

Optimizing control of a PSA process for CO₂ capture

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A bilevel strategy for optimizing control of a pressure swing adsorption (PSA) process for CO₂ capture is proposed. A new mass transfer model and an associated parameter estimation technique were developed for the precision modeling of a fixed-bed adsorption process, and the performance curves of commercial vacuum pump and blower were used for realistic calculation of the operating cost. To ensure numerically stable computation, the gradient-directed adaptive predictive collocation method was adopted with a cubic spline interpolation function and far-side boundary conditions. Numerical studies showed that the proposed strategy is successful at driving the process to the intended optimum and maintaining it there while robustly regulating the product purities despite various uncertainties.