Enhancing the efficiency of single-celled microbial fuel cells (SCMFC) provides the opportunity for wastewater treatment plants to invest in green technology that will allow these facilities to become sustainable. SCMFCs comprise of a dualistic nature by producing electricity through the clarification of wastewater. In a SCMFC, the electrode compartment is a vital component of a stabilized fuel cell. This experiment focuses on the durability of electrodes when permeated with various electron acceptors.

Nine SCMFCs were developed and later permeated with the specific electron acceptors, potassium ferricyanide (PF) and manganese dioxide (MnO2). Both have proven to be high reduction and oxidation compounds but PF releases a greater toxic concentration. Several tests were conducted to quantify the effects of specific electrode permeations and catalyst’s in SCMFCs. To determine treatment efficiency, fuel cell inoculum was measured for chemical oxygen demand (COD), total phosphorus, and conductivity. To assess the fuel cells ability to generate electricity, experimentation included measuring the voltage and current for each day of experimentation. For this study, two statistical analyses were performed: repeated measures analysis of variance (ANOVA) and a three-factor ANOVA. Through the repeated measures results, there was an insignificant interaction between week*chemical*electrode. However, the highest electrical power production was achieved with the MnO2 fuel cells (2506.9mW).

Developing an efficient combination of electrodes and catalyst compounds will allow SCMFCs to achieve high electron transfer. By decreasing the cost and the operational parameters of SCMFCs, this biotechnology will become a promising outlook for the future of wastewater treatment sustainability.