

A compact and self-contained wastewater treatment technology for in-situ and community wastewater treatment.

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As a newly developed efficient multiphase reactor, the liquid-solid Circulating Fluidized Bed is perfect BioReactor (CFBBR) that provides very efficient liquid-solid contact (and therefore higher productivity) while incorporating two or more bio-reaction systems together to allow seamless integration. Although fluidized beds have been known to have many advantages, only single stage or isolated multiple stage fluidized beds have been used so far. This technology has been licensed to a London-based company (Renix, www.renix.ca) which has marketed it as a RenixUIX (fluidized bed uninterrupted ion exchange) technology and has successfully developed new applications for several industries such as food, beverage and mining industry.

Requirements of wastewater treatment to remove carbonaceous substrates, nutrients and phosphorus, has recently become increasingly more stringent worldwide, given the increasing population and environmental concerns. Biological fluidized bed systems with fixed-film process provide higher biomass process intensities, more compact bioreactor sizes, higher mass transfer rate, better ability to handle shock organic loadings as well as mitigate inhibition and toxic impacts, enhanced retention of biosolids, and better sludge settling characteristics. Our new technology incorporates the fixed-film biological fluidized bed system with biological nutrient removal in a multi-column gas-liquid-solid Circulating Fluidized Bed BioReactor (CFBBR), and has achieved simultaneous removal of organic carbon, nitrogen and phosphorus, in a very efficient manner and with very compact space requirement. The new CFBBR has two fluidized beds, running as anoxic/anaerobic and aerobic processes to accomplish simultaneous nitrification and denitrification as well as the elimination of organic nitrogen and phosphorus, with continuous liquid and solids recirculation through the anoxic/anaerobic and aerobic bed. The new CFBBR system is not only an excellent alternative for conventional activated sludge type treatment technologies but also capable of processing much higher loadings and suitable for industrial applications. With 5 ton/day pilot successfully demonstrated between 2007-2010 in London, and a 100 ton/day compact and mobile commercial scale unit demonstrated in China (which capacity commensurates that of a subdivision or an apartment buildings), the technology is ready to be distributed and is mostly suitable for remote areas where normal wastewater treatment system is not available such as rural / northern communities and camping sites, as well as subdivisions away from the city.