

Power Generation and Treatment potential of Microbial Fuel Cell (MFC) from Landfill Leachate

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Abstract : Modern day municipal solid waste landfills are operated and controlled to protect the environment from contaminants during the biological stabilization and degradation of the solid waste. They are equipped with liners, caps, gas and leachate collection systems. Landfill gas is passively or actively collected and can be used as bio fuel after necessary purification, but leachate treatment is the more difficult challenge. Leachate, if not recirculated in a bioreactor landfill system, is typically transported to a local wastewater treatment plant for treatment. These plants are designed for sewage treatment, and often charge additional fees for higher strength wastewaters such as leachate if they accept them at all. Different biological, chemical, physical and integrated techniques can be used to treat the leachate. Treating that leachate with simultaneous power production using microbial fuel cells (MFC) technology has been a recent innovation, reported its application in its earliest starting phase. High chemical oxygen demand (COD), ionic strength and salt concentration are some of the characteristics which make leachate an excellent substrate for power production in MFCs. Different materials of electrodes, microbial communities, carbon co-substrates and temperature conditions are some factors that can be optimized to achieve simultaneous power production and treatment. The advantage of the MFC is its dual functionality but lower power production and high costs are the hurdles in its commercialization and more widespread application. The studies so far suggest that landfill leachate MFCs can produce 1.8 mW/m² with 79% COD removal, while amendment with food leachate or domestic wastewater can increase performance up to 18W/m³ with 90% COD removal. The columbic efficiency is reported to vary between 2-60%. However efforts towards biofilm optimization, efficient electron transport system studies and use of genetic tools can increase the efficiency of the MFC and can determine its future potential in treating landfill leachate.

Keywords : microbial fuel cell, landfill leachate, power generation, MFC

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