

PROCESS CHARACTERIZATION FOR DYNAMIC DESIGN SPACE DEVELOPMENT: AN INTENSIFIED DESIGN OF EXPERIMENT METHOD

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In this contribution, an intensified Design of Experiment (iDoE) methodology will be introduced. The iDoE approach is based on the idea that the values of certain factors do not need to be kept constant throughout the experiments. Instead the value of the factors can be changed during the experiments, e.g. after a specified time a step-change from 23 to 30 (°C) can be applied in temperature. In this way a classical Design of Experiment plan can in principle be executed using less experiments.

The iDoE method is applied to industrial and simulated E.coli fed-batch fermentations. A dynamic hybrid modeling method is adopted for the analysis of the data, since the analysis cannot be accomplished with the traditional static statistical methods. The process understanding gathered from the iDoE is compared to DoE results. The results suggest that the number of experiments can be reduced by factor of three to two, meaning less than half of the experiments of a classical DoE are required with the iDoE method. In addition, the understanding of the process dynamics is much improved, which is of particular importance to assess the impact of temporal deviations in the factors on the process response.