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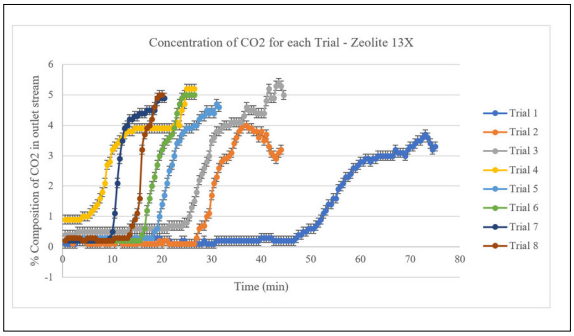
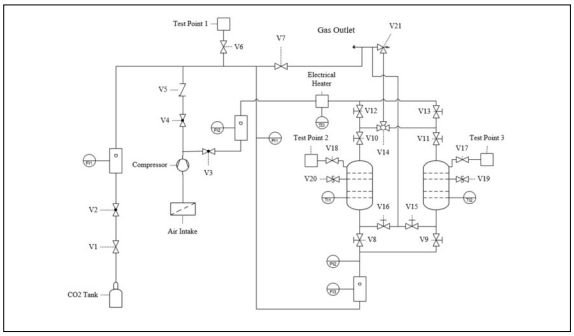
Subject Area	Energy and Environment

Adsorption of Carbon Dioxide through Various Zeolites



As time increased, the zeolite bed became more full. Once it approached the 5% limit, the zeolite had to be regenerated.
Own presentment



Recommended parallel setup of the new adsorption setup based on the research collected and trials ran
Own presentment

Objective: This project encompassed the testing and optimization of a zeolite based adsorption plant. The first part of this two part project involved the background research into zeolites as well as the experimental testing of 2 zeolites (13X and 5A). This was done by running a gas mixture of air and 5% carbon dioxide through a bed of the chosen zeolites. Adsorption, or the process by which the chemical species (in this case carbon dioxide) adheres onto or near the surface or pores of a solid, was used to clean or rid the gas mixture of carbon dioxide, producing a clean exit stream. Concentrations of the gas were measured at the entrance and at the exit through a measuring device and, using material balances, the adsorption capacity of each run was calculated. After each trial run, the carbon dioxide was desorbed from the zeolite by running hot clean air through the system. By mass diffusion and the increase in temperature, the zeolite was regenerated, where it could once again be used to clean the next gas mixture. Using the results ascertained, comparisons were drawn between the two zeolites to see which performed more effectively.

Objective: The second part of this project was the optimization and theoretical creation of an adsorption plant. The 2-plant system that existed in the lab, was optimized to 1 plant system and further modifications were made to the new plan given the obstacles that had be overcome in the first part. Along with recommendations such as reactor optimization, new valve and heater placements (based on thermodynamic losses), a standard operating procedure was written that highlighted how to run the new plant. The final result were two separate setups that would either be run in series (adsorption, then desorption) with the mindset for further testing of zeolites or parallel (adsorption in one reactor, desorption in the second reactor, then flipping the incoming streams) with the mindset for running a continuous process/incorporation into the Power-2-Gas setup.