

## Nonlinear Model Predictive Control of an Entrained-flow Gasifier for an IGCC Power Plant

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Integrated Gasification Combined Cycle (IGCC) is not only an environmentally friendly but also a highly efficient way to produce electricity from coal. One challenge in designing and operating an IGCC power plant is to integrate two separately developed technologies, gasification and combined cycle, into one seamless system. The gasification plant is normally operated at steady state with infrequent load changes and scheduled long-term maintenance outages. However, the power plant environment demands more frequent load changes and rapid start-ups and shut downs in order to follow dynamic load demand. The gasifier supplies the feed to the gas turbine so its dynamic response impacts the dynamics of the downstream equipment and the performance of the entire plant ultimately. In this study, we attempt to understand the gasifier's dynamic behavior through mathematical modeling and a nonlinear model predictive control (NMPC) algorithm is designed. The benefits of NMPC for the gasifier control over the simpler linear MPC are analyzed in terms of disturbance rejection and following dynamic load changes.