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Co-digestion of microalgae and activated sludge following a novel bioflocculation method

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1. INTRODUCTION

- New technologies are developed to recover wastewater resources and increasing energy yields in form of biogas.
- Potential energy recovery using microalgae.
- Available harvesting methods are costly and energy intensive.

2. OBJECTIVES

- Cost-efficient way of harvesting microalgae via bioflocculation using wasted activated sludge.
- Assess the biogas potential from the harvested activated sludge-algal biomass.
- Increased energy yields in form of biogas.

3. MATERIALS AND METHODS

Mixed green microalgal culture cultivated on effluent wastewater:
Chlorella sorokiniana and Scenedesmus sp.

Two-step flocculation
1. step: Algae is flocculated with activated sludge
2. step: Algae is coagulated with cationic polymer (PDADMAC)

4. RESULTS

(i) Polymer dosing

(ii) Algal activated sludge settleability

(iii) Mixing ratio

- 27 mg polymer / g algae dosing results in 92 % recovery
- Restabilization effect results in lower recovery
- Microalgal recovery with activated sludge used as flocculant (strategy I) is low (40%) – we need a coagulation aid (strategy II)
- 16 mg polymer / g algae dosing results in 97 % recovery
- Bulking events in activated sludge systems cause poorly settling sludge → The sludge blanket height (SBH) increases
- The efficiency of the flocculation does not deteriorate, the microalgal recovery stays sufficient (>90%)

5. CONCLUSION

- An effective solution is proposed to harvest the microalgae
- 97% microalgal biomass recovery was reached
- Poorly settling sludge did not improve microalgal biomass recovery
- Optimum polymer dosing should be estimated for specific operational conditions
- Co-digestion with AS wasted after the anaerobic phase enhanced biogas potential
- Up to 40% of the COD was recovered as methane

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