



SCIENTIFIC & RESEARCH PROJECTS

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Project Title:

Simultaneous Optimization of CO₂ Emissions Reduction Strategies for Effective Carbon Control in Process Industries

Abstract:

Concerns about global warming have led governments to regulate CO₂ emissions, including through emissions caps, trading and penalties, thus creating economic incentives to reduce CO₂ emissions. This paper presents a mathematical model based on a MINLP formulation to address the problem of CO₂ emissions from large-scale sites in the process industries. The proposed approach considers the interactions between process units, associated heat exchanger networks and the site utility system. The CO₂ emissions reduction strategies considered include retrofit of heat exchanger networks (HENs), operational optimization of the utility system and fuel switching. The mathematical model captures interactions between the HEN and the utility system; the optimization explores these interactions systematically within a superstructure of CO₂ reduction options. The optimization objective is to determine suitable CO₂-mitigation options for a given emissions reduction target and available capital for investment, taking carbon trading issues into account. The proposed approach is applied to a published industrial case study; the results demonstrate the applicability of the approach to finding cost effective solutions for CO₂ emissions reduction. Results show that the best solution CO₂ emissions reduction is affected by carbon trading. Therefore, opportunities to sell CO₂ allowances, if practically achievable, play an important role in the process economics.