

Cell Lysis Cryptic Growth Method Using Ozonation for Excess Sludge Minimization

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Abstract

In any wastewater treatment plant large amount of sludge generation is major issue. The final disposal of the sludge cost almost 60% of total operational cost of treatment plant. In addition to this, it is necessary to meet today's stringent pollution control norms, thus finding methods to minimize excess of sludge is of growing interest. The paper mainly focuses on sludge reduction based on cell lysis cryptic growth method using ozonation for both in wastewater line and sludge line.

Keywords: Lysis cryptic growth; Ozonation; Sludge reduction; Dewatering; Settleability; Filterability

Introduction

In Waste Water Treatment Plant (WWTP) sludge can be produced in two ways; primary which is produced by settleable solids removed from influent wastewater in primary settling; and secondary which is produced by biological process such as activated sludge process. But among all sludge secondary sludge or excess sludge is of great concern because, during the biological treatment of industrial effluent wastewater, in addition to cell biomass, a large amount of non-biodegradable (inert) solids in particulate form, incoming with the influent raw wastewater, contributes significantly to sludge production. Besides this secondary sludge is difficult to dewater because of high amount of bound water content. The final disposal of this sludge cost 60% of total operational cost of treatment plant. So, considering environmental burden and high expense, finding methods which minimize sludge production is of growing interest. There are many techniques available for reduction of sludge for example lysis cryptic growth method, metabolic uncoupler, endogenous metabolism, microbial predation, hydrothermal oxidation but the paper mainly focuses on reviewing lysis cryptic growth method. The term lysis means breakdown of cell wall or cellular membrane due to some external force and the term cryptic growth means survival of remaining cells on contents lysed from dead cell. When microbial cell undergo lysis or death, the cell contents are released into external environment and provide autochthonous substrate that contributes to the organic loading. Now the few remaining cell will grow either using this autochthonous substrate or using substrate which is already present in wastewater therefore this type of growth is termed as cryptic growth. However once lysed, it becomes easy for the living cells to biodegrade the lysed cells, therefore lysis is the rate-limiting step of lysis-cryptic growth, and an increase of the lysis efficiency can therefore lead to an overall reduction of sludge production (Figures 1 and 2).

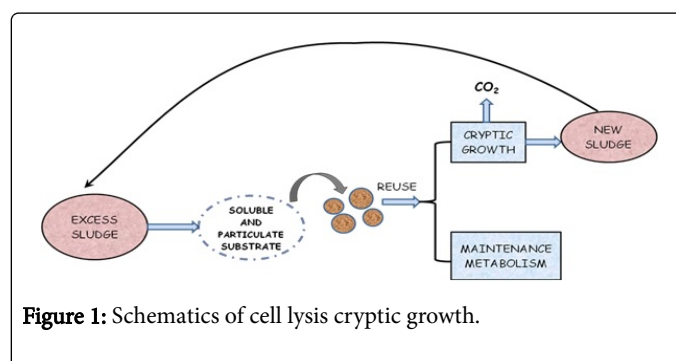


Figure 1: Schematics of cell lysis cryptic growth.

The cell lysis cryptic growth technique can be used in both wastewater handling line and sludge handling line. The figure shows the possible location of lysis cryptic growth method in WWTP.

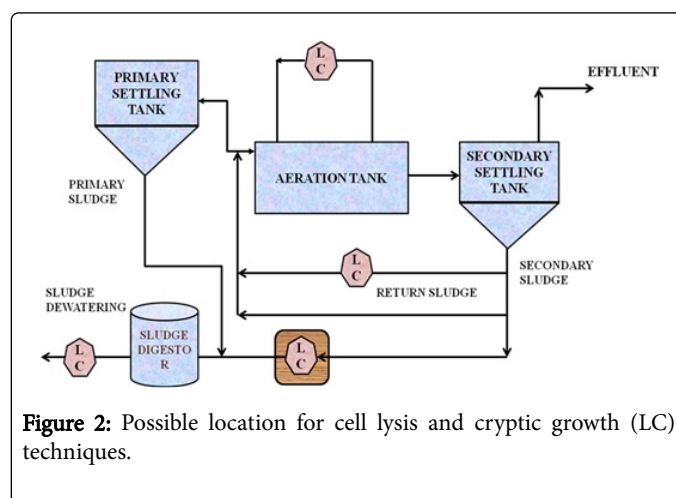


Figure 2: Possible location for cell lysis and cryptic growth (LC) techniques.

The objective of this paper is to critically review current and emerging approaches of sludge reduction based on lysis cryptic growth method using ozonation.