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# **Anaerobic Co-digestion of Municipal Primary Sludge and Whey**

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in Environmental Engineering  
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**Xinyuan Zhang**

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## ABSTRACT

The aim of this research was to investigate the feasibility of co-digestion of municipal primary sludge and whey by anaerobic CSTR (Continuous Stirred Tank Reactor), as well as the factors that affect the performance of the co-digestion reactors.

Before studying the co-digestion process, a semi-continuous whey digestion experiment was conducted to analyze the feasibility of anaerobic digestion of whey along with pH control. The results obtained from the study indicated that supplement of nutrients, trace elements as well as heavy metals was necessary to maintain the anaerobic whey digestion system.

To investigate the co-digestion of primary sludge and whey process, the effects of pH, OLR (Organic Loading Rate), HRT (Hydraulic retention time) as well as the COD (Chemical Oxygen Demand) loading ratio of primary sludge to whey on the performance of the reactors were studied. The results of the co-digestion experiments demonstrated that it was feasible to co-digest primary sludge and whey without nutrient, trace element and heavy metal supplement. The TCOD (Total Chemical Oxygen Demand) removal efficiency and the biogas production of the co-digestion system increased with the increase of OLR. At same OLR, digestion of the mixture of primary sludge and whey with higher whey content achieved higher biogas production and TCOD removal efficiency. The anaerobic co-digestion of primary sludge and whey process performed successfully at OLR of  $5.8 \pm 0.1$  g COD/l.d without pH control when the COD loading ratio of primary sludge to whey was approximately 70:30, due to the fact that the primary sludge may serve as buffering reagent. By adding sodium bicarbonate ( $\text{NaHCO}_3$ ) to maintain the pH at  $6.9 \pm 0.1$ , the OLR of the co-digestion reactor could reach  $8.1 \pm 0.1$  g COD/l.d at HRT of 20 days. Moreover, by co-digestion of primary sludge and whey solution, the reactor could be operated successfully at HRT of 10 days and at OLR of  $7.6 \pm 0.1$  g COD/l.d with COD loading ratio of primary sludge to whey of 53 : 47. The biogas production ( $3.2 \pm 0.1$  l/d) was 1.5 l/d higher than digestion of the same amount of primary sludge alone ( $1.7 \pm 0.1$  l/d).

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