Fuel Cell Experiment

Winter 2007

TO: Engineering Development Branch

FROM: Engineering Division

SUBJECT: Performance of fuel cell

The company is considering using a proton exchange membrane (PEM) fuel cell to produce electricity in our petroleum refinery. The fuel cell will use hydrogen gas produced as a byproduct as a result of the petroleum refining process. In order to design the fuel cell, kinetic parameters for the reaction of O_2 and H_2 over the membrane catalyst are required.

A small prototype (16 cm^2) provided by the manufacturer has been installed in our laboratory. Please obtain kinetic data for this prototype and analyze the data to find the form and coefficients' values of an equation that describes fuel cell power output. Find the conditions which produce the highest power density. Limit your studies to: 25-75 °C, 5-10 psig, 60-160 mL/min H_2, 200-600 mL/min air.

The fuel cell to be installed in the refinery must provide a net power output of 1kW. Please estimate the area of catalyst required (cm^2) and under what conditions (temperature, flowrate, pressure). Submit a recommendation based on your findings whether the design specifications are feasible.