

Improvement of Central Composite Design in Modeling and Optimization of Simulation Experiments

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Abstract : Simulation modeling can be used to solve real world problems. It provides an understanding of a complex system. To develop a simplified model of process simulation, a suitable experimental design is required to be able to capture surface characteristics. This paper presents the experimental design and algorithm used to model the process simulation for optimization problem. The CO₂ liquefaction based on external refrigeration with two refrigeration circuits was used as a simulation case study. Latin Hypercube Sampling (LHS) was purposed to combine with existing Central Composite Design (CCD) samples to improve the performance of CCD in generating the second order model of the system. The second order model was then used as the objective function of the optimization problem. The results showed that adding LHS samples to CCD samples can help capture surface curvature characteristics. Suitable number of LHS sample points should be considered in order to get an accurate nonlinear model with minimum number of simulation experiments.

Keywords : central composite design, CO₂ liquefaction, latin hypercube sampling, simulation-based optimization

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