

Single-Section Fermentation Reactor with Cellular Mixing System

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Abstract : This publication presents a reactor designed for methane fermentation of organic substrates. The design is based on rotating cellular cylinders connected to a biomass feeder and an ultrasonic generator. This allows for simultaneous mixing and partial disintegration of the biomass, as well as stimulating higher metabolic rates within the microorganisms. Such a design allows from 2-fold to 14-fold reduction of power usage when compared to conventional mixing systems. The sludge does not undergo mechanical deformation during the mixing process, which improves substrate biodegradation efficiency by 10-15%. Cavitation occurs near the surface of the rods, partially releasing the biomass and separating it from the destroyed microorganisms. Biogas is released further away from the cellular cylinder rods due to the effect of the ultrasonic waves, in addition to increased biochemical activity of the microorganisms and increased exchange of the nutrient medium with metabolic products, which results in biogas production increase by about 15%.

Keywords : methane fermentation, bioreactors, biomass, mixing system

Conference Title : ICEET 2014 : International Conference on Civil, Environmental Engineering and Technology

Conference Location : Istanbul, Turkey

Conference Dates : February 17-18, 2014