Optimization of the PSA process for CO_2 capture

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The PSA process is one of the potentially viable options for CO2 capture from large CO2 generating sources. The operating cost of a PSA process for CO2 capture is mostly contributed by the operation of vacuum pumps. Hence, how to reduce the operation cost of vacuum pumps becomes an important issue in the concerned PSA process. The aim of this research is placed in re-evaluating the economy of the two-stage PSA process for CO2 capture using zeolite 13X as adsorbent through numerical simulation and optimization. The performance curves of commercial vacuum pumps were used for realistic calculating of the operating cost. In addition, parameters such as LDF constants and effective diffusivity that have significant effects on the process variables such as the P/F ratio, bed utilization factor, and so forth on the operating cost and CO2 recovery were investigated to select the decision variables for optimization. Economy of the PSA process was evaluated for the optimized process conditions as a function of CO2 contents of the inlet flue gas and CO2 recovery rate.