

Metal and Phosphorus Speciation of Sewage Sludge (Ph.D. Research)

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Title: An investigation into metal and phosphorous fractions of CPR WAS and digested sludge and the subsequent digestion implications

The Urban Wastewater Treatment Directive (1991) specifies lower phosphorus (P) levels in sewage wastewater effluent, when discharging in 'sensitive' waters. P removal within wastewater treatment can be chemical (CPR) or biological (BPR). Sewage treatment works add metal salts (usually Aluminium (Al) or Iron (Fe)) to the sewage as a means of reducing P levels.

The addition of Fe salts impacts other treatment processes, particularly anaerobic digestion. Anaerobic digestion is the final process in wastewater treatment and is necessary to stabilise the sludge before it can be safely applied to land. In activated sludge plants, a mixture of primary and waste activated sludge (WAS) is fed into the digester, and over approximately 16 days is broken down by micro organisms, removing organic matter and producing a gas mixture of carbon dioxide and methane. This 'biogas' can be used as energy to heat the digester and any surplus can be sold. If digestion is inhibited, it may take longer to break down the sludge, and could result in less biogas being produced. It is therefore desirable to establish 1) whether the addition of Fe salts inhibits digestion, and 2) why.

Analysing WAS and digested sludge with respect to their metal and P content is possible by implementing sequential extraction techniques. The speciation of metals (Calcium, Magnesium, and Fe) and P differs depending on the type of sludge analysed. The aim of this research is to investigate how sludges differ with regard to their metal and P speciation and relate this to their digestibility. 11 works have been tested, and their results along side those obtained from 2 bench-scale digesters (Figure 1) can be compared to each sludges' digestibility (established from batch tests).

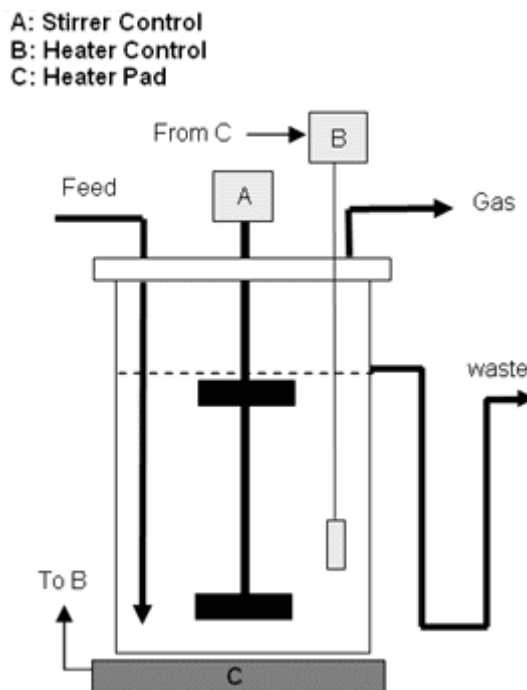


Figure 1 Photograph and schematic diagram of the bench-scale digester

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