SUPER-PLANT: A Multifunctional Sustainable Energy System for the Curbing and Mitigation of Greenhouse Gas Emissions

Ribeiro, Thomas

Climate change is the greatest humanitarian dilemma of our time threatening our public health, the environment, the economy, our national security and more. In the years to come, the combination of climate change and human population growth (inciting an increase in the global energy demand) will have devastating effects on the planet and on future generations. SUPER-PLANT is an innovative, multifunctional environmental engineering project that aims to decrease the growing rates of global warming and carbon pollution, prevent the degradation and contamination of natural ecosystems, and generate significant amounts of clean, sustainable electrical energy. The latter is achieved by effectively extracting, utilizing, absorbing and oxidizing greenhouse gases (that would otherwise become atmospheric) via an intricate piping and filtration unit, a uniquely-designed gas turbine and sabatier reactor, and an industrially promising photo-methanotrophic biofiltration system. The engineering aspect embodies the computational designing and testing of the CHP plant as well as the utilization of mathematical formulae and stoichiometric calculations to accurately deduce the high thermodynamic, total and effective electric efficiency. The biotechnological aspect entails the growing of environmental strains of methanotrophic bacteria via enrichment, the monitoring of oxygen, carbon dioxide and methane oxidation levels via gas chromatography and spectrophotometry, and the detection of pmoA genes encoding the subunits of methane monooxygenase enzymes. The results obtained concur with the efficiency and feasibility of SUPER-PLANT as well as its in-situ implementation to successfully aid the current industrialization crisis and improve the quality of living in various communities worldwide.

Awards Won:
Fourth Award of $500