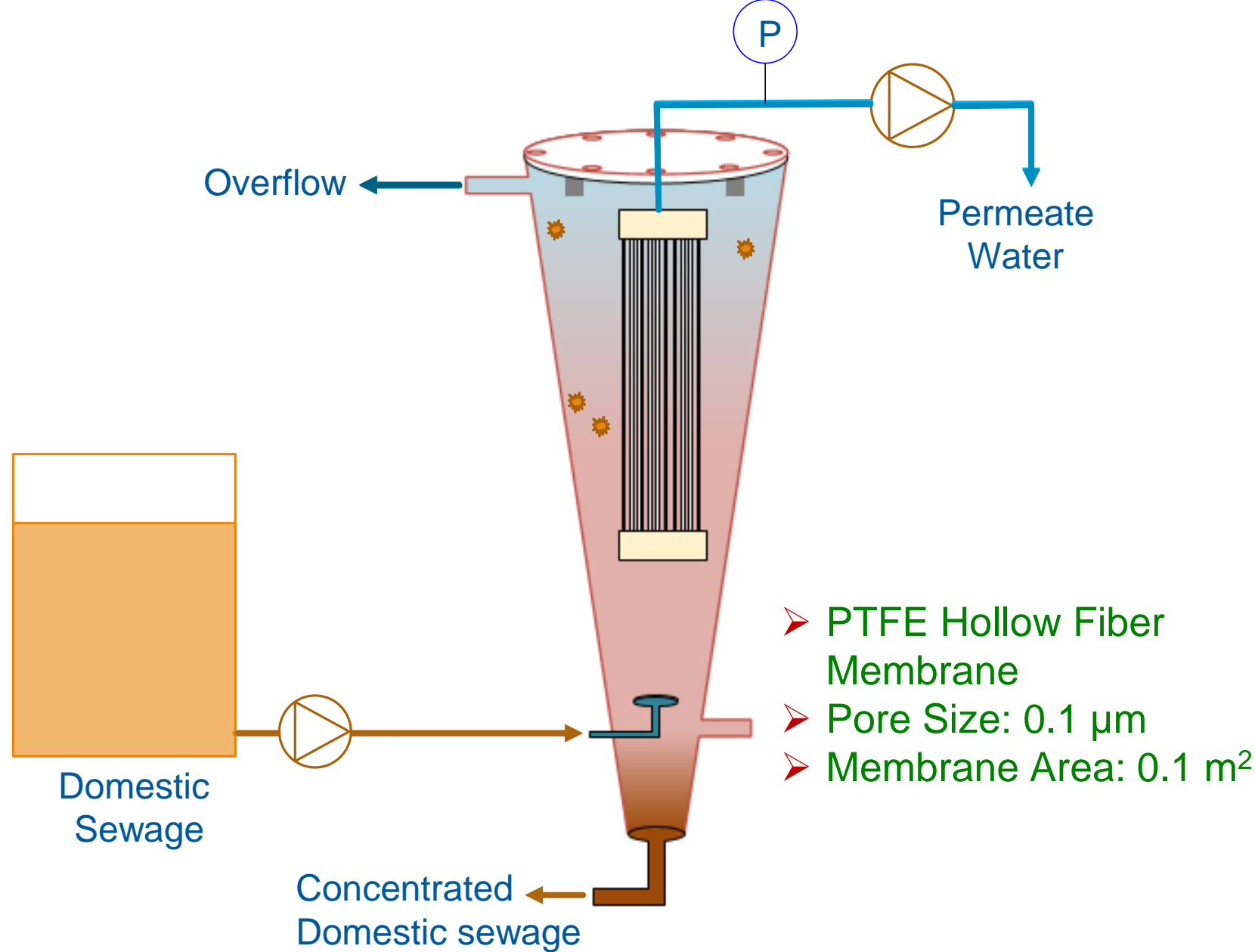
Operating Variables

Experiment	Variables	Measurements
WFMF	Membrane Flux	<ul style="list-style-type: none"> Flux vs TMP Pre-concentration efficiency Fouling potential Membrane cleaning Permeate water quality
	5 LMH	
	7.5 LMH 10 LMH	
TSET	Overflow rate	<ul style="list-style-type: none"> Pre-concentration efficiency Effluent water quality
	0.005 m/h without coagulation 0.01 m/h with coagulation	
CMT	Membrane flux	<ul style="list-style-type: none"> Flux vs TMP Pre-concentration efficiency Fouling potential Membrane cleaning Permeate water quality
	5 LMH	
	7.5 LMH 10 LMH	

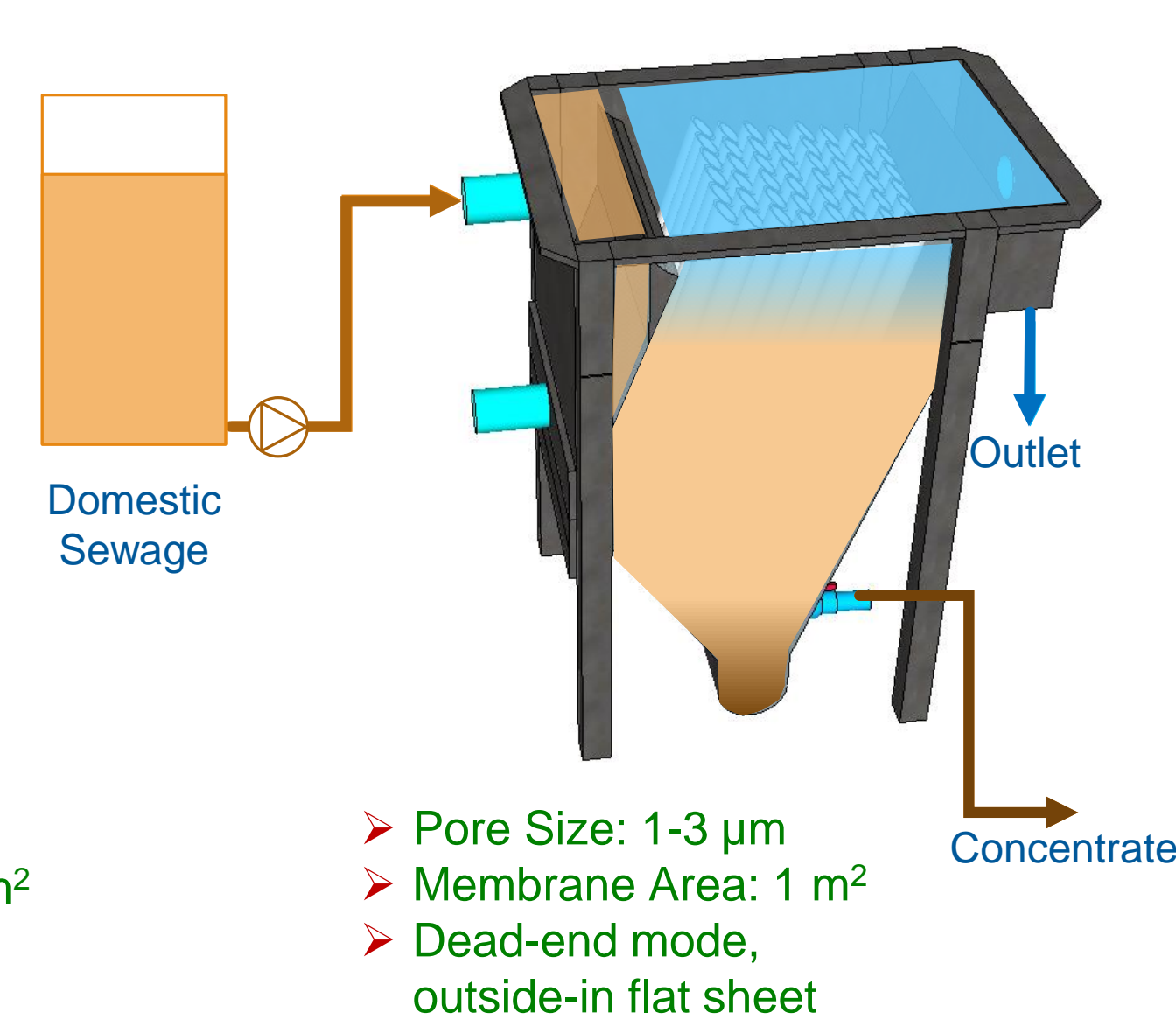
Woven Fiber Microfiltration (WFMF)



Conical Membrane Tank (CMT)

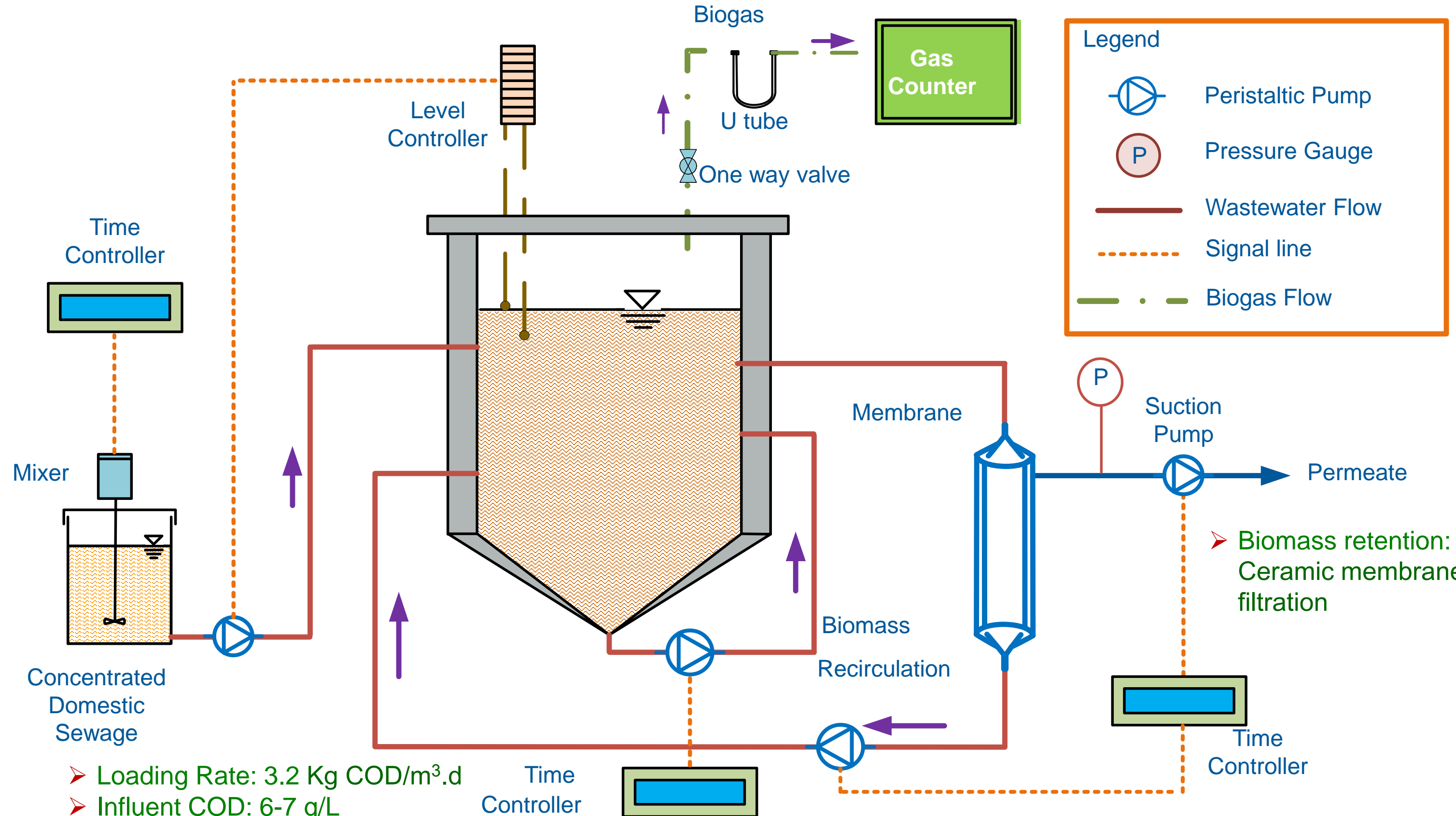


Tube Settler (TSET)



Evaluate the pre-concentration, efficiency of domestic sewage with woven fiber microfiltration, tube settler and conical membrane tank applications.

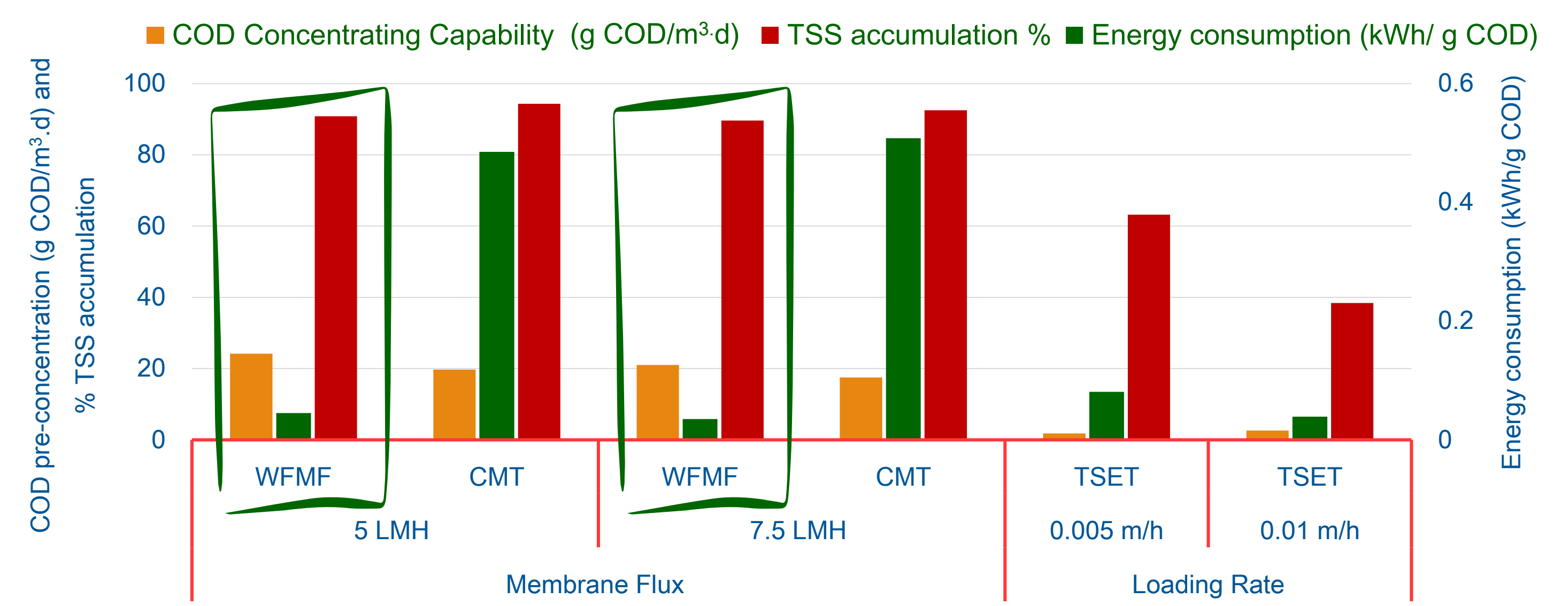
Anaerobic Membrane Bioreactor (AnMBR)



Evaluate the performance of anaerobic digestion, with best performing pre-concentration technology.

RESULTS & DISCUSSION

Overall Comparison of the Pre-concentration Technologies

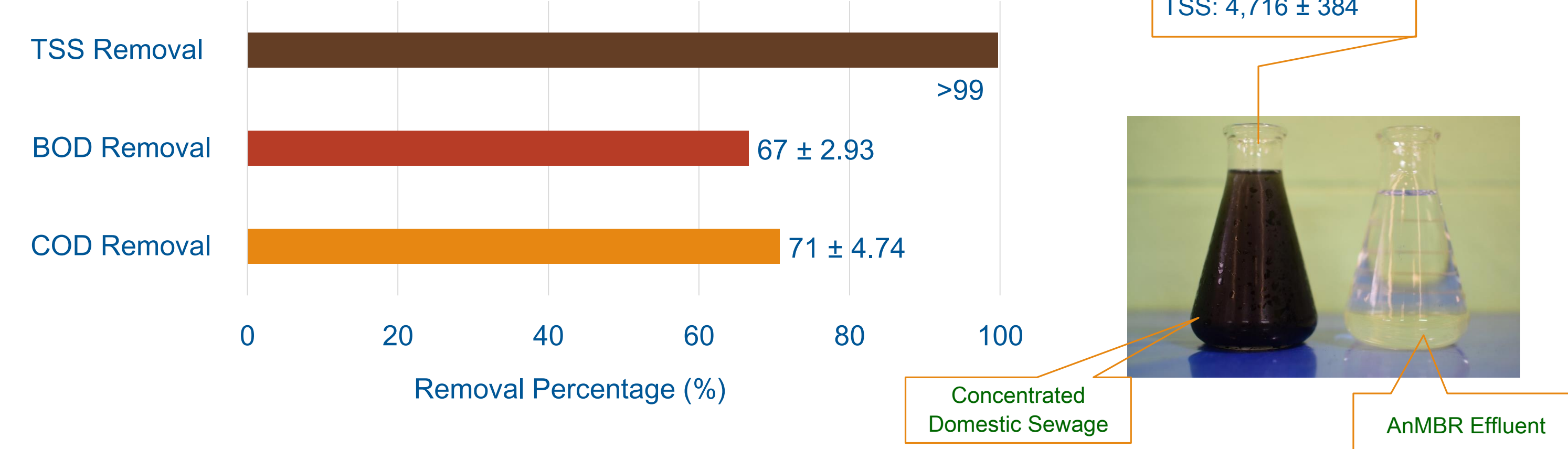


WFMF system showed the higher **COD concentration capability** and the nearly 10 times lower **energy consumption** compared to the CMT system.

Performance of WFMF 7.5 LMH flux was the best among three technologies, in terms of its **low energy consumption**, **higher COD concentration capability**, and the **higher TSS accumulation** for domestic sewage pre-concentration.

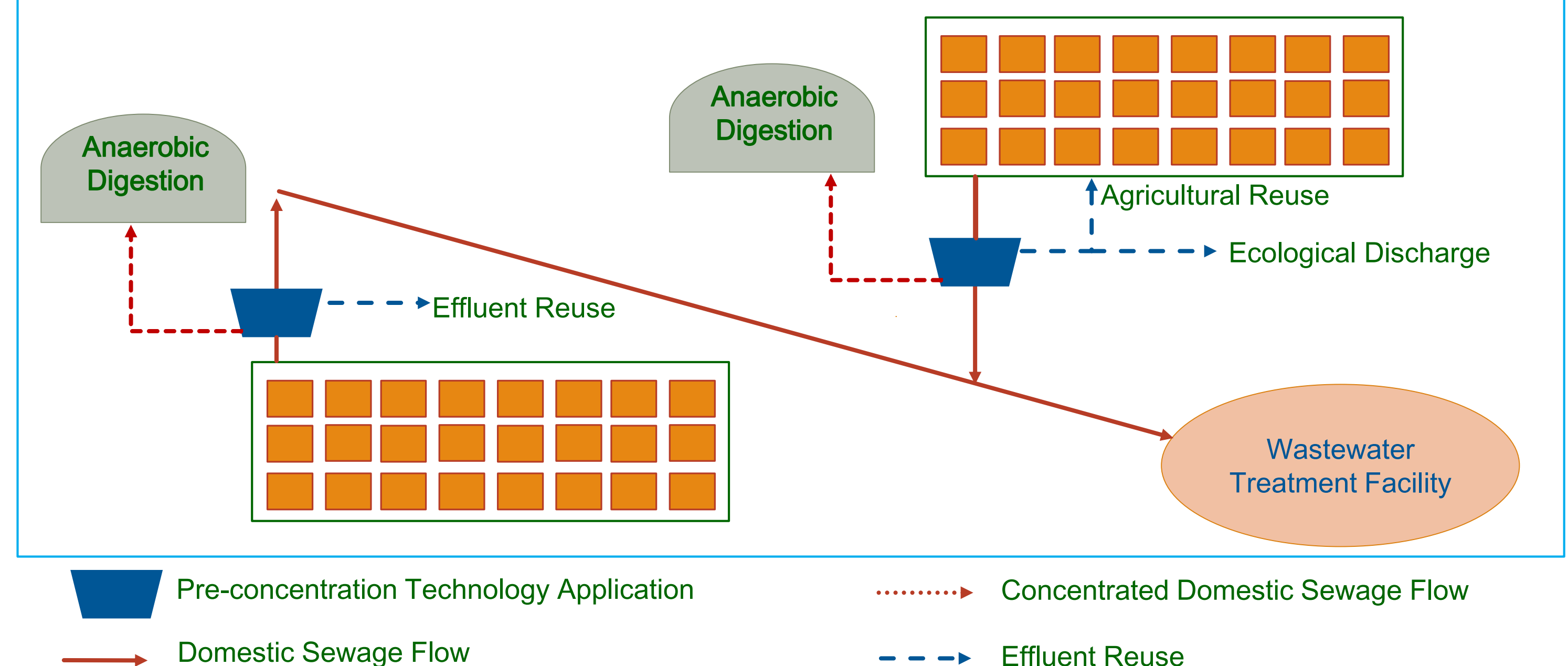
Best Performing Pre-concentration Technology Coupling with AnMBR

Removal Efficiencies of the AnMBR



Potential Application

De-centralized Domestic Sewage Pre-concentration for Anaerobic Digestion



Depending on the application and initial feed water quality, the permeate water can have a reuse potential in the nearby community.

Biogas can be converted into electricity and use in the decentralized wastewater treatment plant or the nearby community.

CONCLUSIONS

- Capturing solid fraction from the domestic sewage can lead to generate the higher COD concentrations that can be effectively used for the anaerobic digestion process.
- To compare the different technology performance, the comparable factors needed to bring it to the same level that can be compared. To make the common comparable unit, the amount of the COD, filtration time and volume was considered. \rightarrow g COD/m³. d
- WFMF (Best Technology) Performance:
 - COD Pre-concentration Performance (g COD/m³.d): 21.0-22.4
 - TSS Accumulation (%): 90
 - Energy Consumption (kWh/g COD): 0.035-0.045
- Pre-concentration capability of the WFMF and CMT systems were better than the tube settler application.

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