

2 July 2013

Modeling and Optimization Symposium

BYU Chemical Engineering Welcomes



Lee Jacobsen

<http://www.linkedin.com/pub/lee-jacobsen/44/b92/148>

Nonlinear MPC of Solid Oxide Fuel Cells

A solid oxide fuel cell (SOFC) is an electrochemical conversion device that produces electricity directly from oxidizing a fuel. Fuel cells are characterized by their electrolyte material; the SOFC has a solid oxide or ceramic, electrolyte. Advantages of this class of fuel cells include high efficiency, long-term stability, fuel flexibility, low emissions, and relatively low cost. The largest disadvantage is the high operating temperature which results in longer start-up times and mechanical and chemical compatibility issues.

To address these fundamental challenges, a nonlinear Model Predictive Control strategy was formulated to limit thermal stresses during load changes and startup procedures. The control strategy relies on a detailed mathematical model composed of partial differential algebraic equations (PDAEs). The model is posed in APMonitor to simultaneously converge the model equations and minimize the objective function with the large-scale nonlinear programming solver APOPT. The approach is generally applicable to any system that can be described by PDAE equations.

Some of the areas covered with this presentation include:

- Current state of the art in multivariate control of solid oxide fuel cells
- Large-scale dynamic optimization for real time application
- Nonlinear dynamic model identification and validation
- Improved control techniques with next generation multivariate control strategies

Following the presentation there will be a question and answer session with a brief introduction to set the stage for the discussion. Participants are welcome to submit questions beforehand to the moderator, John Hedengren, (john.hedengren@byu.edu) or during the session.

10 AM MDT on 2 July 2013

Join the Webinar at <http://byu.webex.com>

Password: apm2013



Presentation to be posted online afterwards: <http://www.youtube.com/user/APMonitorCom>