



Course on Model based Predictive Control (MPC) with hands-on training

Seminar on Plant-wide control

Trondheim
May 8-10, 2006

Arranged by NFA (Norsk Forening for Automatisering), NTNU, and Cybernetica AS in co-operation with Promatch – a Marie Curie Research Training Network.

Summary

This course gives a survey of techniques applied in Model based Predictive Control (MPC).

Correctly applied, MPC has proven to give excellent return of investment. Criteria for success are presented, together with typical problems and challenges from the process industry. Practical examples show how MPC is interfaced to other control functions and plant information systems.

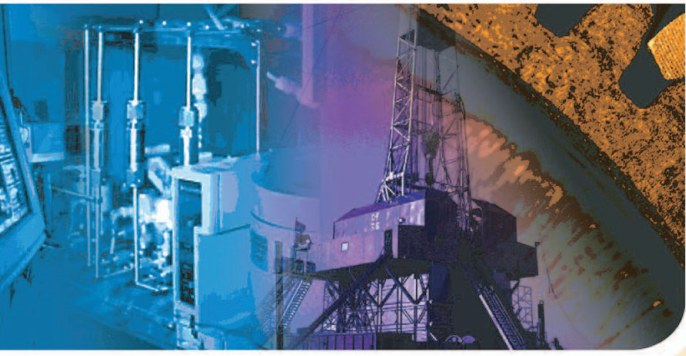
Key concepts and the basic theory are introduced. Model formulations for MPC applications are surveyed, and benefits and draw-backs of various formulations are summarized. Techniques for model derivation and identification are included.

Emphasis will be on practical implementation of MPC. Typical project phases in MPC implementation are presented. This is followed up by industrial examples, and two hands-on training sessions.

The lectures are held in English.

Course objective

The objective of this course is to give the participants practical knowledge of the MPC technology: What it takes to conduct a successful implementation.



Program

Who should attend?

This course is suitable for:

- managers with responsibility for plant operation or process control systems
- control engineers who would like an overview of the MPC technology
- students, teachers and researchers who could benefit from a practical approach to the MPC technology

Programme

Day 1: May 8th:

10.00 – 12.00	Opening Process control as a tool for increased profitability
12.00 – 13.00	Lunch
13.00 – 17.00	Introduction to MPC technology

Day 2: May 9th:

08.30 – 12.00	Phases in industrial installation of MPC Presentation of an industrial installation (Case 1)
12.00 – 13.00	Lunch
13.00 – 17.00	Presentation of an industrial installation (Case 2) Introduction to the training process Hands-on training (Session 1)

Day 3: May 10th:

08.30 – 12.00	Hands-on training (Session 2) Summary of the MPC lectures and training sessions.
12.00 – 13.00	Lunch
13.00 – 16.30	Seminar on Plant-wide control
16.30 – 17.00	Feed-back and evaluation. Closure.

Instructors

Prof. Sigurd Skogestad, NTNU;
Siv. ing. Svein Olav Hauger,
Dr. ir. Stefan de Graaf, and
Dr. ing. Peter Singstad, Cybernetica AS

Contents

1. Opening
2. Process control as a tool for increased profitability
 - Overview of available tools and possibilities
 - Objectives for Return of Investment
 - Integration of MPC in the control hierarchy and in the plant information systems
 - Relation to Enterprise Resource Planning (ERP) and Manufacturing Execution Systems (MES)
 - Industrial challenges
3. Introduction to MPC technology
 - Theoretical background
 - Basic concepts (MV, CV, DV)
 - Optimality, criteria
 - Model structure
 - Model identification
 - On-line model update
4. Phases in industrial installation of MPC
 - Pre-study (incentive plan)
 - Analysis of plant topology and plant operation
 - Application development
 - Factory Acceptance Test
 - Systems integration
 - Operator interface • Commissioning, tuning
 - Site Acceptance Test
 - Training of application engineers
 - Training of operators
 - Documentation
 - Maintenance

5. Presentation of industrial cases

- Cost/benefit of MPC applications
- Experience from introduction, use and maintenance of MPC applications

6. Hands-on training

- Introduction to the process and training problem: Grade transition in a continuous polymerization process.
- Configuration and tuning of a MPC controller (Cybernetica CENIT)
- Configuration and tuning of an extended, augmented Kalman filter for state and parameter estimation in a nonlinear model; re-tuning of the MPC controller (Cybernetica CENIT)

7. Plant-wide control

- Overview of plantwide control
- Selection of primary controlled variables based on economic : The link between the optimization (RTO) and the control (MPC; PID) layers
 - Degrees of freedom
 - Optimization
 - Self-optimizing control
 - Applications
 - Examples
- Where to set the production rate and bottleneck
- Design of the regulatory control layer ("what more should we control")
 - Stabilization
 - Secondary controlled variables (measurements)
 - Pairing with inputs
 - Controllability analysis
 - Cascade control and time scale separation.
- Design of supervisory control layer
 - Decentralized versus centralized (MPC)
 - Design of decentralized controllers: Sequential and independent design
 - Pairing and RGA-analysis
- Summary and case studies

8. Summary of the course

9. Feed-back and evaluation

10. Closure

Registration information

- Time and place:** May, 8.-10. 2006, Trondheim
- Registration deadline:** April, 26. 2006
- Cancellation:** Cancellation after April, 26. will be charged with the complete participation fee. Cancellations must be submitted in writing.
- Participation fee:** Kr. 11.950,- (company or personal member of NFA)
Kr. 12.950,- (not a member of NFA)
- The participation fee includes seminar materiel, food and drink during breaks and lunch incl. beverage.
- Hotel:** Must be booked individually. We can recommend the Quality Hotel Augustin, tlph. 73 54 70 00. All hotel bills must be settled before departure.
- Seminar committee:** Peter Singstad, Cybernetica AS
Svein Olav Hauger, Cybernetica AS
Lars Annfinn Ekornsæter, NFA
Morten Hovd, NTNU

Registration MPC:

send to; NFA, Kjøita 42, 4630 Kr.sand – Fax: 3804 6259 – www.nfaplassen.no

First name:
Surname:
Company:
Invoice address:
Post number/place:
Booking reference:

<input type="checkbox"/> Personal membership – kr. 250,-
<input type="checkbox"/> Company membership – kr 3.000,-
<input type="checkbox"/> Student membership – kr 0,-
<input type="checkbox"/> First two days only (kr 5.950,- / kr 6.500,-)

<input type="checkbox"/> Personal member
<input type="checkbox"/> Company member
<input type="checkbox"/> Not a member

Telephone No.:	
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E-mail:	
<input type="checkbox"/> Invoice private	<input type="checkbox"/> Invoice company