Nordic Process Control Workshop.
15-16 January 2015
Technical program

Thursday 08:40-09:00 Welcome and introduction

Chair: Sigurd Skogestad, NTNU

Thursday 09:00-10:20 Oral presentations 1 . Industrial process control

Chair: Bjarne Foss, NTNU

1. (21)

The "hidden" process control discipline and its link to operational profit for oil- and gas production
Olav Slupphaug
ABB, Oslo, Norway

2. (50)

Industrial control structures practice: some observations
Krister Forsman
Perstorp AB, Sweden

3. (44)

Control of granulation processes
Bjørn Glemmestad, Vidar Alstad, Trude Odberg Nysæter
Yara, Porsgrunn, Norway

4. (16)

Improved Feed Control with Feed-forward for Producing Aggregates
Pasi Airikka
Metso Corporation, Tampere, Finland

Thursday 10:50-12:30 Oral presentations 2. MPC and optimization

Chair: Kurt Häggblom. Åbo Univ.

5. **(12)**

Optimal control of uncertain systems using Dual Model Predictive Control (DMPC)
Tor Aksel N. Heirung*, B. Erik Ydstie**, Bjarne Foss*
*Dept. of Chemical Engineering, Carnegie Mellon University, Pittsburgh, PA, USA
** Dept. of Engineering Cybernetics, NTNU

6. (31)

Efficient solvers for soft-constrained MPC
Gianluca Frison, John Bagterp Jørgensen
Technical University of Denmark, DTU, Department of Applied Mathematics and Computer Science, Lyngby, Denmark

7. (46)

Sensitivity-based economic model predictive control
Johannes Jäschke, Xue Yang, Lorenz T. Biegler
NTNU & Carnegie-Mellon University, Pittsburgh, USA

8. (2)

On the Convergence Rate of Extremum Seeking Control

Olle Trollberg and Elling W. Jacobsen
Automatic Control, KTH, Stockholm

9. (4)

Model Predictive Control of Pasteurization Processes
Patrick Hammer, Martin Mayer
evon GmbH, Gleisdorf, Austria

Thursday 13:40-15:20 Oral presentations 3. PID and decentralized control

Chair: Elling Jacobsen, KTH

10. (3)

Software-based optimal PID design with PI versus PID performance comparison
Olof Garpinger, Tore Hagglund
Department of Automatic Control, Lund University, Lund, Sweden

11. (30)

Industrial setup for autotuning of PID controllers in large-scale processes: Applied to Tennessee Eastman process
Selvanathan Sivalingam, Esmaeil Jahanshahi
Technology & Innovation Department, Siemens AS, Trondheim, Norway

12. (6)

Derivative Backoff: A Process Value Saturation Problem for PID Controllers
Alfred Theorin, Tore Hägglund
LTH, Lund, Sweden

13. (38)

Wireless process control - Handling of variable latency and sampling rates in PI controllers
Ivar J. Halvorsen,
SINTEF, Applied Cybernetics, Trondheim

14. (26)

Reconfiguration of Decentralized Controllers Using Closed-Loop Sensitivity Factorization
Wolfgang Birk
Control Engineering Group, Luleå University of Technology, Sweden

Thursday 15-20-16:40: Poster session

Thursday 16:40-18:00 Oral presentations 4. Applications

Chair: Tore Hägglund, Lund Univ.

15. (5)

A mid-ranging control strategy for non-stationary processes and its application to dissolved oxygen control in a bioprocess
O. Johnsson∗, D. Sahlin∗∗, J. Linde∗∗∗, G. Liden∗∗∗, T. Hagglund*
∗Department of Automatic Control, Faculty of Engineering LTH,Lund University, Sweden
∗∗Novozymes A/S, Hallas Alle 1, 4400 Kalundborg Denmark
∗∗∗ Department of Chemical Engineering, Faculty of Engineering LTH,Lund University, Sweden

16. (10)

Integrated Process Design and Control of Reactive Distillation Processes
Seyed Soheil Mansouri*, Mauricio Sales Cruz**, Jakob Kjøbsted Huusom*, John M. Woodley*, Rafiqul Gani*
* DTU, Lyngby, Denmark
**UAM, Mexico

17. (35)

A Mean-Variance Objective for Robust Production Optimization in Uncertain Geological Scenarios
Andrea Capolei a, Eka Suwartadi b, Bjarne Foss b, John Bagterp Jørgensen a
a Department of Applied Mathematics and Computer Science & Center for Energy Resources Engineering, Technical University of Denmark, Lyngby, Denmark.
b Department of Engineering Cybernetics, Norwegian University of Science and Technology (NTNU), Trondheim, Norway

18. (53)

Modelling and Model Predictive Control of ESP lifted wells
Alexey Pavlov, Dinesh Krishnamoorthy, Elvira Marie.B Aske, Kjetil Fjalestad, Morten Fredriksen, Statoil Research Centre, Norway.

Thursday 18:00-18:30 NPC award: Rudolph Kalman interview (video)

Chair: Sigurd Skogestad, NTNU.

Interview (video) by Johannes Jäschke, NTNU

Thursday 20:00: Dinner

Friday 08:10-10:10 Oral presentations 5. Power and bio applications

Chair: John Bagterp Jørgensen, DTU

19. (23)
Remote light stress detection for greenhouse LED lighting control
Anna-Maria Carstensen, Torsten Wik, Tessa Pocock
Department of Signals and Systems, Chalmers University of Technology, Göteborg, Sweden

20. (51)
Fault tolerant model predictive control for the BioPower 5 CHP plant
J. Kortela, S-L. Jämsä-Jounela
Aalto University School of Chemical Technology, Finland

21. (19)
Relative Gain Measures for Once-through Circulating Fluidized Bed Boiler Control Design
Matias Hultgren*. Jenö Kovács**. Enso Ikonen*
* Systems Engineering Laboratory, University of Oulu, Finland.
** Foster Wheeler Energy Ltd, Varkaus, Finland.

22. (43)
Model-based optimal design and control of an anaerobic digestion reactor
Finn A. Haugen
Telemark University College, Porsgrunn, Norway

23. (41)
A study on the combustion dynamics of a biomass fuel bed in a BioGrate boiler
[1]A. Boriouchkine , [2]V. Sharifi, [2]J. Swithenbank, [1]S.-L. Jämsä-Jounela,
[1]School of Chemical Technology, Aalto University, Finland;
[2]University of Sheffield, Department of Chemical and Biological Engineering, UK;

24. (8)
Investigation of tuning of a fuzzy-logic control for biological wastewater treatment systems
Riccardo Boiocchi, Krist V. Gernaey and Gürkan Sin
Chemical Engineering, DTU, Lyngby, Denmark

Friday 10:40-12:40 Oral presentations 6. Modelling and identification

Chair: Sirkka-Liisa Jämsä-Jounela, Aalto Univ.

25. (22)
Dynamic modelling of a multiple hearth furnace for kaolin calcination
Aleksi Eskelinen[a], Alexey Zakharov*[a], Sirkka-Liisa Jämsä-Jounela[a]
[a] Aalto University, School of Chemical Technology, Research group of Process Control and Automation, P.O. Box 16100, FI-00076 Espoo, Finland

26. (42)
A Continuous-Discrete Extended Kalman Filter for State and Parameter Estimation in People with Type 1 Diabetes
Dimitri Boiroux[1,2], Vladimír Bátora[3], Morten Hagdrup[1], Tinna Björk Aradóttir[1], Caroline Johannsen[1], Marían Tárnik[3], Ján Murgaš[3], Signe Schmidt[2,4], Kirsten Nørgaard[4], Niels Kjølstad Poulsen[1], Henrik Madsen[1] and John Bagterp Jørgensen[1]
[1] DTU Compute, Technical University of Denmark, Kgs. Lyngby, Denmark
[2] Danish Diabetes Academy, Odense, Denmark
[3] Faculty of Electrical Engineering and Information Technology, Slovak University of Technology, Bratislava, Slovakia

[4] Department of Endocrinology, Hvidovre Hospital, Denmark

27. (20)

Output-Error System Identication in the Presence of Structural Disturbances

Amir H. Shirdel, Jari Böling, Hannu T. Toivonen
Department of Chemical Engineering, Åbo Akademi University, Finland

28. (52)

Iterative Sub Network component analysis

Nadav Bar, Lasse Aasgaard, Naresh D. Jayavelu
Department of Chemical Engineering, NTNU, Trondheim

29. (34)

Balanced input excitation for identification of ill-conditioned $n \times n$ systems with $n > 2$

Ramkrishna Ghosh, Kurt E. Häggblom, Jari M. Böling
Department of Chemical Engineering, Åbo Akademi University, Finland

30. (18)

Advanced optimization of C5 and C6 fermentation by the use of state estimators with pH measurements

Miguel Mauricio-Iglesias, Krist V. Gernaey, Jakob K. Huusom.
CAPEC-PROCESS, Department of Chemical and Biochemical Engineering, Technical University of Denmark. Lyngby.

POSTERS (Thursday and Friday)

1. (P1)

Self-tuning of predictive controller based on step response model in real-time framework

Dejan Dovzan, Igor Skrjanc

Faculty of Electrical Engineering, Ljubljana, Slovenia

2. (P9)

Modeling the Automotive SCR Catalyst

Andreas Åberg*, Anders Widd**, Jens Abildskov*, Jakob Kjøbsted Huusom*

*DTU, Lyngby, Denmark

** Haldor Topsøe A/S, Lyngby, Denmark

3. **(**P11)

A Trajectory-based Bumpless Switching Control of Multi-Evaporator Air-Conditioning Systems

Tushar Jain, 1, Joseph J. Yame, 2

1 Aalto University, School of Chemical Technology,Finland

1. Universit´e de Lorraine, Vandoeuvre-l`es-Nancy, France

4. (P13)

Active Disturbance Rejection Control of the Newell-Lee forced circulation evaporator – a simulation study

Rainer Dittmar, West Coast University of Applied Sciences at Heide, Germany

5. (P14A)

Nonlinear Model Predictive Control of a High-Pressure

Polyethylene Tubular Reactor in Stenungsund, Sweden

Staffan Skålén and Fredrik Josefsson

Advanced Process Control group, Borealis AB, SE-444 86 Stenungsund, Sweden.

6. (P14B)

Automation experiences during projects in Abu Dhabi

Staffan Skålén

Advanced Process Control group, Borealis AB, SE-444 86 Stenungsund, Sweden.

7. (P15)

Enabling High-Performance Industrial Embedded Model Predictive Control using Code Generation and High-speed Solvers

D. K. M. Kufoalor*, B. J. T. Binder*, L. Imsland*, T. A. Johansen*, G. O. Eikrem**, A. Pavlov**

* Department of Engineering Cybernetics, NTNU, Trondheim, Norway

** Statoil ASA, Rotvoll & Porsgrunn.

8. (P17)

Model Selection and Estimation of Neural Networks by Using Weight Dropout

Mikael Manngård, Jari M.Böling

Department of Chemical Engineering, Åbo Akademi University, Finland

9. (P24)

Using Fluorescence as Control Parameter to Decide Optimal Light Spectrum for Plant Growth

Linnéa Ahlman, Torsten Wik, Daniel Bånkestad

Department of Signals and Systems, Chalmers University of Technology, Göteborg, Sweden

10. (P25)

Dynamic Effects of Diabatization in Distillation Columns

Thomas Bisgaard, Jakob K. Huusom, Jens Abildskov

CAPEC-PROCESS, Technical University of Denmark, Lyngby, Denmark

11. (P27)

Fault propagation analysis by merging process causality and plant topology

R. Landman, J. Kortela, S-L. Jämsä-Jounela

Aalto University, School of Chemical Technology, Process Control and Automation Research Group, Finland

12. (P28)

Relative Gain Array Estimation Based on Non-parametric Process Identification for Uncertain Systems

Ali M. H. Kadhim*, Wolfgang Birk and Thomas Gustafsson

Control Engineering Group, Luleå University of Technology, Sweden

13. (P29A)

Convex optimization as a design tool for feedforward controllers

Martin Hast, Tore Hägglund

Department of Automatic Control, Lund University, Sweden

14. (P29B)

Autotuning Based on Asymmetric Relay

Josefin Berner, Karl Johan Åström, Tore Hägglund
Department of Automatic Control, Lund University, Lund,

15. (P32)

A reduced observer design for a freezing process

Christoph Josef Backi, Jan Tommy Gravdahl
Department of Engineering Cybernetics, NTNU, Trondheim

16. (P33)

Decoupling approach in fluidized bed combustor control

Szabó, Z.*, Kovács, J.**, Szentannai P.*
** Budapest University of Technology and Economics, Department of Energy Engineering*
Budapest, Hungary
***University of Oulu, System Engineering Laboratory, Oulu, Finland*

17. (P36)

A performance optimization algorithm in fault tolerant distributed model predictive control

Alexey Zakharov, , Elena Zattoni, Miao Yu, Sirkka-Liisa Jämsä-Jounela
Aalto University, Department of Biotechnology and Chemical Technology, Finland
Alexey Zakharov

18. (P37)

Modeling Vapor Compression Cycles for Dynamic Simulation of Supermarket Refrigeration Systems

S. N. Mohd. Azam a, R. Izadi-Zamanabadi b, J. B. Jørgensen a
A Department of Applied Mathematics and Computer Science, Technical University of Denmark, Lyngby, Denmark
B Danfoss A/S, Electronic Controllers & Services, DK-6430 Nordborg, Denmark

19. (P39)

Data Reconciliation method for improving performance and reliability of MPC control strategy for a BioGrate boiler

Palash Sarkar, Jukka Kortela, Alexandre Boriouchkine, Sirkka-Lisa Jämsä-Jounela
Aalto University, School of Chemical Technology, Process Control and Automation Research Group, Finland

20. (P40)

An indirect fuel moisture content estimation approach for BioGrate boilers

Alexandre Boriouchkine*, Miao Yu, Sirkka-Liisa Jämsä-Jounela
Aalto University, School of Chemical Technology, Department of Biotechnology and Chemical Technology, FI-00076 Aalto, Finland.

21. (P47)

Dynamic Real-Time Optimization for a Reactor, Separator and Recycle Processes

Vladimiros Minasidis, Sigurd Skogestad
Department of Chemical Engineering, Norwegian University of Science and Technology, Trondheim, Norway

22. (P48)

Robust anti-slug control

Vinicius de Oliveira, Sigurd Skogestad, Johannes Jäshke
NTNU

23. (P49)

Non-robustness and limitations of Smith Predictor Control

Chriss Grimholt, Sigurd Skogestad
NTNU

24. (P7)

NOVEL STRATEGIES FOR CONTROL OF FERMENTATION PROCESSES

Lisa Mears[1], Stuart Stocks[2], Gürkan Sin[1], Krist V. Gernaey[1], Kris Villez[3]
1.Department of Chemical and Biochemical Engineering,
Technical University of Denmark, Building 229, 2800 Lyngby, Denmark
2. Novozymes A/S, Pilot plant, Krogshoejvej 36, 2880 Bagsværd, Denmark
3. Eawag: Swiss Federal Institute of Aquatic Science and Technology, Dübendorf, Switzerland

25 (P55)

From Tweets to Optimality in the Smart and Sustainable Factory

Bengt Lennartson
Chalmers University of Technology, SE-412 96 Göteborg, Sweden

26 (P56)

Optimal controller design for balancing input/output disturbance rejection response with robust stability condition

Bo Sun, Shanghai Jiao Tong University, China