



Techno-economics and Life Cycle Assessment of Bioreactors

Post-Covid19 Waste Management Approach

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Chapter 12 - Challenges and emerging approaches in life cycle assessment of engineered nanomaterials usage in anaerobic bioreactor

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Abstract

Nanotechnology has wide applications in all areas such as agriculture, the environment, and industry energy pharmaceuticals. The use of nanoparticles (NPs) is increasing, positive and negative effects in various environmental areas, including air, water, and soil, have recently been discovered. Various types of engineered NPs (ENPs) have been used in the renewable energy production system. Anaerobic digestion (AD) process is cost-effective and waste-to-energy production. Different types ENPs are applied in the AD method for improving biogas yield with suitable conditions. ENPs have their excellent performance in understanding their presence, behavior, and impact

on water is critical during the AD process. This study aims to understand the consequence of ENPs on the biogas production rate in the AD system. ENPs interaction with bacteria in the AD process for increasing biogas yield rate in the AD process has been discussed. Cost-effective ENPs production, life cycle assessment, and challenges have been elaborated. Finally, the positive effect of ENPs in the AD system for enhancing biogas yield has been concluded.

Keywords

Anaerobic digestion; biochar; emerging challenges; evaluation measures; LCA methodology; LCA cost analysis

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