Curriculum Vitae

Personal data:

Name:	Morten Hovd
Date and place of birth:	12th of September 1963 in Harstad, Norway
Address:	Lindeveien 23a, N-7058 Jakobsli, Norway
Present position:	Professor of process control, Engineering Cybernetics Department, Norwegian University of Science and Technology

Education:

Institution	Duration	Course/degree
University of Salford, England	1982-1986	Natural Gas Engineering / BSc with Honours
Norwegian Institute of Tecnology, Department of Chemical Engineering	1989-1992	Process Control / Doktor Ingeniør (PhD)

Work experience:

Institution / Company	Department	Duration	Position
Institue for Continental Shelf Research	Center for Petroleum Related Process Technology	1986-1987	Engineer
Norsk Hydro	Process Technology Department, Technology and Development Division	1987-1989	Engineer
Sintef	Technical Chemistry Department	1992	Scientist
Fantoft Prosess	Process Control Group	1993	Engineer
Sintef	Technical Chemistry Department (assigned to projects for Norske Skog Research)	1993-1995	Scientist
Fantoft Prosess	Process Control Group	1996-1997	Engineer
Fantoft Prosess	Process Control Group	1997-1998	Head of group
Norwegian University of Science and Technology	Department of Engineering Cybernetics	1998 -	Professor

Consultancies: (company, date):

Fantoft Prosess	1998 – 2000
Sintef Electronics and Cybernetics	1999 –
Honeywell HiSpec Solutions	2000 – 2003
Cybernetica	2004 –

Other appointments and activities:

- IFAC Technical Committee on Mining, Mineral and Metals Processing, member.
- Visiting professor, Mechanical and Aerospace Engineering Department, University of California San Diego, July 2002 – June 2003.
- Editor, Modeling, Identification and Control (from 2004).
- Board member, Norwegian Society for Automation (from 2004)

Membership in professional organizations:

- Institute of Electrical and Electronics Engineers
- American Institute of Chemical Engineers
- Norwegian Society of Chartered Engineers (Tekna)
- Norwegian Society for Automation (NFA)

Prizes:
- International Chemistry Olympiad, Stockholm, 1982: Bronze medallist.
- Institution of Gas Engineers, UK, 1986: awarded the Charles Hunt Memorial Medal as the best student in Gas Engineering (Distribution of natural gas).

Supervision of doctoral students:

Name of student	Research topic	Starting date
Kristin Hestetun	Use of data for anodic current distribution in aluminium electrolysis	Feb. 2000
Arjun Singh	Model-based predictive control of heat exchangers for production of liquefied natural gas (LNG)	Jan. 2004

Courses taught:

Modelling of contiuous-time dynamical systems (1998)
Structures in process control (1999 – 2000)
Robust control (2001 –)
Advanced process control (2001 –)

Bibliography of Morten Hovd

Dr. ing. thesis:
Studies on Control Sturcture Selection and Design of Robust Decentralized and SVD Controllers.
Department of Chemical Engineering, Norwegian Institute of Technology, 1992.

Book chapter:
Hovd, M. and Skogestad, S. (2000). *Techniques in the Control of Interconnected Plants*, pp. 139-200 in C. T. Leondes (Ed.) *Mechatronic Systems Techniques and Applications. Vol 5: Diagnostic, Reliability and Control System Techniques.* Gordon and Breach Science Publishers

International journal publications:

1. Skogestad, S., Hovd, M., and Lundström, P. (1991). Simple Frequency Dependent Tools for Analysis of Inherent Control Limitations. *Modeling, Identification and Control*, Vol. 12, No. 4, pp. 159-177.
2. Hovd, M. and Skogestad, S. (1992). Simple Frequency-dependent Tools for Control System Analysis, Structure Selection and Design. *Automatica*, Vol. 28, No. 5, pp. 989-996.
3. Hovd, M. and Skogestad, S. (1993). Improved Independent Design of Robust Decentralized Controllers. *Journal of Process Control*, Vol. 3, No. 1, pp. 43-51. Reprinted in: *Modeling, Identification and Control*, (1994), Vol. 15, No. 2, pp. 93-107.
4. Hovd, M., Lee, J. H. and Morari, M. (1993). Truncated Step Response Models for Model Predictive Control. *Journal of Process Control*, Vol. 3, No. 2, pp. 67-73.
5. Hovd, M. and Skogestad, S. (1993). A Procedure for Regulatory Control Structure Selection with Application to the FCC Process. *AIChE Journal*, Vol. 39, No. 12, pp. 1938-1953.
6. Hovd, M. and Skogestad, S. (1994). Control of Symmetrically Interconnected Plants. *Automatica*. Vol. 30, No. 6, pp. 957-973.
7. Hovd, M. and Skogestad, S. (1994). Sequential Design of Decentralized Controllers. *Automatica*, Vol. 30, No. 10, pp. 1601-1607.
8. Hovd, M. and Skogestad, S. (1994). Pairing Criteria for Decentralized Control of Unstable Plants. *Industrial & Engineering Chemistry Research*, Vol. 33, No. 9, pp. 2134-2139.
9. Hovd, M., Braatz, R. D. and Skogestad, S. (1994). SVD Controllers for H_2-, H_σ - and μ-optimal Control. *Automatica*, Vol. 33, No. 3, pp. 433-439.

10. Skogestad, S. and Hovd, M. (1995). Letter to the editor on decentralized vs. multivariable control, *Journal of Process Control*, Vol. 5, pp. 399-400.
11. Hovd, M., Michaelsen, R., and Montin, T. (1997). Model Predictive Control of a Crude Oil Distillation Column. *Computers and Chemical Engineering*, Vol. 21, Suppl. pp. S893-S897.
12. Hovd, M. (1997). Review of: "Multivariable Control System Design Techniques. Dominance and Direct Methods" by G. F. Bryant and L. F. Yeung. Journal of Process Control, Vol. 7, No. 6, pp. 467-468.
13. Hovd, M., Braatz, R.D. and Skogestad, S. (1997) ``SVD Controllers for H_2-, H_∞-, and m-optimal control, *Automatica*, Vol. 33, pp.433-439.
14. Ma, D.L., VanAntwerp, J., Hovd, M. and Braatz, R. (2002) Quantifying the potential benefits of constrained control for a large scale system. IEE-Proc Control Theory Appl., Vol 149, No. 5, pp. 423 – 432.
15. Hovd, M., Ma, D.L. and Braatz, R.D. (2003). On the computation of disturbance rejection measures. Ind. Eng. Chem. Res., Vol 42, No. 10, pp. 2183 – 2188. (Also in Modeling, Identification and Control, Vol 25, No. 1, pp.45-56).

International conference publications

1. Skogestad, S. and Hovd, M. (1990). Use of Frequency-Dependent RGA for Control Structure Selection. *Proc. American Control Conference*, pp. 2133-2139, San. Diego, USA.
2. Hovd, M., Lundström, P. and Skogestad, S. (1990). Controllability Analysis Using Frequency-dependent Measures for Interactions and Disturbances. *American Institution of Chemical Engineers (AIChE) Annual Meeting*, paper 321j, Chicago, Illinois, USA.
3 P. Lundström, S. Skogestad, M. Hovd and Wang, Z.-Q. (1991). Non-uniqueness of Robust H_∞ decentralized PI-control. *Proc. American Control Conference*, pp. 1830-1835, Boston, USA.
4. Hovd, M., Lee, J. H. and Morari, M. (1991). Model Requirements for Model Predictive Control. Proc. European Control Conference, Grenoble, Frankrike, pp. 2428-2433.
5. Skogestad, S., Hovd, M. and Lundström, P. (1991). Towards Integrating Design and Control: Use of Frequency-dependent Tools for Controllability Analysis. *Proc. Process Systems Engineering 91*, pp. III.3.1-III.3.15, Canada
6. Hovd, M. and Skogestad, S. (1991). Impact of Model Uncertainty on Control Structure Selection for the Fluid Catalytic Cracking Process. *Preprints IFAC Symposium ADCHEM'91*, Toulouse, Frankrike, pp. 107-112.
7. Hovd, M. and Skogestad, S. (1991). Controllability Analysis of the Fluid Catalytic Cracking Process. *AIChE Annual Meeting*, paper 145g, Los Angeles, California, USA.
8. Wolff, E. A., Skogestad, S. and Hovd, M. (1992). Controllability of Integrated Plants. *AIChE Spring National Meeting*, Paper 67a, New Orleans, USA.
9. Hovd, M. and Skogestad, S. (1992). Robust Control of Systems Consisting of Symmetrically Interconnected Subsystems. *Proc. American Control Conference,* Chicago, Illinois, USA, pp. 3021-3025.
10. Hovd, M. and Skogestad, S. (1992). Controllability Analysis for Unstable Processes. *Preprints IFAC Workshop on Interactions Between Process Design and Process Control*, London, England, pp. 127-132.
11. Wolff, E. A., Skogestad, S., Hovd, M. and Mathiesen, K. W. (1992). A procedure for Controllability Analysis. *Preprints IFAC Workshop on Interactions Between Process Design and Process Control*, London, England, s. 49-54.
12. Hovd, M. and Skogestad, S. (1992). Design of Robust Decentralized Controllers. *AIChE Annual Meeting*, paper 127d, Miami Beach, Florida, USA.
13. Hovd, M,, Braatz, R. D. and Skogestad, S. (1993). On the Structure of the Robust Optimal Controller. *Proc 12th IFAC World Congress*, Sydney, Australia, Vol 4., pp. 27 - 30.
14. Hovd, M. and Skogestad, S. (1993). Improved Independent Design of Robust Decentralized Controllers. *Proc. 12th IFAC World Congress*, Sydney, Australia,

Vol. 5, pp. 271 - 274.

15. Hovd, M. and Skogestad, S. (1993). Robust Sequential Design of Decentralized Controllers. *Proc. European Control Conference*, Groningen, Nederland, pp. 1050-1055.

16. Hovd, M. and Skogestad, S. (1993). Robust Control of Symmetric Processes. *AIChE Annual Meeting*, paper 146k, St. Louis, Missouri, USA.

17. Hovd, M. and Skogestad, S. (1993) Pairing Criteria for Unstable Plants. *AIChE Annual Meeting*, paper 149i, St. Louis, Missouri, USA.

18. Hovd, M., Braatz, R. D. and Skogestad, S. (1994). SVD Controllers for H_2-, H_∞- and μ-optimal Control, *Proc. American Control Conference*, pp. 1233-1237, Baltimore, USA.

19. Hovd, M., Michaelsen, R., and Montin, T. (1997). Model Predictive Control of a Crude Oil Distillation Column. *PSE'97-ESCAPE-7*, Trondheim, Norway.

20. Hovd, M., Eikaas, T. I., and Foss, B. A., (1999). Merging physical experiments into the learning arena. *AIChE Annual Meeting*, paper 205o/206o, Dallas, Texas, USA.

21. Hovd, M. and Glende, E., (1999). Interactions between design and control in offshore oil production platforms. *AIChE Annual Meeting*, paper 208ab, Dallas, Texas, USA.

22. Hovd, M. and Braatz, R. D. (2000). On the computation of disturbance rejection measures. Preprints of *IFAC Symposium ADCHEM'2000*, Pisa, Italy, pp.63-68.

23. Foss B. A., Eikaas, T. I., Hovd, M. (2000). Merging Physical Experiments back into the Learning Arena, *American Control Conference*, Chicago, USA.

24. Hovd, M. and Braatz, R. D. (2001). On the use of soft constraints in MPC controllers for plants with inverse response. *IFAC Symposium DYCOPS- 6*, Chejudo Island, Korea.

25. Hovd, M. and Braatz, R. D. (2001). Handling state and output constraints in MPC using time-dependent weights. American Control Conference, Arlington, Virginia, USA.

26. Jakobsen, S. R., Hestetun, K. Hovd, M. and Solberg, I. (2001). Estimating alumina concentration distribution in aluminium electrolysis cells. *10th IFAC Symposium on Automation in Mining, Mineral and Metals Processing*, Tokyo, Japan.

27. Hovd, M. and Bitmead, R. R. (2004). Directional leakage and parameter drift. Accepted for publication at *IFAC Symposium on Dynamics and Control of Process Systems (DYCOPS-7)*, Boston, July 2004.

28. Hovd, M. and Bitmead, R. R. (2004). Interaction between control and state estimation in nonlinear MPC. Accepted for publication at *IFAC Symposium on Dynamics and Control of Process Systems (DYCOPS-7)*, Boston, July 2004.

Submitted for publication

1. M. Hovd (2004). Adaptive MPC for reference tracking applications. Submitted to the IEEE Conference on Decision and Control, Bahamas, Dec. 2004.

Publications in national journals (in Norwegian)

1. M. Hovd (2000). Modellbasert prediktiv regulering. *Automatisering*, no. 1, pp. 12-17.

Trondheim,

02 June 2004

CURRICULUM VITAE

Name:	**BJØRN NYGREEN**
Born:	April 7th 1946
Nationality:	Norwegian
Address:	Group for Managerial Economics and Operations Research
	Department of Economics and Technology Management
	Norwegian University of Science and Technology (NTNU).
	7491 Trondheim, Norway
Phone/fax:	+47 73593607 / +47 73593603
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Academic degrees:

1969:	M.Sc. in Applied Physics - The Norwegian Institute of Technology.
1973:	Dr.ing. in Operations Research - The Norwegian Institute of Technology.

Employment after dr.ing:

1974 - 1990:	Associate professor, Department of Managerial Economics and Operations Research - NTH.
1980 - ....:	Scientific adviser for SINTEF Industrial Management, Economics and Logistics.
1991 - ....:	Professor (Operations Research), Group for Man.Ec. & Op. Res. - NTNU.
1999 - 2002:	Professor II (Logistics), Department for Economics, Molde College.

Sabbatical years:

1984 - 1985:	"Visiting Academic" at Imperial College (mining and petroleum), London combined with cooperation with Scicon Ltd., London and Milton Keynes, England.
1995 - 1996:	"Visiting Professor" at Brunel University (maths), London, England.
2001 - 2002:	"Visiting Professor" at University of Edinburgh (maths), Edinburgh, Scotland.

Academic society memberships:

1972....:	NORS (The Norwegian Operations Research Society, group of PF)
1988....:	The Mathematical Programming Society
1993....:	Norwegian Council-member in IFORS.
1993....:	Norwegian Council-member in EURO.
1994…:	Operational Research Society

Main interests:

Mixed discrete optimization applied to real planning problems in transportation and process production with focus on ship scheduling and petroleum production.

Ongoing international collaboration:

Professor Ken McKinnon, School of Mathematics, University of Edinburgh, UK (Gas production)

Major Norwegian Companies I have collaborated with:

Hydro (Metals, Oil and gas, Refinery, Ammonia), Saga (Gas), Statoil (Oil and gas, Gas stations), Elkem (metals), Norske Skog (paper), British Petroleum (Distribution)

Norwegian Applied Research Institutions I have collaborated with:

SINTEF (Industrial Management, Applied Mathematics, MARINTEK), Norwegian Centre for Transport Research

Governmental bodies I have collaborated with:

Norwegian Petroleum Directorate

Participation in international evaluations:

1999: Readership evaluation in Edinburgh, Scotland
2002: PhD evaluation in Linköping, Sweden

Supervised PhD (Dr.ing.) candidates:

Finished candidates:

Kjetil K. Haugen: "Possible Coputational Improvments in a STicastic Dynamic Programming Model for Scheduling of Off.Shore Petroleum Fields", NTH 1991. He is now an associate professor at Molde College.

Marielle Christiansen: "Inventory and Time Constrained Ship Routing – A mathematical programming approach", NTNU 1996. She is now a professor at NTNU.

Gerhard L. Doorman (only co-supervised): "Peaking Capacity in Restructured Power Systems", NTNU 2000. He is now a senior scientist at SINTF Energy Research.
Current candidates:

Nina L. Ulstein: "Thesis on logistics including ship routing". She plans to finish in 2004.

Geir Brønmo: "Thesis on heuristic methods for ship and vehicle routing". He plans to finish in 2005.

Refereed publications from 1998:

1998:   (co-author: M. Christiansen) "A method for solving ship routing problems with inventory constraints". *Annals of Operations Research*, Vol. **81,** p 357-378.

1998:   (co-authors: T. Bjørkvoll, M. Christiansen, K. Haugen and Ø. Kristiansen) "Modeling Norwegian petroleum production and transportation". *Annals of Operations Research*, Vol. **82,** p 251-267.

1998:   (co-authors: P.Baricelli og G. Mitra) "Modeling of augmented makespan problems (AMAPs): Computational experience of applying integer presolve at the modelling stage". *Annals of Operations Research*, Vol. **82,** p 269-288.

1998:   (co-author: M. Christiansen) "Modelling path flows for a combined ship routing and inventory management problem". *Annals of Operations Research*, Vol. **82,** p 391-412.

2000:   (co-authors: K. Kularajan, G. Mitra and F. Ellison) "Constraint Classification, Preprocessing and a Branch and Relax Approach to Solving Mixed Integer Programming Models". *International Journal of Mathematical Algorithms*, Vol. **2,** p 1-45.

2002:   (co-authors: G. Doorman) "An integrated model for market pricing of energy and ancillary services". *Electric Power Systems Research*, Vol. **61,** p 169-177.

2003:   (co-authors: G. Doorman) "Market Price Calculations in Restructured Electricity Markets ". *Annals of Operations Research*, Vol. **124,** p 49-67

2005: (co-author: M. Christiansen, K. Fagerholt and D. Ronen) "Maritime Transportation" in a volume of "*Handbooks in Operations Research and Management Science*" edited by C. Barnhart and G. Laporte, Elsevier (forthcoming)

2005: (co-authors: M.M. Sigurd, N.L. Ulstein and D.M. Ryan) "Ship Scheduling with Recuring Visits and Visit Separation Requirements" in "*Column generation*" edited by G. Desaulniers, J. Desrosiers and M. Solomon, Kluwer (forthcoming)

2005: (co-author: M. Christiansen) "Robust Inventory Ship Routing by Column Generation" in "*Column generation*" edited by Guy Desaulniers, Jacques Desrosiers and Marius Solomon, Kluwer (forthcoming)

Participation in International Conferences from 1998:

1998: "Applied Mathematical Programming and Modelling", Limassol, Cyprus. Paper: "Integer Column generation by use of Subroutine Libraries for Mathematical Programming" co-author: M. Christiansen and co-author to paper given by G. Mitra "Constraint Classification, Preprocessing and Branch and Relax Approach to Solving Mixed Integer Programming Models".

1998: "The 5th Nordic MPS-meeting", Molde, Norway. Paper: "Integer programs and subroutine libraries for mathematical programming".

1998: "The 40th British OR-conference ", Lancaster, England. Papers: "Governmental use of MP in planning the Norwegian petroleum production" and "Integer presolve and model formulation of integer programs ".

1999: "The 15th Triennial Conference of The International Federation of Operational Research Societies", Beijing, China. Paper: " Nonlinear Capacitated Lot Sizing " co-authors: K. Haugen and A. Olstad and co-author to the paper " A Ship Routing Problem with Soft Time Windows " given by M. Christiansen.

2000: "Applied Mathematical Programming and Modelling", London, England. Paper: "An Integrated Model for Market Pricing of Energy and Ancillary Services" co-author: G. Doorman.

2000: "The 17th International Symposium on Mathematical Programming", Atlanta, GA, USA. Paper: "Short term planning of natural gas production off-shore" co-author N. Ulstein.

2001: "The 43rd British OR-conference", Bath, England. Paper: "Planning gas production off-shore"

2001: "The 7th Meeting of the Nordic Section of the Mathematical Programming Society", Copenhagen, Denmark. Paper: "Does it pay to upgrade MP software".

2002: "Applied Mathematical Programming and Modelling", Varenna, Italy. Co-author together with M. Christiansen, R. Grønhaug and N. Magnussen to the paper: "Strategic capacity planning in the metal-working industry" given by N. Ulstein.

2002:   "The 16th Triennial Conference of The International Federation of Operational Research Societies", Edinburgh, Scotland. Paper: "Optimization of routing in oil and gas gathering networks" co-author: K. McKinnon and co-author to the paper "Developing a system for sea transport between Norway and Europe" given by N. Ulstein.

2002:   "The 8th Meeting of the Nordic Section of the Mathematical Programming Society", Bergen, Norway. Paper: "Routing in oil and gas gathering networks" co-author K. McKinnon.

2002:   "Maritime Logistics Workshop", Georgia Institute of Technology, Atlanta, GA, USA. Paper: "Ship scheduling in vendor managed inventory systems" co-author M. Christiansen and co-author together with N. Ulstein, R. Grønhaug and N. Magnussen to the paper "Supply Chain Design and Production Planning in Elkem ASA" given by M. Christiansen.

2003:   "Odysseus 2003 - second international workshop on freight transportation and logistics" Sicily, Italy. Co-author with K. Fagerholt and G.Brønmo to the paper: "Short-term scheduling of chemical tankers" given by M. Christiansen.

2003:   "The 18th International Symposium on Mathematical Programming", Copenhagen, Denmark. Paper: "Optimal routing of oil and gas from wells to separators" co-author K. McKinnon and co-author together with M. Christiansen, K. Mannsåker Reikvam and M. Storhaug Jensen to the paper: "A stochastic programming model for strategic capacity planning in the metal-working industry" given by N. Ulstein.

2004:   "CO 2004 Combinatorial Optimisation Conference", Lancaster, England. Paper: "Robust inventory routing in the shipping industry" co-author M. Christiansen. Co-author together with M. Christiansen to the paper "Ship Scheduling with Flexible Cargo Sizes" given by Geir Brønmo.

2004:   "Applied Mathematical Programming and Modelling", London, England. Paper: "A hybrid search heuristic for real Ship Scheduling problems" co-authors: Geir Brønmo, Marielle Christiansen and Kjetil Fagerholt and co-author together with M.M. Sigurd and D.M. Ryan to the paper "Ship Scheduling with Recuring Visits and Visit Separation Requirements" given by N.L. Ulstein.

International guest lectures hold at the following institutions

Department of Mathematical modelling, Denmark Technical University, Lyngby, Denmark
Department of Mathematics, University of Linköping, Linköping, Sweden
Department of Mathematics, Royal Institute of Technology, Stockholm, Sweden
School of Manufacturing & Mechanical Engineering, University of Birmingham, Birmingham, England
Graduate School of Management, University of Lancaster, Lancaster, England
Department of Mathematics, University of Kent at Canterbury, England
Department of Mathematics and Statistics, Brunel University, London, England
Department of Mathematics and Statistics, University of Edinburgh, Edinburgh, Scotland
Department of Operational Research, London School of Economics, London, England
Department of Engineering and Applied Science, George Washington University, Washington, USA

Curriculum Vitae Asgeir Tomasgard

Born: October 16th 1970
Nationality: Norwegian
Marital status: Married, two children
Title: Dr. Ing. (PhD)
Profession: associate professor /senior researcher
Address: Rudolf Nilsens vei 1, N-7024 Trondheim, Norway

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Mobile phone: + 47 93058771   EMail: asgeir.tomasgard@sintef.no

Employment record

1998- : SINTEF Industrial Management, Economics and Logistics, Senior researcher (from 2002), part time (50%) from 2001.

Tasks include:

Projects: Tomasgard has been involved in projects within supply chain optimization, investment analysis and risk management (aluminium extrusion, food production , electricity (production, sales and risk management), natural gas (production, transportation, financial trades and sales). Tomasgard has also been responsible for developing a valuation framework for new technology based firms. Client companies include: Statoil, Hydro, Iberdrola, Enel, Norsk Kjøtt (Gilde), NSB, Volvo Aero, Alcatel.

Project manager : Tomasgard has been responsible for managing national and international projects with duration from a few months and up to several years.

Project coordination: Tomasgard is currently acting as a coordinator for all research projects in the SINTEF group towards Norsk Kjøtt (Gilde). Tomasgard has been responsible for negotiating long term agreements with Norsk Kjøtt and NSB.

Tomasgard has been responsible for arranging several international workshops and national seminars within the topics liberalized natural gas markets, venture capital and supply chain optimization.

2002- : NTNU, Department of Industrial Economics and Technology Management, associate professor in business economics.

- Group leader for the managerial economics and operations research group from fall 2002 (13 staff and research fellows).

- Teaching at under-graduate and graduate level, courses with 5-200 students. Responsible for developing 3 new courses : production- and network economics, production economy and markets, planning and economical analysis in supply chains.

- Student supervision at PhD level, masters level (about 5-10 student groups every year) and student projects (about 5-10 groups per year) within subjects: investment analysis, logistics, supply chain optimization, risk management and liberalized energy markets (electricity and gas). Most projects have been towards industry.

- Core team member in SMARTLOG (25 mill research project in logistics). Member of Næringslivets idefond, area transportation and logistics. Contact person at NTNU/SINTEF natural gas technology center in the field Energy economics.

2000-2002 : NTNU, Department of Industrial Economics and Technology Management, adjunct associate professor in business economics (part-time position 20-50%).

1995-1998: Department of Industrial Economics and Technology Management, research fellow (stipendiat).

1995 - 1998: Consultant.: Tomasgard consulted in small projects for SINTEF Industrial Management, Fokus forvaltning (development of sales reports from Microsoft SQL database)

07.02.94 - 01.12.94: Norwegian Armed Forces: Software design and database development.

01.06.93 - 20.08.93: Statoil, system development: Development of software for accounting and portfolio management.

Education

01.12.94 -30.11.98: Dr.Ing. in operations research, Department of Industrial Economics and Technology Management, Norwegian University of Science and Technology. *"Aspects of service provision and distributed processing in a telecommunication network"*. Scholarship from Telenor Research . (Supervisor Stein.W. Wallace, co-supervisors, Leen Stougie, Shane Dye, Jan Audestad).

1989 - 1993: Siv.Ing (M.Sc.) in Industrial Economics, The Norwegian Institute of Technology (NTH), (Average score 1.5). Thesis written for Statoil: "Deterministic versus dynamic stochastic analysis of development projects: Influence on project evaluation and decisions".

Research visits

05.08.96 - 20.12.96: Visitor at the Tinbergen Institute Amsterdam

12.06.95 - 04.08.95: Visitor at Edinburgh Parallel Computing Centre (EPCC) under the Training and Research on Advanced Computing Systems (TRACS) program.

Additional information: Publications and presentations

Publications

International journals

1. S. Dye, L. Stougie, A. Tomasgard, *The single resource service provision problem* , *Naval research logistics*, 50, 869-887, 2003.

2. S. Dye, L. Stougie, A. Tomasgard, *Approximation algorithms and relaxations for a service provision problem on a telecommunication network* , *Discrete applied mathematics*, 129, 63-81, 2003.

3. A. Tomasgard, J.A. Audestad, S. Dye, L. Stougie, M.H. van der Vlerk, S.W. Wallace, *Modelling Aspects of Distributed Processing in Telecommunications Networks* . *Annals of Operations Research*, 82:161-184, 1998

4. S. Dye, A. Tomasgard, S.W. Wallace, *"Feasibility in Transportation Networks with Supply Eating Arcs"* , *Networks,* 31: 165-176, 1998.

Published popular science papers

5. E. Matson, A. Tomasgard and L.H. Vik, *Verdsetting av høyteknologibedrifter* , Magma: Tidsskrift for økonomi og ledelse, 4 (4), 2001.

6. S.F. Fleten, A. Tomasgard, S.W. Wallace, *Produksjonsplanlegging og risikostyring i et deregulert kraftmarked med finansielle instrumenter*. Magma: Tidsskrift for økonomi og ledelse, 4 (5), pp. 22-33, 2001.

7. S. Dye, A.Tomasgard, S.W. Wallace, "*New aspects of service provision and technology strategies*", *Telektronikk*, Telenor research, Kjeller, Norway, to appear 1998.

Published in books

8. A. Tomasgard, and E. Høeg, *'A supply chain optimization model for the Norwegian Meat Co-operative'*, in Ziemba, W.T. and Wallace, S.W., eds, *'Applications of stochastic programming'*, MPS-SIAM series on optimization, to appear 2004.

9. A. Tomasgard and E. Høeg, *Supply chain optimization and demand forecasting*, in Olhager, Persson, Selldin, Wikner (editors),'Produktionslogistik 2002-Modeller for effektiv produktionslogistik". Linköpings tekniske högskola, 2002.

10. *Aspects of service provision and distributed processing in a telecommunication network: using stochastic programming*, Dr.Ing thesis, Supervisor: Stein W. Wallace, co-supervisors: Jan A. Audestad, Shane Dye and Leen Stougie. NTNU, 1998.

11. S.W. Wallace, S. Dye, A. Tomasgard, *"Feasibility in bipartite uncapacitated networks",* in E. Matson, A.Tomasgard, E. Meiestad, S. Dye (eds.), "Essays in honour of Bjørn Nygreen on his 50th birthday", Dept. Of industrial economics and technology management, Norwegian University of Science and Technology, 1996.

Other refereed publications

12. T. Bjørkvoll, S.F. Fleten, M. P. Nowak, A. Tomasgard og S. W. Wallace*, Power generation planning and risk management in a liberalised market*, IEEE Porto Power Tech Proceedings, pp. 426-431, 2001.

13. A. Tomasgard, E. Høeg, *Supply Chain Optimization for the Norwegian Meat co-operative,* Conference proceedings: NOFOMA 15, Trondheim, June 2002.

14. N. Olsson, A. Tomasgard, C.C. Røstad, B. Andersen, I.-A.F. Sætermo*, Major logistic changes, a project perspective,* Conference proceedings :NOFOMA 15, Trondheim, June 2002.

Selected Non-refereed publications

15. J.J.J van der Broek, L. Stougie, and A. Tomasgard, *Location of slaughterhouses under eonomics of scale,* Working paper NTNU, 2003, (submittd)

16. S. Dye, L. Stougie, A. Tomasgard, *Single node service provision with fixed charges* ,working paper #4-98, Department of Economics and Technology Management, Norwegian University of technology and Science, 1998. (submitted)

17. Tomasgard, A, Borgen, E., Elevenes, J. and Hynne, H., *A spreadsheet model for valuation of venture projects,* in Matson, E. (editor), *Valuation of new technology projects*, Department of Industrial economics and technology management, NTNU, 2003.

18. H.J. Dahl, *F. Rømo and A. Tomasgard, An Optimisation Model for Rationing-Efficient Allocation of Capacity in a Natural Gas Transportation Network, Conference proceedings: IAEE Praha, June, 2003.*

19. Rømo, F., Tomasgard, A.., Røvang, L.B. and Pedersen, B., *Optimal routing of natural gas in pipeline networks*, SINTEF working paper, SINTEF Industrial Management, Trondheim, Norway, 2003.

20. Rømo, F. Sæthermo, I.A. and Tomasgard, A*., Slaughterhouses and Courts of Justice - A location analysis approach*, Conference proceedings Uddevalla Symposium, Sweden, 2001.

21. Tomasgard, "Deterministic versus dynamic stochastic analysis of development projects: Influence on project evaluation and decisions" (in Norwegian), Thesis for the degree Siv.Ing. at Department of Managerial Economics and Operations Research, The Norwegian Institute of Technology, Norway. Thesis supervisor: Stein W. Wallace, 1993.

In addition Tomasgard has coauthored a number of SINTEF reports.

Presentations at conferences/seminars

1. *Tactical and operational planning in – the VENOGA perspective*, 3rd SINTEF International Workshop on Integrated natural gas market and transportation systems, Trondheim 2003.

2. *Issues on modelling financial markets under imperfect competition*, 3rd SINTEF International Workshop on Integrated natural gas market and transportation systems, Trondheim 2003.

3. *Introduksjon til operasjonsanalyse*, Smartlog industri seminar : Optimeringsbasert beslutningssøtte I industrien, Trondheim, 2003.

4. *Facility location under economics of scale*, ISMP 2003,Copenhagen, August 2003.

5. *Weekly Supply Chain Coordination with Stochastic Demand*, ISMP 2003, Copenhagen, August 2003.

6. *Tactical and operational planning in a deregulated gas market - the VENOGA perspective*, 2nd SINTEF International Workshop on integrated natural gas market and transportation systems, Selbu, October, 2002.

7. *Supply chain optimization and demand forecasting, Plan forsknings og tilämpningskonferens, Linköping, August 2002.*

8. *Supply Chain Co-ordination with Stochastic Demand,* IFORS 2002, Edinburgh, July, 2002.

9. *Supply Chain Optimization for the Norwegian Meat co-operative,* NOFOMA, Trondheim June 2002.

10. *Value Chain Management in the Liberalized Natural Gas Market,* APMOD 2002, Varenna, Italy, June, 2002.

11. *The VENOGA project,* 1st SINTEF International Workshop on integrated natural gas market and transportation systems, Røros, October, 2001.

12. *Optimization models in a liberalized natural gas market,* The Seventh Meeting of the Nordic Section of the Mathematical Programming Society, Copenhagen, October, 2001.

13. *A Supply Chain Management Model with stochastic demand,* 9th international conference on stochastic programming, Berlin, August, 2001.

14. *The value of flexibility and the price of risk,* International workshop on decision making under uncertainty, Håholmen, May, 2001.

15. *Et beslutningsstøtteverktøy for verdivurdering av kunnskapsbedrifter* , Fagkonferanse i bedriftsøkonomiske emner (FIBE), NHH, Bergen, January 2001.

16. *En modell for verdsetting av ny teknologi og intellektuell kapital*, Seminar om venturekapitalselskapenes virksomhet vedrørende bedriftsetablering og industriutvikling basert på ny teknologi, Trondheim, September 2000.

17. *A Stochastic Supply Chain Management Model for the Norwegian Meat Cooperative,* , 17th International Symposium on Mathematical Programming (ISMP2000), Atlanta, august 2000.

18. *A Supply Chain Optimization Model for the Norwegian meat industry*, International Working Conference on Information and Communication Technology (ICT) in Logistics and Production Management, IFIP WG 5.7, Tromsø, Norway, June 28-30, 2000.

19. *Scenario generation and valuation of new technology based firms*, 26th Meeting of Euro working group on financial modelling, Trondheim, Norway, May 4-6, 2000.

20. *Stokastisk programmering i lys av opsjonsteori*, Institutt for Industriell økonomi og teknologiledelse, Trondheim, Norway, 1. februar, 2000

21. *SINTEF's evaluering av pilotprosjekt med FAST systemene*, ITTFs konferanse om ERP og logistikk spesialsystemer, Hamar, Norway, november 16-17, 1999

22. *Stochastic Integer Programming,* Guest lecture, Department of Industrial Economis and Technology Management, NTNU, Trondheim, Norway , October, 1999.

23. *New Aspects of Service Provision and Technology Strategies in Telecommunications, Department seminar*, Norwegian school of economics and business administration, Department of finance and management science, Bergen, October 1,1999.

24. *Complexity and approximation of a stochastic integer program,* The Sixth Meeting of the Nordic Section of the Mathematical Programming Society, Vesterås, September 25, 1999.

25. *Optimeringsbasert beslutningsstøtte i verdikjeder,* SINTEF Teknologiledelse's fagdager i logistikk, Selbusjøen hotell og gjestegård, September 23, 1999.

26. *Approximation of a Stochastic Integer Program with applications in telecommunications,* 19th IFIP TC7 Conference on System Modelling and Optimization, Cambridge, England**,** July 12 - 16, 1999

27. *Solution methods for the service provision problem,* OR98 International Conference on Operations Research*,* Zurich, September 1998.

28. *Solving a stochastic service provision problem in telecommunications using branch and bound and relaxations,* Eindhoven University of Technology, August 1998.

29. *Solving a stochastic service provision problem in telecommunications using branch and bound and relaxations,* VII International Conference on Stochastic Programming, Vancouver, August 1998.

30. S*ervice provision and distributed processing in a telecommunications network: using stochastic programming*, The Fifth Meeting of the Nordic Section of the Mathematical Programming Society, Molde, May 1998.

31. *A stochastic service provision problem: decomposition methods*, 4th INFORMS telecommunications conference, Boca Raton, Florida, March 1998.

32. *Modelling Aspects of Distributed Processing in Telecommunication Networks,* Telenor Research, Kjeller, November 1997.

33. *Modelling in Distributed Telecommunications Networks*, 16th International Symposium on Mathematical Programming (ISMP97), Lausanne, August 1997.

34. *Stochastic Programming Models For Distributed Communications Models*, EURO/INFORMS-97, Barcelona, July 1997.

35. *Service configuration in Intelligent Networks: A mixed-integer formulation*, TRACS-seminar, Edinburgh Parallel Computing Centre (EPCC), 1995.

CV

Name: Olav Bolland
Born: 1962
Nationality: Norwegian
Present position: Professor
Degrees:
Siv.Ing. (M.Sc.): Norwegian University of Science and Technology,
Mech. Eng., 1986
Dr.Ing.: Norwegian University of Science and Technology, Mech. Eng.,
1990
Work experience:

- Visiting researcher at Siemens AG/UB KWU in Erlangen, Germany, 01.01.87 - 01.08.87
- Scientific advisor for SINTEF, 01.01.88 - 01.11.96, 01.03.98 - present
- Associate Professor, Department of Energy and Process Engineering, Norwegian University of Science and Technology, 01.02.1990 - 01.05.2002
- Professor, Department of Energy and Process Engineering, Norwegian University of Science and Technology, 01.05.2002 - present
- Sabbatical year from august 1996 to august 1997. Working as a scientific guest at the Eidgenössische Technische Hochshule Zürich - ETHZ, (Swiss Federal Institute of Technology)

Membership in academic and professional committees:

- Member of the Lead Author Team of the IPCC Special Report on CO_2 Capture, Transport and Storage (2003-2005)
- University programme *Energy and Environment* (500 students), Chairman of the Board
- ASME member
- Norwegian Research Council, Klimatek evaluation committee
- Several times in Ph.D.-committees
- Professorship evaluation committee – 3 times, 2003-2004
- Member of Faculty Board, 2 periods

Present doctoral students and post.docs supervised:
Øyvind Brandvoll 2001-2004 Chemical Looping Combustion
Rehan Naqvi 2003-2005 Chemical Looping Combustion
Bjørn Thorud 2001-2004 Dynamic performance SOFC
Christoph Stiller 2003-2005 Dynamic performance SOFC
Ragnhild Ulfsnes 2001-2004 Dynamic performance of oxy-fuel gas turbine cycle
Maria Jonsson 2004-2005 Gas turbine cycle modelling and analysis (post-doc)
Khasayar Nasrifar 2004-2005 LNG technology (post-doc)
Ola Maurstad 2004-2006, Modelling and simulation of power cycle with CO_2 capture

Supervised doctoral students:
Ola Maurstad 1998-2002

Academic and professional publications

Peer-reviewed

1. Maurstad O., Bredesen R., Bolland O., Kvamsdal H., and Schell M., "SOFC and gas turbine power systems - evaluation of configurations for CO2 capture", submitted for review to GHGT-7, Vancouver, Sept. 2004

2. Kvamsdal H., Maurstad O., Jordal K., and Bolland O., "Benchmarking of gas-turbine cycles with CO_2 capture", submitted for review to GHGT-7, Vancouver, Sept. 2004

3. Bolland O., Kvamsdal H., Boden J.C., "A comparison of the efficiencies of the oxy-fuel power cycles Water-cycle, Graz-cycle and Matiant-cycle", in press for publication in the book 'The CO_2 Capture and Storage Project for Carbon Dioxide in Deep Geological Formations for Climate Change Mitigation', by Elsevier, final result of the CCP-project, 2004

4. Jordal K., Möller B.F., Bolland O., and Torisson T., 'Optimisation with genetic algorithms of a gas turbine cycle with H_2-separating membrane reactor for CO_2 capture', submitted for review to the *International Journal of Green Energy*, 2004

5. Ertesvåg I., Kvamsdal H., and Bolland O., "Exergy analysis of a gas-turbine combined-cycle power plant with precombustion CO_2 capture", in press for publication in the journal *Energy*, 2004

6. Jordal K, Bredesen R., Kvamsdal H.M., O. Bolland O., "Integration of H_2-separating membrane technology in gas turbine processes for CO_2 sequestration", presented at and in the proceedings of the Sixth International Conference on Greenhouse Gas Control Technologies - GHGT-6, Kyoto, Japan, October 2002, in press for publication in *Energy*, 2004

7. Jordal K., Bolland O., and Klang Å., "Aspects on cooled gas turbine modelling for the semi-closed O_2/CO_2 cycle with CO_2", presented at the ASME TURBO EXPO conference, 16-19 June, 2003, Atlanta, USA, ASME Paper No. GT-2003-38067, in press for *ASME Journal of Engineering for Gas Turbines and Power*, July 2004

8. Brandvoll Ø. and Bolland O., "Inherent CO_2 capture using chemical looping combustion in a natural gas fired power cycle", presented at the ASME TURBO EXPO conference, 3-6 June, 2002, Amsterdam, The Netherlands, ASME Paper No. GT-2002-30129, in press for publication in the *ASME Journal of Engineering for Gas Turbines and Power*, 2004

9. Imsland L., Snarheim D., Ulfsnes R., Bolland O., Foss B. "Modeling and control of a O2/CO2 gas turbine cycle for CO2 capture, to be presented at the 7th International Symposium on DYnamics and COntrol of Process Systems (DYCOPS), Cambridge, Massachusetts USA, 5-7 July, 2004

10. Bredesen R., Jordal K. and Bolland O., "High-Temperature Membranes in Power Generation with CO_2 capture", invited review paper, in press for publication in the *Journal of Chemical Engineering and Processing*, Elsevier, 2004

11. Veér T., Ulvestad A. and Bolland O., "Frame, a Tool for Predicting Gas Turbine Condition as well as Reliability, Availability Performance", ASME Paper No. GT2004-53770, to be presented at and in the proceedings of the ASME TURBO EXPO conference, 14-17 June, 2004, Vienna, Austria

12. Veér T., Haglerød K.K. and Bolland O., "Measured Data Correction for Improved Fouling and Degradation Analysis of Offshore Gas Turbines", ASME Paper No. GT2004-53760, to be presented at and in the proceedings of the ASME TURBO EXPO conference, 14-17 June, 2004, Vienna, Austria

13. Naqvi R., Bolland O., Helle K. and Brandvoll Ø. "Chemical Looping Combustion-Analysis of Natural Gas Fired Power Cycles With Inherent CO2 Capture", ASME Paper No. GT2004-53359, to be presented at and in the proceedings of the ASME TURBO EXPO conference, 14-17 June, 2004, Vienna, Austria

14. Stiller C., Thorud B., Seljebø S., Mathisen Ø., Karoliussen H., and Bolland O., "Simulation-Based Comparison of Combined SOFC/GT Cycles with Planar and Tubular Fuel Cell Models - part 1", submitted for review in the *Journal of Power Sources*, 2004

15. Stiller C., Thorud B., Seljebø S., Mathisen Ø., Karoliussen H., and Bolland O., "Simulation-Based Comparison of Combined SOFC/GT Cycles with Planar and Tubular Fuel Cell Models - part 2", submitted for review in the *Journal of Power Sources*, 2004

16. Veér T. and Bolland O., "Reliability and Availability – a challenge of Increasing Importance for the Energy Industry", presented at and in the proceedings of the ECOS - 16th International Conference on Efficiency, Costs, Optimization, Simulation and Environmental Impact of Energy Systems, Copenhagen, Denmark, 30 June - 2 July, 2003

17. Ulfsnes R., Karlsen G., Jordal K., Bolland O. and Kvamsdal H., "Investigation of physical properties for O_2/CO_2 gas turbine cycle with CO_2 capture", presented at and in the proceedings of the ECOS - 16th International Conference on Efficiency, Costs, Optimization, Simulation and Environmental Impact of Energy Systems, Copenhagen, Denmark, 30 June - 2 July, 2003

18. Brandvoll Ø., Kolbeinsen L., Olsen N., Bolland O., Chemical Looping Combustion - reduction of nickel oxide - nickel aluminate by hydrogen", presented at and in the proceedings of ICheaP-6, The Sixth Italian Conference on Chemical and Process Engineering, Pisa, Italy, 08 -11 June 2003

19. Ulfsnes R., Bolland O. and Jordal K., "Modelling and simulation of transient performance of the semi-closed O_2/CO_2 gas turbine cycle for CO_2 capture", presented at the ASME TURBO EXPO conference, 16-19 June, 2003, Atlanta, USA, ASME Paper No. GT-2003-38068, accepted for publication in the *ASME Journal of Engineering for Gas Turbines and Power*

20. Veér T. and Bolland O, "Using Probabilistics and advanced Software Tools for Reliability and Availability Assessment and Lifing", presented at the ASME TURBO EXPO conference, 16-19 June, 2003, Atlanta, USA, ASME Paper No. GT-2003-38474.

21. Bolland O., Undrum H., A novel methodology for comparing CO_2 capture options for natural gas-fired combined cycle plants, *Advances in Environmental Research,* Volume 7, Issue 4, (2003) 901-911, Elsevier Science Ltd., available online www.elsevier.com/locate/aer, 2003

22. Zvolinschi A., Kjelstrup S., Bolland O. and van der Kooi H.J., "Including exergy analysis in industrial ecology: The case of combined cycle power plants with CO_2 capture", presented at and in the proceedings of the ECOS - 15th International Conference on Efficiency, Costs, Optimization, Simulation and Environmental Impact of Energy Systems, Berlin, Germany, 3-5 July, 2002

23. Kvamsdal H.K., Ertesvåg I.S., Bolland, O., and Tolstad T., "Exergy analysis of gas-turbine combined cylce with CO_2 capture using pre-combustion decarbonization of natural gas", presented at the ASME TURBO conference, 3-6 June, 2002, Amsterdam, The Netherlands, ASME Paper No. GT-2002-30411, 2002

24. Maurstad, O., Liu L.X., Bolland O., and Litster J.D., "Experimental study of the particle size distribution in fluidized bed granulation", In Proceedings of the 6th World Congress of Chemical Engineering, Melbourne, Australia, 2001

25. Bolland O., Nicolai R., "Describing Mass Transfer in Circulating Fluidized Beds by Ozone Decomposition", Chemical Engineering Communications, Vol. 187, pp. 1-21, 2001

26. Kvamsdal H.M., Andersen T., and Bolland O., "Natural gas fired power plants with CO_2-capture - Process integration for high fuel-to-electricity conversion efficiency", presented at ESCAPE 10 conference - European symposium on computer aided process engineering, May 2000, published in *Computers and Chemical Engineering*, #8, ISBN: 0444505202, pp. 331-336, 2000

27. Andersen T., Kvamsdal H.M., and Bolland O., "Gas turbine combined cycle with CO_2 capture using auto-thermal reforming of natural gas", presented at the ASME Gas Turbine and Aeroengine Congress and Exposition in München , May 8-12, 2000

28. Bolland O., Nicolai R., "Describing Mass Transfer in Circulating Fluidized Beds by Ozone Decomposition", presented at the Advanced Technologies for Particle Processing (AiChE annual meeting), November 15-20, 1998, Miami Beach, USA. Published in AIChE Symposium Series No. 321, Volume 95, Advanced Technologies for Fluid-Particle Systems, ISBN 0-8169-0815-X, pp. 52-60, November 1999.

29. Bolland, O. and Mathieu, P., 1998, Comparison of Two CO_2 Removal Options in Combined Cycle Power Plants, *Energy Conversion and Management*, 39 (16-18), p.1653-1663, presented at the FLOWERS'97 conference July 30-August 1, 1997

30. Bolland, O., Førde, M. and Hånde, B. "Air Bottoming Cycle - use of gas turbine waste heat for offshore power generation", presented at the ASME COGEN TURBO conference, August 23-25, 1995, Vienna, Austria, ASME Paper No. 95-CTP-050, published in the *ASME Journal of Engineering for Gas Turbines and Power*, Volume 118, No. 2, Apr 1996.

31. Bolland, O. and Stadaas, J.F., "Comparative Evaluation of Combined Cycles and Gas Turbine Systems with Water Injection, Steam Injection and Recuperation", presented at the ASME Gas Turbine and Aeroengine Congress and Exposition May 24-27, 1993, Cincinnati, ASME Paper No. 93-GT-57, 1993, published in the *ASME Journal of Engineering for Gas Turbines and Power*, Vol. 28, Jan 1995.

32. Bjerve, Y. and Bolland, O., "Assessment of Power Generation Concepts on Oil Platforms in Conjunction with CO_2 Removal", presented at the ASME International Gas Turbine and Aeroengine Congress and Exposition, June 13-16, 1994, Hague, the Netherlands, ASME Paper No. 94-GT-378, 1994.

33. Bolland, O. and Sæther, S., "New Concepts for natural Gas Fired Power Plants which Simplify the Recovery of Carbon Dioxide", presented at the First International Conference on Carbon Dioxide Removal, Amsterdam, The Netherlands, March 4-6, 1992, published in *Energy Convers. Mgmt* Vol. 33, No. 5-8, pp. 467-475, 1992

34. Bolland, O., "A Comparative Evaluation of Advanced Combined Cycle Alternatives", presented at the ASME Gas Turbine and Aeroengine Congress and Exposition June 11-14, 1990, Brussels, ASME Paper No. 90-GT-335, published in the *ASME Journal of Engineering for Gas Turbines and Power*, Vol. 113, 1991

International conference proceedings (not peer-reviewed)

1. Thorud B., Stiller C., Weydahl T., Bolland O., Karoliussen H., "Part-load and load change simulation of tubular SOFC systems", to be presented at the Fuel Cell Forum, Luzerne, 28 June – 2 July 2004

2. Veér T. and Bolland O., "Derating and Degradation Considerations within FMECA", 6th International Conference on Heat Engines and Environment, Balatonfured, Hungary, May, 2003

3. Zvolinschi A., Kjelstrup S., Bolland O. and Kooi, H.J. van der, "Exergy Analysis for the Assessment of the Sustainability of Combined Cycle Power Plants with CO_2 Capture", poster, 14th World Hydrogen Energy Conference, Montréal, Canada, June 9-13, 2002
Awarded as the best poster in conference

4. Kvamsdal H.K., Ertesvåg I.S., Bolland, O., and Tolstad T, "Combined Cycle with CO_2 capture based on the pre-combustion method", Second Nordic Minisymposium on Carbon Dioxide Capture and Storage, Göteborg, October 26, 2001. available at http://www.entek.chalmers.se/~anly/symp/symp2001.html

5. Brandvoll Ø., Bolland O., Vestøl S.., "Chemical looping Combustion - fuel energy conversion with inherent CO_2 capture", poster, paper published in the proceedings of the International Conference POWER GENERATION AND SUSTAINABLE DEVELOPMENT, Liège (Belgium), 8-9 October, 2001

6. Bolland O., Ertesvaag I.S., and Speich D., "Exergy analysis of gas-turbine Combined Cycle with CO_2 capture using auto-thermal reforming of natural gas", poster, paper published in the proceedings of the International Conference POWER GENERATION AND SUSTAINABLE DEVELOPMENT, Liège (Belgium), 8-9 October, 2001

7. Bolland O., Kvamsdal H.K., and Boden J.C., "A thermodynamic comparison of the oxy-fuel power cycles Water-Cycle, Graz-Cycle and Matiant-Cycle", presentation, paper published in the proceedings of the International Conference POWER GENERATION AND SUSTAINABLE DEVELOPMENT, Liège (Belgium), 8-9 October, 2001

8. Undrum, H., Bolland, O., and Aarebrot, E., "Economical assessment of natural gas fired combined cycle power plant with CO2 capture and sequestration", presented at the Fifth International Conference on Greenhouse Gas Control Technologies, Cairns, Australia, August 2000.

9. Bolland, O., Undrum, H., and Myhre-Nielsen, M., "Natural gas fired power cycles with integrated CO_2 capture", presented at the Fifth International Conference on Greenhouse Gas Control Technologies, Cairns, Australia, August 2000.

10. Bolland O., Undrum H., "Removal of CO_2 From Natural Gas Fired Combined Cycle Plants", presented at the Power-Gen '99, Frankfurt, Germany, June 1999
11. Bolland O., Undrum H., "Removal of CO_2 from Gas Turbine Power Plants: Evaluation of pre- and postcombustion Methods", presented at the Fourth International Conference on Greenhouse Gas Control Technologies, Interlaken, Switzerland, September 1998
12. Bolland, O., "Thermal Power Cycles for the Future", presented at the poster session of the Eurogas '94 conference, March 21-23, Trondheim, Norway, 1994
13. Bolland, O. and Pettersen, J., "Improved Cycles for Natural Gas Power Generation", presented at the IEA International Conference on Natural Gas Technologies: Energy Security, Environment and Economic Development, October 31 - November 3, Kyoto, Japan, published in conference proceedings pp. 121-130, 1993
14. Sæther, S. and Bolland, O., "Thermal Power Production", presented at the poster session of the SPUNG Seminar, Trondheim, Norway, October 5-6, 1993

Invited lectures (selection)

1. Bolland O., "Power generation with CO2 capture and sequestration", invited keynote speaker at the annual program seminar for the Swedish Gas Turbine Center, 19-20 November 2003
2. Bolland O., "STATUS FOR GASSKRAFTVERK MED CO2-HÅNDTERING (Status for gas fired power plants with CO_2 capture)", invited speaker at the Norges Energidager conference, organised by The Norwegian Water Resources and Energy Directorate (NVE), 17 October 2003
3. Bolland O., "Gassteknisk Senter NTNU – SINTEF Satsning på gasskraftverk med CO2-innfanging (The Gas Technology Center - efforts for making power plants with capture of CO2)", invited speaker at the Energirike Haugalandet conference, 23 September 2003
4. Bolland O. and Veer T., "CENTENARY OF THE FIRST GAS TURBINE TO GIVE NET POWER OUTPUT: A TRIBUTE TO ÆGIDIUS ELLING", presented (with no paper) at the ASME TURBO EXPO conference, 16-19 June, 2003, Atlanta, USA,
5. Bolland O., "Gassteknisk Senter NTNU – SINTEF (Gas Technology Center NTNU – SINTEF)", invited lecture at the conference Gass- og energiteknologi, Skjærgården Hotell og Badepark, Langesund, 3-4. June 2003
6. Bolland O., "Oppsummering og vurdering av teknologier rundt CO_2-fjerning (Summary and conclusion about CO_2 capture methods)", invited lecture at the conference Gass- og energiteknologi, Skjærgården Hotell og Badepark, Langesund, 3-4. June 2003
7. Bolland O., Om brenselceller, gassturbiner og CO2-fangst - Eksempel på et forskningsprosjekt (About fuel cells, gas turbines and CO2 capture - example of a research project), invited lecture at opening of the Gas Technology Center NTNU - SINTEF, Trondheim, 22 April 2003
8. Bolland O., CO_2 removal before combustion, invited lecture at CONFERENCE ON CYCLES FOR LOW CARBON DIOXIDE PRODUCTION, Cranfield University, School of Engineering, UK, March 24-25, 2003
9. Bolland O., Policy, research and implementation of CO_2 sequestration technologies in Norway, invited lecture at Swiss Federal Institute of Technology - ETH Zürich - Switzerland. November 22, 2002
10. Bolland O., Policy, research and implementation of CO_2 sequestration technologies in Norway, invited lecture for *Studiengruppe Energieperspektiven* - Baden, Switzerland. November 21, 2002
11. Bolland O., Options for oxy-fuels & pre-combustion decarbonisation cycles, invited lecture for Alstom Power Cross Segment CO_2 Mitigation Group - Baden, Switzerland. October 11, 2002
12. Bolland, O., "Fossila bränslen men ingen CO_2 ? (Fossile fuels but no CO_2 ?)", presented at NORDVARME-Symposium i Nyköping, Sweden, June 2002

13. Bolland O., "Gasskraftverk med CO_2-håndtering (Gas fired power plant with CO_2 sequestration)", invited lecture at 2nd International Symposium on High Strength Steel, Stiklestad/Verdal, 24 April 2002
14. Bolland O. and Brandvoll Ø., "Inherent CO_2 capture using chemical looping combustion in a natural gas fired power cycle", invited lecture at the national NTNU seminar on CO_2 capture, Trondheim, 22 April 2002
15. Bolland O., "Technology for gas turbine power plants - an environmental view", invited lecture at the IBC Conference New Dynamics of Scandinavian Gas & Power Oslo, 11-12 February 2002
16. Bolland O., "Status for norsk satsning innen miljøvennlig utnyttelse av naturgass (Status for the Norwegian efforts related to utilization of natural gas)", presentation at the Miljøforum, The Norwegian Oil Industry Association, 15 October 2001
17. Bolland, O., "Particle technology research at NTNU in general, and in particular measurement of bubble velocity in fluidized bed reactors", invited lecture at the University of Queensland, Brisbane, August 2001
18. Bolland, O., "Naturgass til kraft - miljøvennlig ? (natural gas for power generation - environmentally friendly ?", invited lecture at the UMOE 100 year anniversary seminar, 11 April 2000
19. Bolland, O., "Removal of CO_2 from Natural Gas Combined Cycle Power Plants", lecture at the seminar Flowsheet synthesis and optimisation of CHP power plants, Nordic Council of Ministers, Helsinki, 3-5 March 2000
20. Bolland, O., and Aam, S., "SINTEFs synspunkter i gasskraftdebatten" (SINTEFs points of view in the debate about Gas Power Generation), presented to the Committee of Energy and Environment of the Norwegian Storting, Oslo, December 1999
21. Bolland O., "Experimental examination of bubble rise velocity in a fluidised bed", Presentation at the Norsk Hydro seminar on Fluid Bed Technology, Sluiskil in the Netherlands, October 27-28, 1999
22. Bolland O., "Semi-industriell prosess for granulering og belegging (Semi-industrial sized process for granulation and coating)", Presentation at the NTNU Dewatering Laboratorium Seminar, October 13-14, 1999
23. Bolland, O., "CO_2 - fjerning og lagring" (CO_2 - removal and storage), Invited lecture at the seminar "Et energieffektivt Norge" (Norway - energy efficient), Trondheim, April 1999
24. Bolland O., "Agglomeration & Drying Granulation in fluidized Bed", Presentation at the opening of the NTNUSINTEF Dewatering Laboratorium, September 1998
25. Bolland O., "Natural Gas Power Generation", 3-hour lecture at the Norsk Hydro Seminar on Hydrokraft, Gas Power and Hydrogen as Energy Carrier, Oslo, June 1998
26. Bolland, O., "Gasskraftverk - teknologisk status og utviklingstrender (Gas Fired Power Plants - Technology state-of-the-art and trends, Lecture for NFTS - the Norwegian Society for Turbomachinery, Trondheim, Norway, October 30, 1997
27. Bolland, O., "CO_2 und der Treibhauseffekt - ein Blick aus Norwegen (CO_2 and the greenhouse effect - a view from Norway), Colloquium at the Swiss Federal Institute of Technology, Zürich, Switzerland, April 24, 1997
28. Bolland, O., " Teknologisk status for gassturbiner og kombinerte gass/dampturbin-prosesser (State-of-the-art gas turbines and combined cycles)", invited speaker at the Bergen Gas Conference, Bergen, Norway, 1996
29. Bolland, O. and Pettersen, J., "Improved Cycles for Natural Gas Power Generation", presented at the IEA International Conference on Natural Gas Technologies: Energy Security, Environment and Economic Development, October 31 - November 3, Kyoto, Japan, published in conference proceedings pp. 121-130, 1993.

Patent

Rønning S.O., Bjerve Y., Falk-Pedersen O., Glittum G., and Bolland O., "A method for removing and preventing emissions into the atmosphere of carbon dioxide (CO_2) from exhaust gas of gases from heat engines", WO 95/21683, PCT/NO95/00033, 1995, Registered patent in Norway #940527 "Fremgangsmåte til fjerning av karbondioksid fra forbrenningsgasser", 1994, US-patent 5,832,712 - 1998

Fields of interests and present research activities

- **Gas turbines and gas turbine power plants – design and operation**

Design of gas turbine power cycles using tools like the in-house code GTSIM, GTPRO/GTMASTER (Thermoflow, Inc.) and PRO/II (Simsci, Inc.). Research work includes Rankine bottoming cycles with alternative working fluids (other than steam/air) and so-called Air Bottoming Cycle.

Operation of gas turbines: Working with a reliability and availability study in cooperation with Statoil and Norsk Hydro. The goal is to develop a prediction tool, which takes into account the connection between the external parameters (environmental conditions, fuel quality and mode of operation) and their influence on degradation of the gas turbine.

- **Power generation with CO_2 capture**

Research work includes a large range of power cycle modelling and simulations, with pre- and post-combustion methods as well as oxy-fuel combustion cycles. The methodologies are both theoretical and experimental. The theoretical work includes cycle design with a several state-of-the-art software tools, transient modelling and simulation using the tool gPROMS (PSE, Ltd.), methodology related to generalisation of efficiency penalty in CO_2 capture, and exergy analysis for pre-combustion methods.. The experimental work is within so-called "Chemical Looping Combustion", where the kinetics of oxidation and reduction of Ni/NiO is studied in two experimental set-ups.

- **Solid oxide fuel cells – modelling and simulation**

Research work includes cycle modelling and simulation as well as 2-D modelling of both planar and tubular SOFCs. The work is on both steady state where an in-house code for the 2-D analysis has been developed and coupled with the flowchart simulator PRO/II, and on transient modelling and simulation using the tool gPROMS (PSE, Ltd.),

- **Particle technology**

Research work includes gas-solid mass transfer, agglomeration and oxidation and reduction processes in fluidised systems. I was the project manager in a 5-year experimental program in the department's laboratory on magnesium chloride granulation, in cooperation with Norsk Hydro.

Curriculum Vitae
for Truls Gundersen

Date of print: 25 May, 2004

1. CIVIL DATA

* Born: 4 October 1952, Nes, Akershus, Norway
* Home: Olaf Bulls vei 50, N-7024 Trondheim, Norway
              Phone: + 47-72-560070 (house) or + 47-916-81726 (mobile)
* Office: Department of Energy and Process Engineering, NTNU,
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              Fax: + 47-73-598390   E-mail: Truls.Gundersen@ntnu.no

2. EDUCATION AND ACADEMIC EXPERIENCE

- 1971 - 1977   Norwegian Institute of Technology (NTH), Trondheim, M.Sc in Physics. Thesis: *"Simulation of a Hydrogenation Plant"* (in Norwegian).

- 1978 - 1982   Norwegian Institute of Technology (NTH), Trondheim, Ph.D in Chemical Engineering. Thesis: *"Decomposition of Large Scale Chemical Engineering Systems"*.

- 1978 - 1981   Lecturer in Process Control and Teaching Assistant in Process Dynamics and Process Simulation, Chem. Engng. Dept., NTH.

- 1983 - 1986   Lecturer in Process Simulation and Synthesis, Chemical Engineering Department, NTH, Trondheim.

- 1986 - 1996   Professor (II) of Chemical Engineering with lecturing and supervision of M.Sc and Ph.D students, NTH, Trondheim.

- 1987 - 1988   Sabbatical Year at Carnegie Mellon University in Pittsburgh, working on Process Synthesis and Mathematical Programming with Professors I.E. Grossmann, L.T. Biegler and A.W. Westerberg.

- 1989 - 1996   Lecturing a new Senior Year Course in Process Synthesis, Chemical Engineering Department, NTH, Trondheim.

- 1992 - 1993   Guest Lectures (24 hours) on Heat Exchanger Network Design and Optimization, Telemark Institute of Technology, Porsgrunn.

- 1993 - 1996   Professor in the Department of Process Technology, Telemark Institute of Technology, Porsgrunn, Norway.

- 1997 - 2002   Professor (II) in the Department of Process Technology, Telemark Institute of Technology, Porsgrunn, Norway.

- 1996 - now   Professor in the Department of Energy and Process Engineering, Norwegian University of Science and Technology, Trondheim, Norway.

3. INDUSTRIAL AND OTHER WORK EXPERIENCE

- 1977   7 weeks with SINTEF (Society for Industrial and Technological Research), Department of Technical Chemistry, Computer-Aided Process Design and Simulation, Trondheim, Norway.

- 1977   4 months with the Defense Research Centre (FFI), Department of Weapons and Materials, Kjeller, Norway, as part of the compulsory national military service.

- 1981 - 1993   Norsk Hydro a.s, Research Centre, Chemical Engineering Department, Porsgrunn, Norway. Research and Applications in the area of Process Simulation and from 1984 in the area of Process Synthesis with special emphasis on the Efficient Use of Energy in new as well as existing plants in a company that is involved in Chemicals, Fertilizers, Light Metals, Petrochemicals, Oil and Gas and Pharmaceuticals.

- 1991   20 weeks with Kaiser Aluminum and Chemical Company, Gramercy, Louisiana, USA. "On the plant training" for Norsk Hydro a.s in a Bayer process for aluminum oxide operated by Kaiser. Focus on overall Process Design and Energy Consumption.

- 1996 - now   Scientific advisor for Sintef Energy Research, Department of Thermal Engineering, Trondheim, Norway.

4. VARIOUS APPOINTMENTS, AWARDS, Etc.

- Awarded a Fulbright Fellowship in Natural Science for a Postgraduate Stay at Carnegie Mellon University in Pittsburgh, USA, from 1987 to 1988.

- Awarded a Research Fellowship from the Royal Norwegian Council for Scientific and Industrial Research to pursue Advanced Studies in the USA from 1987 to 1988.

- Elected Chairman of the Process Integration Research Consortium at University of Manchester Institute of Science and Technology (UMIST), supporting the research in Professor Bodo Linnhoff's group, for the two year period 1990 - 1992.

- Elected member of the Norwegian Academy of Science and Technology (NTVA) in May 1991, based on contributions in the area of Process Design in general and Heat Exchanger Network Synthesis in particular.

- Appointed Referee for the following international journals: **1.** Computers and Chemical Engineering (from 1987) **2.** Industrial and Engineering Chemistry, Research and Design (from 1989) **3.** Modeling, Identification and Control (from 1989) **4.** Chemical Engineering Science (from 1991) **5.** American Institute of Chemical Engineers Journal (from 1996) **6.** Chemical Engineering Research and Design, Part A: Trans. of the Institution of Chemical Engineers

(from 1997), **7.** Canadian Journal of Chemical Engineering (from 2001), **8.** Chemical and Engineering Technology (from 2001) and Applied Thermal Engineering (from 2003), **9.** Kirk-Othmer Encyclopedia of Chemical Technology (from 2004).

- Appointed Operating Agent for Annex I of the IEA Implementing Agreement on Process Integration for the period September 1995 to September 1997 and the Extension from September 1997 to October 1998. Then again Operating Agent for the continuation of Annex I as a small Secretariat on an annual basis from October 1998 to March 2002. This should be viewed on the background that Norway does not participate in this Agreement.

- Appointed Nordic Research Professor in the Process Integration Scientific Programme within the Nordic Energy Research Programme for the period 1 December 2001 to 31 December 2002.

- Given the Best Lecturer Award by the students in the Energy and Environment Study Program at the Norwegian University of Science and Technology, May 2004.

5. JOURNAL PUBLICATIONS (see section 7 for more publications)

J1   Gundersen T. "Numerical Aspects of the Implementation of Cubic Equations of State in Flash Calculation Routines", ***Comput. and Chem. Engng.***, vol. 6, no. 3, pp. 245-255, 1982.

J2   Gundersen T. and Hertzberg T. "Partitioning and Tearing of Networks - Applied to Process Flowsheeting", ***Modeling, Identification and Control***, vol. 4, no. 3, pp. 139-165, 1983.

J3   Skogestad S., Gundersen T. and Johnsen O. "Compositional Simulation of a Refinery Coker Furnace - An Industrial Example of Two-Phase Flow with Chemical Reaction", ***Modeling, Identification and Control***, vol. 7, no. 1, pp. 24-44, 1986.

J4   Gundersen T. and Naess L. "The Synthesis of Cost Optimal Heat Exchanger Networks - An Industrial Review of the State of the Art", ***Comput. and Chem. Engng.***, vol. 12, no. 6, pp. 503-530, 1988.

J5   Gundersen T. and Naess L. "The Synthesis of Cost Optimal Heat Exchanger Networks - An Industrial Review of the State of the Art", ***Heat Recovery Systems and CHP***, vol. 10, no. 4, pp. 301-328, 1990.

J6   Gundersen T. and Grossmann I.E. "Improved Optimization Strategies for Automated Heat Exchanger Networks through Physical Insights", ***Comput. and Chem. Engng.***, vol. 14, no. 9, pp. 925-944, 1990.

J7   Gundersen T. "Process Integration Methods, Software and Applications - Towards a State-of-the-Art Survey" (in Polish), Fuel and Energy Management (***Gospodarka Paliwari i Energia***), Special Issue on Process Integration, no. 9, pp. 2-8, 1997.

J8   Glemmestad B., Skogestad B. and Gundersen T. "Optimal Operation of Heat Exchanger Networks", ***Comput. and Chem. Engng.***, vol. 23, pp. 509-522, 1999.

6. INVITED PRESENTATIONS AT INTERNATIONAL MEETINGS

I-1   **AspenWorld'88**, Amsterdam, The Netherlands, 13-16 November 1988: *"The Practice and Benefits of Pinch Technology in Norsk Hydro"*.

I-2   **FOCAPD-89** (Foundations of Computer Aided Process Design), Snowmass, Colorado, USA, 9-14 July 1989: *"Retrofit Process Design - Research and Application of Systematic Methods"*.

I-3 **IMP-90** (25th Anniversary of Instituto Mexicano del Petroleo), Conference on Conservation and Efficient Use of Energy, Mexico City, 25 May 1990: *"Industrial Applications of Heat Recovery Techniques"*.

I-4 **SPE-90** (Society of Petroleum Engineers), Seminar on Enhancing Safety and Environmental Standards in Offshore Operations, Grindelwald, Switzerland, 9-14 September 1990: *"Use of Systematic Methods for Energy Optimization"*.

I-5 **PSE-91** (International Conference on Process Systems Engineering), Montebello, Canada, 5-9 August 1991: *"Achievements and Future Challenges in Industrial Design Applications of Process Systems Engineering"*.

I-6 **AspenWorld'91**, Cambridge, Massachusetts, USA, 4-6 November 1991: *"Achievements and Future Challenges in Industrial Design Applications of Process Systems Engineering"*.

I-7 **IEA-92**, Workshop on Process Integration organized by the International Energy Agency, Gothenburgh, Sweden, 28-29 January 1992: *"Implementation Problems and Organizational Aspects"*.

I-8 **IEA-93**, Workshop on Process Integration organized by the International Energy Agency, Berlin, Germany, 4-5 October 1993: *"Definition of Process Integration in an IEA Context"*.

I-9 **FOCAPD-94** (Foundations of Computer Aided Process Design), Snowmass, Colorado, USA, 10-15 July 1994: *"Commentator for the Poster Session on Design and Synthesis"*.

I-10 **Nordic PI-95** (Nordic Annual Meeting on Process Integration), Copenhagen, Denmark, 8 November 1995: *"Classification and Evaluation of Process Integration Methods"*.

I-11 **UNWS-96** (UN Workshop on Process Integration), Manchester, UK, 11 June 1996: *"IEA Implementing Agreement on Process Integration - Survey of Process Integration Methods, Software, Applications and End-User Needs"*.

I-12 **IMP-97** (3rd Forum of Advances in the Refinery Industry), Mexico City, 25-26 September, 1997: *"State-of-the-Art in Process Integration Methods, Software and Industrial Applications"*.

I-13 **AspenWorld'97**, Boston, USA, 12-16 October 1997: *"Recent Trends and Hot Topics in Process Integration Methods, Software and Applications"*.

I-14 **Nordic PI-97** (Nordic Annual Meeting on Process Integration), Copenhagen, Denmark, 27 November 1997: *"Topology Traps in Evolutionary and Simultaneous Strategies for Heat Exchanger Network Synthesis"*.

I-15 **CHISA' 98**, Prague, Czech Republic, 24-28 August 1998 (Keynote): *"Recent Trends in Process Integration Methods, Software and Applications"*.

I-16 **PI' 99**, Copenhagen, Denmark, 7-10 March 1999: *"From Gothenburg'92 to Copenhagen'99 - Major Trends and Developments in Process Integration"*.

I-17 **Mexico-01**, Mexico City, 22 October 2001 (International Seminar on Process Integration for Environmental Protection): *"An Introduction to the Methods and Industrial Benefits of Process Integration"*.

I-18 **Durban-02**, Durban, South Africa, 18-20 November 2002 (International Seminar on Advanced Achievements in Pinch Technology, keynote): *"From University Pinch through Industrial Savings to Environmental Improvements"*.

7. OTHER PUBLICATIONS (many with normal international referee procedures)

P1 Gundersen T. "Decomposition of Large Scale Chemical Engineering Systems", ***Dr.Ing Thesis***, Chemical Engineering Department, The Norwegian Institute of Technology, Trondheim, Norway, April 1982.

P2 Gundersen T. and Hertzberg T. "Partitioning and Tearing Chemical Process Flowsheets", ***Proceedings from PSE-82*** (International Conference on Process Systems Engineering), volume from Technical Sessions, pp 9-21, Kyoto, Japan, August 1982.

P3 Hertzberg T. and Gundersen T. "Process Flowsheeting; Part 1: Algorithms for solving Flowsheeting Problems, and Part 2: Partitioning and Tearing in Flowsheeting Calculations", in R. von Schalien, ***Proceedings from the Symposium Use of Modeling and Simulation in Energy Research***, Aabo Academy, Dept. of Chem. Engng., Finland, December 1983.

P4 Gundersen T. and Naess L. "The Synthesis of Cost Optimal Heat Exchanger Networks - An Industrial Review of the State of the Art", ***Proceedings from CEF-87*** (The Use of Computers in Chemical Engineering), pp 675-704, Giardini Naxos, Sicily, Italy, April 1987.

P5 Gundersen T. and Grossmann I.E. "Improved Optimization Strategies for Automated Heat Exchanger Networks through Physical Insights", ***AIChE Annual Meeting***, Washington D.C., November 1988.

P6 Gundersen T. "Retrofit Process Design - Research and Application of Systematic Methods", in J.J. Siirola, I.E. Grossmann and G. Stephanopoulos, ***Proceedings from Foundations of Computer Aided Process Design*** (FOCAPD-89, Snowmass, Colorado, July 1989), CACHE Elsevier, pp 213-240, 1990.

P7 Sagli B., Gundersen T. and Yee T.F. "Topology Traps in Evolutionary Strategies for Heat Exchanger Network Synthesis", in H.T. Bussemaker and P.D. Idema, ***Proceedings from Computer Applications in Chemical Engineering*** (ComChem'90, The Hague), Elsevier, pp 51-58, 1990.

P8 Gundersen T. "Achievements and Future Challenges in Industrial Applications of Process Systems Engineering", ***Proceedings from the International Symposium on Process Systems Engineering*** (PSE-91, Montebello, Canada), vol. I - Design, pp I.1.1-I.1.32, August 1991.

P9 Gundersen T., Sagli B. and Kiste K. "Problems in Sequential and Simultaneous Strategies for Heat Exchanger Network Synthesis", in L. Puigjaner and A. Espuna, ***Proceedings from Computer-Oriented Process Engineering*** (COPE'91, Barcelona, Spain, October 1991), Elsevier, pp 105-116, 1991.

P10 Mathisen K.W., Skogestad S. and Gundersen T. "Optimal Bypass Placement in Heat Exchanger Networks", Paper 67e, Session on Plant-wide Control, ***AIChE Spring Meeting***, New Orleans, April 1992.

P11 Gundersen T., Duvold S. and Hashemi-Ahmady A. "An Extended Vertical MILP Model for Heat Exchanger Network Synthesis", ***Comput. and Chem. Engng***., vol. 20, Suppl. (Proc. from the European Symposium of Computer-Aided Process Engineering, ESCAPE-6, Rhodes, May 1996), pp S97-S102, 1996.

P12 Glemmestad B., Mathisen K.W. and Gundersen T. "Optimal Operation of Heat Exchanger Networks based on Structural Information", ***Comput. and Chem. Engng***., vol. 20, Suppl. (Proc. from the European Symposium of Computer-Aided Process Engineering, ESCAPE-6, Rhodes, May 1996), pp S823-S828, 1996.

P13   Gundersen T., Trædal P. and Hashemi-Ahmady A. "Improved Sequential Strategy for the Synthesis of Near-Optimal Heat Exchanger Networks", *Comput. and Chem. Engng.*, vol. 21, Suppl. (Proc. from the joint PSE-97/ESCAPE-7, Trondheim, May 1997), pp S59-S64, 1997.

P14   Glemmestad B., Skogestad S. and Gundersen T. "On-line Optimization and choice of Optimization Variables for Control of Heat Exchanger Networks", *Comput. and Chem. Engng.*, vol. 21, Suppl. (Proc. from the joint PSE-97/ESCAPE-7, Trondheim, May 1997), pp S379-S384, 1997.

P15   Glemmestad B. and Gundersen T. "A Systematic Procedure for Optimal Operation of Heat Exchanger Networks", Proceedings from FOCAPO'98 (Third International Conference on Foundations of Computer-Aided Process Operations, Snowbird, Utah, 5-10 July, 1998), *AIChE Symp. Series*, vol. 94, no. 320, pp. 451-457, 1998.

P16   Hashemi-Ahmady A., Zamora J.M. and Gundersen T. "A Sequential Framework for Optimal Synthesis of Industrial Size Heat Exchanger Networks", AIChE Annual Meeting, Session 218 (Poster), Miami Beach, November 1998.

P17   Gundersen T. "From Gothenburg'92 to Copenhagen'99 - Major Trends and Developments in Process Integration", *Proceedings from PI'99* (International Conference on Process Integration, Copenhagen, Denmark, 7-10 March, 1999), vol. 1, pp. 7-24, 1999.

P18   Hashemi-Ahmady A., Zamora J.M. and Gundersen T. "A Sequential Framework for Optimal Synthesis of Industrial Size Heat Exchanger Networks", Proc. from PRES'99, Budapest, Hungary, 31 May - 2 June, pp. 329-334, 1999.

8. NON - INVITED INTERNATIONAL PRESENTATIONS

NI-1   **PSE-82** (International Conference on Process Systems Engineering), Kyoto, Japan, August 1982: *"Partitioning and Tearing Chemical Process Flowsheets"*.

NI-2   **PIRC-84** (Annual Meeting of the Process Integration Research Consortium), London, October 1984: *"SUPERTARGET - Prototype Software for Heat Exchanger Network Design"*.

NI-3   **PIRC-86** (Annual Meeting of the Process Integration Research Consortium), Manchester, October 1986: *"On the Use of ΔT_{min} Contributions in Retrofit Projects - Experience from an Energy Study of an Ammonia Plant"*.

NI-4   **CEF-87** (European Conference on the Use of Computers in Chemical Engineering), Giardini Naxos, Sicily, Italy, April 1987: *"Synthesis of Cost Optimal Heat Exchanger Networks - An Industrial Review of the State of the Art"*.

NI-5   **PIRC-88** (Annual Meeting of the Process Integration Research Consortium), Manchester, October 1988: *"Is the Use of a Global ΔT_{min} in HENS another Topology Trap ? "*.

NI-6   **AIChE-88** (Annual Meeting of the AIChE), Washington D.C., December 1988: *"Improved Optimization Strategies for Automated Heat Exchanger Network Synthesis through Physical Insights"*.

NI-7   **NTH-90** (Seminar on Mathematical Programming: Modern Optimization Techniques in Process Design and Control), Norwegian Institute of Technology, Trondheim, Norway, May 1990: *"The Advantage of Simultaneous Strategies in the Design of Heat Exchanger Networks"*.

NI-8 **COPE-91** (European Conference on Computer-Oriented Process Engineering), Barcelona, Spain, October 1991: *"Problems in Sequential and Simultaneous Strategies for Heat Exchanger Network Synthesis"*.

NI-9 **NTH-92** (Short Course on Process Design Tools and Techniques), The Norwegian Institute of Technology, Trondheim, May 1992: *"Advanced Techniques in Synthesis of Heat Exchanger Networks"*.

NI-10 **ESCAPE-6** (European Symposium on Computer-Aided Process Engineering), Rhodes, Greece, May 1996: *"The Extended Vertical MILP Model for Heat Exchanger Network Synthesis"*.

NI-11 **PSE-97/ESCAPE-7** (Joint Process Systems Engineering and European Symposium on Computer-Aided Process Engineering), Trondheim, Norway, May 1997: *"Improved Sequential Strategy for the Synthesis of Near-Optimal Heat Exchanger Networks"*.

NI-12 **AspenWorld'97**, Boston, USA, 16 October 1997: *"An IEA Initiative on Process Integration"*.

NI-13 **PRES'99**, Budapest, Hungary, 1 June 1999: *"A Sequential Framework for Optimal Synthesis of Industrial Size Heat Exchanger Networks"*.

9. INTERNATIONAL SEMINARS

S1   Carnegie Mellon University (CMU), Pittsburgh, USA, October 1987: *"The Synthesis of Cost Optimal Heat Exchanger Networks - An Industrial Review"*.

S2   Carnegie Mellon University (CMU), Pittsburgh, USA, November 1987: *"Flexibility of Heat Exchanger Networks"*.

S3   University of Maryland, College Park, USA, December 1987: *"A Systems Approach to Process Design"*.

S4   Aspen Technology Inc., Boston, USA, March 1988: *"A Review of Developments in Heat Exchanger Network Synthesis"*.

S5   Massachusetts Institute of Technology (MIT), Boston, USA, March 1988: *"Automatic Generation of Heat Exchanger Networks"*.

S6   University of Pennsylvania, Philadelphia, USA, April 1988: *"Automatic Synthesis of Heat Exchanger Networks"*.

S7   Centre for Process Systems Engineering (Autumn Seminar Series), Imperial College of Science, Technology and Medicine, London, November 1992: *"Process Structure - The Key to Low Cost and Good Operation"*.

S8   Department of Chemical Engineering, Denmark Technical University (DTU), June 1995: *"Use of Mathematical Programming in Heat Exchanger Network Synthesis and the Extended Vertical MILP Model"*.

10. PH.D (OR DR.ING / DR.TECHN) COMMITTEES

- Tulio R. Colmenares "Design of Heat and Power Recovery Systems for Energy Conservation in Chemical Plants", Ph.D, Chem. Engng. Dept., University of Pennsylvania, Philadelphia, *USA*, April 1988.

- Stephen G. Hall "Targeting for Multiple Utilities", Ph.D, Chem. Engng. Dept., University of Manchester, Institute of Science and Technology (UMIST), Manchester, *UK*, Dec. 1989.

- Terrence F. Yee "Simultaneous Optimization Models for Heat Integration Systems", Ph.D, Chem. Engng. Dept., Carnegie Mellon University (CMU), Pittsburgh, *USA*, March 1990.

- Per E. Wahl "Synthesis of Heat Integrated Distillation Sequences: Approaches Combining Knowledge Based and Operations Research Techniques", Dr.Ing, Chem. Engng. Dept., The Norwegian Institute of Technology, Trondheim, *Norway*, June 1991.

- C.W. ("David") Hui "Process Integration between Areas of Integrity", Ph.D, Chem. Engng. Dept., University of Manchester, Institute of Science and Technology (UMIST), Manchester, *UK*, October 1991.

- Ingrid S. Melaaen "Probabilistic Modeling on the Influence of Inaccuracies in Thermo-dynamic Properties on Process Plant Design", Dr.Ing, Dept. of Refrigeration Engng., The Norwegian Institute of Technology, Trondheim, *Norway*, November 1993.

- Tore Omtveit "Studies on Conceptual Design of Chemical Reactor Systems", Dr.Ing, Chem. Engng. Dept., The Norwegian Institute of Technology, Trondheim, *Norway*, March 1994.

- Knut W. Mathisen "Integrated Design and Control of Heat Exchanger Networks", Dr.Ing, Chem. Engng. Dept., The Norwegian Inst. of Technology, Trondheim, *Norway*, April 1994.

- Torbjørn Pettersen "Design of Membrane based Separation Processes", Dr.Ing, Chem. Engng. Dept., The Norwegian Inst. of Technology, Trondheim, *Norway*, November 1994.

- Jan Sandvig Nielsen "Energy Optimization of Integrated Process Plants", Ph.D., Chem. Engng. Dept., The Danish Technical University, Copenhagen, *Denmark*, June 1995.

- Nii D.K. Asante "Automated and Interactive Retrofit Design of Practical Heat Exchanger Networks", Ph.D., Dept. of Process Integration, University of Manchester Institute of Science and Technology (UMIST), Manchester, *UK*, April 1996.

- Erik Wallin "Process Integration of Industrial Heat Pumps in Grassroot and Retrofit Situations", Ph.D., Dept. of Heat and Power Technology, Chalmers University of Technology, Gothenburg, *Sweden*, May 1996.

- Victor M. Briones Vallejo "An Integrated Framework for the Design of Heat Exchanger Networks", Ph.D., Dept. of Process Integration, University of Manchester Institute of Science and Technology (UMIST), Manchester, *UK*, December 1996.

- Xiurong ("William") Nie "Optimization Strategies for Heat Exchanger Network Design considering Pressure Drop Aspects", Ph.D., Dept. of Process Integration, University of Manchester Institute of Science and Technology (UMIST), Manchester, *UK*, May 1998.

- Erik Sauar "Energy Efficient Process Design by Equipartition of Forces - With Applications to Distillation and Chemical Reaction", Dr. Techn., Dept. of Physical Chemistry, Norwegian University of Science and Technology, Trondheim, *Norway*, November 1998.

- Steinar Hauan "On the Behaviour of Reactive Distillation Systems", Dr. Ing., Department of Chemical Engineering, Norwegian University of Science and Technology, Trondheim, *Norway*, January 1999.

- Jens B. Mikkelsen "Thermal Energy Storage Systems in Batch Processing", Ph.D., Dept. of Energy Engineering, Technical University of Denmark, Copenhagen, *Denmark*, January 1999.

- Joao Jorge da Silva Ferreira Alves "Analysis and Design of Refinery Hydrogen Distribution Systems", Ph.D., Dept. of Process Integration, University of Manchester Institute of Science and Technology (UMIST), Manchester, *UK*, September 1999.

- Bunyaphat Suphanit "Design of Complex Distillation Systems", Ph.D., Dept. of Process Integration, University of Manchester Institute of Science and Technology (UMIST), Manchester, *UK*, November 1999.

- Dorrie Wan Tze Chow "Design and Optimization of Wastewater Treatment Networks", M.Phil., Dept. of Process Integration, University of Manchester Institute of Science and Technology (UMIST), Manchester, *UK*, September 2000.

- Lalita Tantimuratha "Automated Design of Flexible and Operable Heat Exchanger Networks", Ph.D., Dept. of Process Integration, University of Manchester Institute of Science and Technology (UMIST), Manchester, *UK*, January 2001.

- Ivar Halvorsen "Minimum Energy Requirements in Complex Distillation Arrangements", Dr. Ing., Department of Chemical Engineering, Norwegian University of Science and Technology, Trondheim, *Norway*, May 2001.

- Pierre Krummenacher "Contribution to the Heat Integration of Batch Processes (with or without Heat Storage)", Ph.D., Department of Mechanical Engineering, École Polytechnique Fédérale de Lausanne, *Switzerland*, November 2001.

- Lieke Wang "Performance Analysis and Optimal Design of Heat Exchangers and Heat Exchanger Networks", Ph.D., Department of Heat and Power Engineering, Lund Institute of Technology, *Sweden*, December 2001.

- Henrik Dalsgård "Simplification of Process Integration in Medium Size Industry", Ph.D., Department of Mechanical Engineering, Denmark Technical University, Copenhagen, *Denmark*, September 2002.

- Fang Liu "Hydrogen Integration in Oil Refineries", Ph.D., Dept. of Process Integration, University of Manchester Institute of Science and Technology (UMIST), Manchester, *UK*, October 2002.

- Hilde Kathrine Engelien "Process Integration applied to the Design and Operation of Distillation Columns", Dr. Ing., Department of Chemical Engineering, Norwegian University of Science and Technology, Trondheim, *Norway*, March 2004.

- Jiaona Wang "Synthesis and Optimization of Low Temperature Gas Separation Processes", Ph.D., Dept. of Process Integration, University of Manchester Institute of Science and Technology (UMIST), Manchester, *UK*, June 2004.

- Jon Agust Thorsteinsson "Modeling of Fishing Vessel Operation for Energy System Optimization", Department of Energy Technology, Aalborg University, Aalborg, *Denmark*, June 2004.

11. SUPERVISION OF PH.D. OR DR. ING. STUDENTS

- Bjørn Glemmestad "Optimal Operation of Integrated Process - Studies on Heat Recovery Systems", Telemark Institute of Technology, Porsgrunn, Norway, 1994-1997. *Finished* on 12 December, 1997.

- Abdolreza Hashemi-Ahmady "Use of Modern Optimization Techniques in Process Integration", Telemark Institute of Technology, Porsgrunn, Norway, 1994-1998. Did *not* finish.

- Tom Ole Øvrum "Process Integration in Energy and Water Management Systems - Mass Transfer Processes and Wastewater Minimization", Telemark Institute of Technology, Porsgrunn, Norway, 1995-1998. Did *not* finish.

- Arne Lind "Analysis and Design of Hydrogen Distribution Networks in Oil Refineries", Department of Energy and Process Engineering, Norwegian University of Science and Technology, Trondheim, Norway, 1999-2003. *Finished* on 15 March, 2004.

- Syed Own Abbas "Top-Level Analysis for Utility Systems in Natural Gas based Industrial Plants", Department of Energy and Process Engineering, Norwegian University of Science and Technology, Trondheim, Norway, 2003-2006.

- Rahul Anantharaman "Process Synthesis – Solving Industrial Problems with Mathematical Programming and Insights", Department of Energy and Process Engineering, Norwegian University of Science and Technology, Trondheim, Norway, 2003-2006.

- Kristin Herder Kaggerud "Process Synthesis with Emphasis on Energy and Chemicals Integration", Department of Energy and Process Engineering, Norwegian University of Science and Technology, Trondheim, Norway, 2003-2006.

- Jelena Malenovic "Next Generation LNG Heat Exchangers", Department of Energy and Process Engineering, Norwegian University of Science and Technology, Trondheim, Norway, 2003-2006.

Trondheim, 25 May, 2004

Truls Gundersen

Curriculum vitae

Name: Hallvard Fjøsne Svendsen

Present pos.:   Professor of Chemical Engineering, Norwegian University of Science and Technology.

Born: March 7th, 1948

Status: Married (1971), two children (1973,1975)

Address: Frydenbergvn. 20 D,   7035 Trondheim, Norway

Education: Sivilingeniør (M.Sc.) Dept. of Chem.Eng., NTH 1971
Dr.Ing. (Ph.D) Dept. of Chem.Eng., NTH 1976
Pedagogisk Utdanning for Sivilingeniører (PUFS), 1976

Employment:

72 - 73:   University of Trondheim, Norwegian Institute of Technology(NTH), Research assistant, Department of Inorganic Chemistry.

73 - 76:   University of Trondheim, Norwegian Institute of Technology(NTH), Dr.Ing. (PhD) studies, Department of Chemical Engineering.

76 - 78:   University of Dar es Salaam, Tanzania. Lecturer in Chemical Engineering, Chemistry Department,(NORAD contract)

78 - 84:   SINTEF, Division of Applied Chemistry, Research Scientist.

84 - 94:   University of Trondheim, Norwegian Institute of Technology (NTH), Department of Chemical Engineering, Associate Professor

94 -   Norwegian University of Science and Technology, Department of Chemical Engineering, Professor

On sabbatical leave as academic visitor:

83 - 84   University of Nevada, Reno, Chemical and Metallurgical Engineering Department, Visiting Professor

92 - 93   Institut National Polytechnique de Toulouse, Ecole Nationale Superieure d'Ingenieurs de Genie Chimique, Visiting Professor

Publications:

/J1/   Anundskås, A., Grjotheim, K., Schultz, A., Svendsen, H., and Øye, H.A.
Benetzungseigenschaften in Systemen von Interesse für die Magnesium-
Elektrolyse (Teil III). Metall **29,** (1975) 493

/J2/   Svendsen, H.F. and Thorsen, G.
Mine water treatment by solvent extraction with carboxylic acids
Proceedings from the Oslo Symposium, Univ. of Oslo, June 1982

/J3/   Thorsen, G., Svendsen, H.F., and Grislingås, A.
The integrated organic leaching-solvent extraction operation in hydro-
metallurgy. In Hydrometallurgical Process Fundamentals, Plenum Press 1984,
Ed R.G. Bautista

/J4/   Jeffreson C., Svendsen H.F.
Selection of Sampling Frequency for Digital Process Control Systems
Ind.Eng.Chem.Fund. **25**,(1986),771-775

/J5/   Svendsen H.F., Schei G., Osman M.
Kinetics of Extraction of Zinc by Di(2-Ethyl-Hexyl)Phosphoric Acid in
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STF66 F98068, 1998

R/45/ Svendsen, H.F., Lysberg, M. Selektiv fjerning av H$_2$S fra CO$_2$ i statisk mixer - videreføring i 1998
STF66 F98116, 1998

R/46/ Svendsen H.F., Sleipner Vest, CO2 removal., STF66 F98134, 1998

R/47/ Lundstrøm P., Lysberg M., Morud J., Skjetne P., Strøm T., Svendsen H.F., Physical Modelling of a
Polyolefin Flash Pipe. Updated version, september 1999., STF66 F99109

R/48/ Svendsen H.F., Lysberg M., Sleipner Vest study, Modeling, STF66 F99119, 1999

R/49/ Svendsen H.F., Lysberg M., Sleipner Vest study, Modeling, Version 2.STF66 F00074, 2000

BIOGRAPHICAL DATA

HEINZ A. PREISIG

Titles and Degrees	**Contact Information**
Professor of Process Systems Engineering	Department of Chemical Engineering
PhD. Tech. Sci. ETH	Norwegian Uni of Sci and Tech (NTNU)
Dipl. Ing ETH, Chemical Engineer ETH	N-7491 Trondheim
Dipl. Ing. HTL, Chemist HTL	Norway
Professional Chemist	Telephone +47 - 735.9.28.07
	Facsimile +47 - 735.9.40.80
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Education

3/78	–	7/84	Ph.D., Technical Sciences, Swiss Federal Institute of Technology (ETH, Prof. Dr. DWT Rippin), 1984.
8/74	–	3/78	Diploma (M.Sc.), Chemical Engineering, Swiss Federal Institute of Technology (ETH), 1978; top 10%
9/74	–	8/75	Transition course HTL--ETH, top 1 % of the country.
8/71	–	8/74	Diploma (B.Sc.), Chemist HTL, Technikum Winterthur, 1974; top 5 %
3/68	–	4/71	Chemical laboratory assistant, apprenticeship, Sulzer 1971; best in 10 years.

Experience

01/03	–	pre-sent	Norwegian University of Science and Technology (NTNU), Trondheim, Norway Professor of Process Systems Engineering, Fac. of Science and Technology
10/00	–	12/02	Eindhoven University of Technology, Eindhoven, The Netherlands Professor of Systems and Control, Fac. of Electrical Engineering
8/95	–	10/00	Eindhoven University of Technology, Eindhoven, The Netherlands, Section Head Dual Appointment Professor of Systems and Control, Fclts Chem Tech & Appl. Physics
97		pres	National University of Singapore, regular Visiting Professor and advisor to Chemical Precess Engineering Centre (CPEC)
2/9	–	8/95	University of New South Wales, Sydney, Australia Senior Lecturer, School of Chemical Engineering and Industrial Chemistry & Electrical Engineering
8/85	–	12/89	Texas A&M University, College Station, Texas, USA Assistant Professor, Chemical Engineering.
8/84	–	7/85	Texas A&M University, College Station, Texas, USA Visiting Assistant Professor, Chemical Engineering.
3/78	–	7/84	Swiss Federal Institute of Technology (ETH), Zürich, Switzerland Teaching and Research Assistant and MS/PhD Supervisor.
74	–	79	Gewerbeschule Winterthur, Winterthur, Switzerland Substitute teacher at apprentice school for chemical laboratory assistants.
6/73	–	8/73	Cementa Inc., Hällekies, Sweden, laboratory technician.
4/68	–	8/71	Sulzer Inc., Winterthur, Switzerland, laboratory technician

Professional Associations

- Former member of Dutch Institute of Systems and Control, DISC
- Former member of Dutch Process Technology Research School, OSPT
- Former member of SMBT (Stichting Meet en Besturings Technologie) (former head of Process Control Section)
- Former member of the steering board and the executive board of PATO control section, the continuous education program of the Dutch Engineering Society
- Former Member of the Stevin Institute, an interdisciplinary research school at Eindhoven Institute of Technology
- Member of American Institute of Chemical Engineers,
- Associate to Computer Aids for Chemical Engineers (CACHE),
- Former member of Institute of Engineers Australia, Section Control (member of the board).

Profile in Brief

I am devoted to interdisciplinary research using the systems approach to provide the supporting platform on which the specific applications rest with a strong emphasis on knowledge integration. On the theoretical side I have been interested in the fields of linear and nonlinear **model predictive control**, **process identification**, modelling and control of **hybrid systems**, with applications to sequential control and fault diagnosis and detection, **time-scale analysis** both in modelling and identification primarily using advanced wavelet technology and singular perturbation, **modelling of macroscopic systems** with an emphasis on system representation, the latter inducing model reduction and integrating all scales of dynamics from sudden events to steady state. I hold a worldwide recognised leading position in the field of modelling hybrid systems and computer-aided modelling of macroscopic systems.

Having started my professional career in industry, carrying theoretical knowledge to bear its fruit in industrial applications is my objective. Applications include concept design of live support systems and distributed waste water installations, waste water plants, modelling of electrical arc cutting machines for control, tuning of a cyclotron, reduced-order modelling of heat exchangers, post-harvest food processing, membrane processes and many more.

RESEARCH STUDENTS

ETH Zürich

Students		Degree	Year
Urs Koster	Process identification	Ms Sci	1983
Urs Koster	Batch plant control	PhD	discont.
Ling Di Qi	Optimal control of discrete systems	Ass Prof guest	1981-3

Texas A&M University

Collaborate projects with C.D. Holland, head of department and well-recognised specialist in simulation and design of distillation columns and R.E. White a specialist in battery modelling.

Students		Degree	Year
Two	Process identification	BS Sci	1985-7
M. Kimmich	Reduced-order modelling of heat transfer processes and mixing	Ms Sci	1988
T.Y. Lee	Computer-aided modelling	PhD	1991
G. Mijares	multi-variable control (with C.D. Holland)	PhD	1988
J.D. Cole	distillation control (with C.D. Holland)	PhD	1989
Several	Battery dynamics (with C.D. White)	Ms Sci	1987-9

University of New South Wales

Students		Degree	Year
Guo, D.-Z. ; (PhD Queensland Univ., Chemical Engineering)	Tree representation of the physical topology of physical-chemical-biological processes.	Post Doc	1991-2
Levitsky, V.; (PhD Odessa, Physics)	Object oriented representation of physical-chemical-biological processes.	Post Doc	1993-4
Li, D.V.	Discrete-event system modelling	Post Doc	1994
Ma, X.M.	Dynamic reduced-order modelling of heat exchangers	PhD	1990-3
Mehrabani, A.Z.	Computer-aided modelling of physical-chemical-biological systems	PhD	1995
Maridable, P.	Modelling of event-discrete chemical processes and controller synthesis	PhD	1992
Renz Jochen	Synthesis of supervisory control systems	Ms Sci	1992-3
Gasendo, G. (lecturer LaSalle Uni, Manila Philippines)	Modelling and identification of a catalytic process	Ms Sci	1992-3
Castillo, Gil	Knowledge representation in computer aided modelling	Ms Sci	1993-7
Mun , Sally	Process Identification in Batch Processes	Ms Sci	1990
Subur , Sophia	Comparison of Kalman Filter and Spline-Type Modulating Functions	Ms Sci	1990
Rys Van,	Auto Tuning of Process Controllers	Ms Sci	1990
Momsen , Steven	Sequential of Dynamic Chemical Processes	Ms Sci	1990
Couldridge, A.T.	Identification of Heat Transfer Process	Ms Sci	1991

Students		Degree	Year
McLauglin,	Discontinued	Ms Sci	1991
Yem, Raymond	Supervisory Control of A Chemical Process	Ms Sci	1991
Thee, C.G.	Dynamic Temperature Measurements	Ms Sci	1991
Thangarajah, C.	Scheduling of Batch Processes	Ms Sci	1991
Panov , V.	Laminate Production Process	Ms Sci	1992
Tika, P.	Simulation and Identification of Fixed-Bed Reactor	Ms Sci	1992
Rahmadi, A.	Identification of Dynamic Heat Transfer Model	Ms Sci	1992
Woodburn, K.	Identification of Local Heat Transfer Parameters in Jacketed Stirred Tank Reactor	Ms Sci	1993
Newman, S.	Distillation Column Modelling	Ms Sci	1993
Bushell, G.	Identification of Fixed-Bed Reactor	Ms Sci	1993
Chang, C.	Identification of Dynamic Heat Transfer in Jacketed Stirred Tank Reactor	Ms Sci	1993
Halsted, J.	Simulation and Optimisation of a Multi-Producer-Storage-Multi-Customer Problem	Ms Sci	1993
Bushell, G.	Identification of a Kinetic Model in a Fixed-Bed Reactor	Ms Sci	1993

Co-supervision of various electrical engineering students working on the School's pilot plant in an effort to replace the existing control system. The new system included new event-discrete system components developed in my group.

One project student has been accepted to MIT and several other major US universities. Another student was rewarded an Australian Overseas Student grant for continuation to PhD.

Eindhoven University of Technology

Students		Degree	Year
Verwaater van der, S	Recipe Development and Model-Based Recipe Optimisation in the Batch Processing Industry (co-supervisor with O. Rademaker)	PhD	1995
Eijpe R.A.	Modellering van biologische defosfatering in Carrousel 2000	Ms Sci	1995
Dr. M. Weiss, (PhD Mathematics in Groningen, The Netherlands)	Computer-aided modelling: Consistency and completeness of mechanistic models in DAE form and index reduction And Discrete-event dynamic system modelling and fault detection	Post Doc	1995-99
Bossink S.	Geen verslag in archief	Ms Sci	1996
Sijbers M.	Parameteridentificatie uit batchexperimenten voor het IMs SciWQ Model No. 1	Proj	1996
Ortmans R.H.M.H.	HMs SciRT Protocol and Control	Proj	1996
Pijpers M.J.H.	Modelling for supervisory control	Ms Sci	1996
Umans F.J.Ms Sci.	Toepassingsmogelijkheden van MPC voor regeling van een polymerisatieproces	Proj	1996
Dr. Y. Lammerts (PhD Mechanical Engineering in Eindhoven, The Netherlands),	Teaching laboratory for systems and control education and batch process control	Post Doc	1996-00
Kovanen J.P.	Design, modelling and simulation of a two-vessel batch plant	Proj Vis.	1997
Lipsch, Roel	Discrete-event dynamic control of batch reactor	PhD	discont.
Verdijk G.J.C.	Modellering en Regelaarontwerp ten behoeve van een industrieel droogproces	Ms Sci	1997
Oosterum van Ms Sci.	Praktikum Systeem- & Regeltechniek, een eerste opzet	Proj	1997
Broek van den	Closed-loop Identification Using Finite Data	Ms Sci	1997

J.R.M.			
Westerweele M.R.	Concepts and Design of Modeller, a Computer-Ms Sciided Modelling Tool	Ms Sci	1997
Eekhof M.	Fault Detection as an Observability Problem	Proj	1997
Bruinsma U.B.D.M.R.	State-event discrete modelling of non-linear batch plants	Ms Sci	1997
Leur van J.L.F.	The first tests with a new interface for experiments	Proj	1997
Heuvel van den I.T.M.	Evaluations of experiments& first completed experiment for two practical courses	Proj	1997
Waal de, Marc	Control structure selection (co-supervisor with J. Kok)	PhD	1998
Stouten B.	Development of a Heating-Cooling System with two solenoid valves	Proj	1998
Meulenberg R.	Heating Cooling System	HTS / Ms Sci	1998
Oosterum van Ms Sci.	Using First Principles Models and Neural Networks for hybrid system identification	Ms Sci	1998
Dekkers R.M.	SyMoM, a Symbolic computation package for analysis and manipulation of dynamical models	Ms Sci	1998
Gastel van P.	"De Limonade Fabriek": De kunst van het vullen van een willekeurige beker	HTS	1998
Wagemakers J.Ms Sci.C.	Het ontwerpen en bouwen van een positioneereenheid	HTS	1998
Francisca R.	Dynamics flow and temperature control in a one-pipe airco	HTS / Ms Sci	1998
Niemans D.	Experiment "The Two Vessel Batch Plant"	HTS	1998
Giebels M.	Experiment "The Two Vessel Batch Plant": Hardware and Software design	HTS	1998
Schuurbiers M.	"One-pipe airco": De software-ontwikkeling	HTS	1998
O'Neill L.	Ms Sci Lemonade Maker	Proj Vis	1998
Pauly M.	External Communications via RS232 for SIMULINK Real-Time Workschop	HTS	1999
Grimm R.Ms Sci.	Low-Order Modelling of the Dynamic Behaviour of Heat Exchangers: Theory and Experimental Verification	Ms Sci	1999
Huisman L.	Experiment with an 'Extended Bath Tub' and a 'Multi Compartment Tank', Design, Realization, Ms Scinalysis and Control	Ms Sci	1999
Vaassen S.	On Spline-Tuype Modulating Functions and Wavelets	Proj	1999
Krabbendam P.	Dynamics of Energy Dissipation in a Batch Reactor driven by a Heating Cooling System	Ms Sci	1999
Grijseels, S.C.M.	On the Subject of Single-Phase Simple Systems: Ms Sci Thermodynamic Modelling Concept	Ms Sci	1999
Weijers, Stefan	Modelling and control of waste water treatment plants	PhD	2000
Mertens, H.	Real-Time Control of Laboratory Experiments with Matlab/Simulink	Ms Sci	2000
Brok, W.	Neuromorphic Modelling of Binoural Localisation	Proj	2000
Brink, R	Design and Realisation of a Novel High-Precision Gas Flow Meter	Ms Sci	2001
Philips, P P H H	Modelling, Control and Fault Detection of Discretely-Observed Systems	PhD	2001
Verdijck, Ger-wald	Model Predictive Control of Post-Harvest Processes (industrial project)	PhD	2002
Westerweele, M R	Consistent Dynamic Process Models	PhD	2003
Vleuten-Balkema van der, A J	Sustainable Wastewater Treatment	PhD	2003

Norwegian University of Science and Technology

Students		Degree	Year
Hayer, Fatemeh	Theme in computer-aided process modelling: application oriented	PhD	Ongoing
Zhu, Zhengjie	Theme in computer-aided process modelling: theoretically oriented	PhD	Ongoing

Proj	Project student
Proj Vis	Foreign visiting project student
HTS	Polytechnic diploma student
Ms Sci	Master of Science
PhD	Doctoral promotion
Post Doc	Post doctoral researcher

REFEREED PUBLICATIONS[1]

#	Authors	Title	Medium	Year
1.	Mijares, G. Cole, J D Naugle, N W Preisig, H A Holland, C D	New Criteria for System Stability and Pairing of Control and Manipulated Variables	AIChE Journal pp 1439-1449	1985
2.	Mijares, G. Cole, J D Preisig, H A Holland, C D	The Jacobi Eigenvalue Criterion: An Analysis and Dynamic Extension	DYCORD 86, Bournmouth, UK	1986
3.	Mijares, G. Cole, J D Preisig, H A Holland, C D	Stability and Performance Relations Between Triangular and Decentralised Control Systems	ACC 87, Minneapolis, USA pp 1701	1987
4.	Mijares, G. Cole, J D Preisig, H A Holland, C D	Use of Point and Group Linear Iterative Methods for the Design of Decentralised Control Structures	ACC 87, Minneapolis, USA pp 664	1987
5.	Preisig, H A Kimmich, M R Rippin, D W T	A Study of Dynamic System Modelling	CEF 87, Taomina, Sicily, Italy	1987
6.	Dovi, V G Paladino, O Preisig, H A	The Importance of Correct Boundary Conditions in the Estimation of Diffusion Coefficients form Mass Sorption Experiments	Com. Heat & Mass Transfer , 15 pp 669-679	1988
7.	Dovi, V G Preisig, H A	Estimation of Parameters in Models Involving Partial Differential Equations with Unknown Boundary Conditions	Zentralblatt für Mathematik	1988
8.	Preisig, H A	Optimising Control--A Survey	IECON'01, Denver, Colorado, USA, Nov 29 - Dec 02 pp 47	1988
9.	Preisig, H A	The Use of Differential Information for Batch Reactor Control	ACC 88, Atlanta, USA pp 671	1988
10.	Preisig, H A Kimmich, M R Rippin, D W T	A Study of Dynamic System Modelling	Computers & Chemical Engineering , 12, 5 pp 455-460	1988
11.	Cole, J D Preisig, H A Holland, C D	The Design of Squaring Compensators for the Feedback Control of Non-Square Systems	ACC 89, Pittsburg, Pennsylvania, USA, 21-06 / 23-06 pp 107	1989
12.	Dovi, V G Paladino, O Preisig, H A	Minimax Approximations to Theoretical Models Using Experimental Data	Applied Mathematics Letters	1989
13.	Dovi, V G Paladino, O Preisig, H A	Inverse Free Boundary Problems	Applied Mathematics Letters	1989
14.	Preisig, H A	The Application of Finite Automata Theory	DYCORD 89,	1989

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[1] The data base may generate similar entries as conference proceedings and subsequent publication in journals may both be present.

		to Sequential Control of Chemical Processes	Maastricht, Netherlands, 21-09 / 23-09 pp 75-82	
15.	Preisig, H A	On-line observation of the composition in non-isothermal batch reactors with non-linear reactions	ACC 89, Pittsburg, Pennsylvania, USA, 21-06 / 23-06, TP 4 pp 1549	1989
16.	Preisig, H A	Estimation of Mismatch Errors of Dynamic Models for Stirred Tank-Reactor Equipment: Part II Heat Dissipation in the Contents, Impact of Mixing	Chem Eng Sci , 44, 12 pp 2957-2965	1989
17.	Preisig, H A	Estimation of Mismatch Errors of Dynamic Models for Stirred Tank-Reactor Equipment: Part I Heat Exchange with Jacket, Impact of Model Reduction	Chem Eng Sci , 44, 12 pp 2943-2955	1989
18.	Preisig, H A Lee, T Y Makela, M Whittacker, A D Little, F	On the Representation of Life-Support System Models	19th ICES, San Diege, USA, 891479 pp 13	1989
19.	Preisig, H A Lee, T Y Little, F	A Prototype Computer-Aided Modelling Tool for Life-Support System Models	20th ICES, Williamsburgh, PA, USA, 901269 pp 10	1990
20.	Preisig, H A Rippin, D W T	Application of Observer Using Differential Information to Bench-Scale Reactor	ACC 90, San Diego, USA	1990
21.	Preisig, H A White, R E	A Solver for Sets of Nonlinear Ordinary Differential Equations	Computers & Chemical Engineering , 14, 2 pp 179-196	1990
22.	Ma, X H Preisig, H A Wood, R M	Model Reduction of Counter-Current Heat Exchangers	CHEMECA 91, Newcastle, Australia pp 808-815	1991
23.	Preisig, H A	Discrete-Event Controlled Systems in the Chemical Processing Industry	CHEMECA 91, Newcastle, Australia pp 983-945	1991
24.	Preisig, H A Guo, D Z Mehrabani, A Z	Computer-Aided Modelling: A New High-Level Interface to Process Engineering Software	CHEMECA 91, Newcastle, Australia pp 954-960	1991
25.	Preisig, H A Subur, S	Comparison of Two Schemes for the Observation of Composition in Stirred-Tank Reactors Operating in Batch Mode	CHEMECA 91, Newcastle, Australia pp 889-895	1991
26.	Ma, X H Preisig, H A Wood, R M	How Accurate Are Low-Order Models For Heat Exchangers ?	CHEMECA 92, Canberra, Australia pp 541-542	1992
27.	Ma, X H Preisig, H A Wood, R M	On the Modelling of Heat Exchangers For Process Control	ACC 92, Chicago, USA pp 1441	1992
28.	Preisig, H A	An Object-Oriented Approach to Computer-Aided Modelling	CHEMECA 92, Canberra, Australia, 2 pp 394-400	1992
29.	Preisig, H A	Discrete-Event Controlled Systems in the Chemical Processing Industry	DYCORD 92, College Park, Maryland, USA pp 277	1992
30.	Preisig, H A	Towards Discrete Event Dynamic Models of Chemical Processes	CHEMECA 92, Canberra, Australia, 2 pp 385-392	1992

31.	Ma, X H Preisig, H A	Improving the accuracy of the low-order models for heat exchangers	CHEMECA 93, Canberra, Australia	1993
32.	Ma, X H Preisig, H A Wood, R M	Reduced-Order Models for Heat Exchangers	IFAC World Congress 93, Sydney, Australia, 19-07 / 23-07, I	1993
33.	Preisig, H A	Safe Supervisory Control of Chemical Processes	CHEMECA 93, Canberra, Australia	1993
34.	Preisig, H A	More on the Synthesis of a Supervisory Controller From First Principles	IFAC World Congress 93, Sydney, Australia, 19-07 / 23-07, V pp 275	1993
35.	Preisig, H A Rippin, D W T	Theory and Application of the Modulating Function Method--Part II Algebraic Representation of Maletinsky's Spline-Type Modulating Functions	Computers & Chemical Engineering , 17, 1 pp 17-28	1993
36.	Preisig, H A Rippin, D W T	Theory and Application of the Modulating Function Method--Part I Review and Theory of the Method and Theory of the Spline-Type Modulating Function Method	Computers & Chemical Engineering , 17, 1 pp 1-16	1993
37.	Preisig, H A Rippin, D W T	Theory and Application of the Modulating Function Method--Part III Application to Industrial Process, a Well-Stirred Tank Reactor	Computers & Chemical Engineering , 17, 1 pp 29-39	1993
38.	Ma, X H Preisig, H A	Model-Based Controller Design for Heat Exchangers	CHEMECA 94, Perth, Australia, 25-09 / 28-09	1994
39.	Ma, X H Preisig, H A	Model-Supported Control of Heat Exchangers	CHEMECA 94, Perth, Australia, 25-09 / 28-09	1994
40.	Ma, X H Preisig, H A	Dynamic Modelling and Simulation of Heat Exchangers - What is available?	PSE 94, Seoul, Korea pp 327-332	1994
41.	Preisig, H A	Computer-Aided Modelling: Species Topology	ADCHEM 94, Kyoto, Japan, 25-05 / 27-05 pp 143-148	1994
42.	Preisig, H A	Modeller - A production tool for process engineering	FOCAPD 94, Snowmass, Colorado, USA	1994
43.	Preisig, H A	MODELLER -- A Computer-Aided Modelling Tool	AIChE Symposium Series FOCAPD 94, Snowmass, Colorado, USA, 91, 304 pp 328-331	1994
44.	Preisig, H A Ma, X H	Modellgestützte Regelung von Wärmeaustauschern	GVC Jahrestagung 94, Aachen, Germany, 28-09 / 30-09	1994
45.	Preisig, H A Ma, X H	Modellgestützte Regelung von Wärmeaustauschern	Chemical Engineering Technology , 11 pp 1	1995
46.	Weijers, S R Kok, J J Preisig, H A	Control strategies for nitrogen removel plants and MPC applied to a pre-denitrification plant	FAB 95, Gent, Belgium, 27-09 / 29-09 pp 2435-2443	1995
47.	Preisig, H A	A Mathematical Approach to Discrete-Event Dynamic Modelling of Hybrid Systems	Computers & Chemical Engineering , 20 pp S1301- S1306	1996
48.	Preisig, H A	Computer Aided Modelling - Two Paradigms on Control	Computers & Chemical Engineering ESCAPE 6 (1996), Rhodes, Greece, 26-05 / 29-05, 20, B pp S981-S982	1996

49.	Preisig, H A	Computer Aided Modelling - Two Paradigms on Control	Computers & Chemical Engineering , 20 pp S981-S986	1996
50.	Preisig, H A	Event-Discrete Modelling of Manufacturing Systems: Reduction of the State Space	I-CIMPRO 96, Eindhoven, Netherlands, 03-06 / 04-06 1996 pp 434-443	1996
51.	Preisig, H A	A Mathematical Approach to Discrete-Event Dynamic Modelling of Hybrid Systems	Computers & Chemical Engineering , 20, B pp S1301-S1306	1996
52.	Preisig, H A Lim, K W	Design and Implementation of a Real-Time, Event-Based Control System	Chem Eng World Congress 96, San Diego, California, USA, 14-07 / 18-07 1996	1996
53.	Weijers, S R Kok, J J Preisig, H A Buunen, A H M Wouda, T W M	Parameter identifiability in the IAWQ Model No. 1 for modelling activated sludge plants for enhanced nitrogen removal	Computers & Chemical Engineering , 20, B pp S1455-S1460	1996
54.	Weijers, S R Kok, J J Preisig, H A Buunen, A H M Wouda, T W M	Parameter identifiability in the IAWQ Model No. 1 for modelling activated sludge plants for enhanced nitrogen removal	ESCAPE 6 (1996), Rhodes, Greece, 26-05 / 29-05	1996
55.	Weijers, S R Preisig, H A	Parameter estimation of the IAWQ activated sludge model No. 1	ECC 96, Brussels, Belgium, 01-07 / 04-07	1996
56.	Weijers, S R Preisig, H A	Identifiability and estimation of parameters in the IAWQ Model No. 1 for modelling activated sludge plants for enhances nitrogen removel	ESCAPE 6 (1996), Rhodes, Greece, 26-05 / 29-05	1996
57.	Johns, W R Preisig, H A	Introduction to David Rippin Memorial Issue	Computers & Chemical Engineering , 22, 1 pp 1-29	1997
58.	Lim, K W Preisig, H A	Design of a Real-Time Hybrid Controller	IFAC Symp AIRT 97, Kuala Lumpur, Malaysia, 22-09 / 25-09 pp 137-142	1997
59.	Philips, P P H H Bruinsma, U B D M R Weiss, M Preisig, H A	A Mathematical Approach to Discrete-event Dynamic Modelling of Hybrid Systems	IFAC Symp AIRT 97, Kuala Lumpur, Malaysia, 22-09 / 25-09 pp 185-190	1997
60.	Preisig, H A Pijpers, M J H Weiss, M	A discrete modelling procedure for continuous processes based on state-discretization	MATHMOD 2, Vienna, Austria, 05-02 / 07-02 pp 189-194	1997
61.	Weijers, S R Engelen, G L Preisig, H A Schagen van, K	Evaluation of model predictive control of nitrogen removal with a carrousel type wastewater treatment plant using different control goals	IAWQ Workshop 97, Brighton, UK, 06-07 / 09-07 pp 401-408	1997
62.	Weijers, S R Preisig, H A Buunen, A H M Wouda, T W M	Parameter estimation of the activated sludge Model No. 1 from full-scale plant input / output data	ECC 97, Brussels, Belgium, 01-07 / 04-07 pp CD, Session TH-A H2	1997
63.	Weiss, M Preisig, H A	Simplifying hypotheses in computer-aided modelling: a singular perturbation approach	Computers & Chemical Engineering , 21 pp S721-S726	1997

64.	Weiss, M Preisig, H A	Simplifying hypotheses in computer-aided modelling: a singular perturbation approach	ESCAPE 7 (1997), Trondheim, Norway, 26-05 / 29-05	1997
65.	Dekkers, R Preisig, H A Weiss, M	SyMoM - a symbolic manipulation package for dynamical models of physical systems	ESCAPE 9 (1999), Budapest, Hungary, 31-05 / 02-06	1998
66.	Dekkers, R Preisig, H A Weiss, M	SyMoM - a symbolic manipulation package for dynamical models of physical systems	Computers & Chemical Engineering pp S657-S660	1998
67.	Lammerts, I M M Preisig, H A	Computer-Aided Experiments for a Course in Dynamic Systems and Control Technology	ESCAPE 9 (1999), Budapest, Hungary, 31-05 / 02-06	1998
68.	Philips, P P H H Weiss, M Preisig, H A	A design strategie for discrete control of continuous systems	ACC 99, San Diego, USA, 02-06 / 04-06	1998
69.	Ramkumar, K Philips, P P H H Preisig, H A Ho, W K Lim, K W	Structured fault-detection and diagnosis usig finite-state automation	24th IEEE Ind Elec Soc Conf, Aachen, Germany, 31-09 / 04-09	1998
70.	Verdijck, G J C Weiss, M Preisig, H A	Modelling of a Pneumatic Dryer for Potato Starch	Journal of Food Engineering , 37 pp 243-258	1998
71.	Verdijck, G J C Weiss, M Preisig, H A	Dynamic model development for an industrial potato starch drier	ACFBP 98, Goeteborg, Sweden, 21-09 / 23-09	1998
72.	Weijers, S R Preisig, H A	Robustness analysis of MPC controlled activated sludge plants	ECC 99, Karlsruhe, Germany, 31-08 / 03-09	1998
73.	Weiss, M Preisig, H A	Nonlinear systems analysis applied to the numerical conditioning of dynamic models for physical processes	ACC 98, San Diego, USA, 02-06 / 04-06 pp 2667-2671	1998
74.	Lammerts, I M M Preisig, H A	Computer-Aided Experiments for a Course in Dynamic Systems and Control Technology	Computers & Chemical Engineering pp S633-S636	1999
75.	Philips, P P H H Ramkumar, K Lim, K W Preisig, H A Weiss, M	Automation-based fault detection and isolation	ESCAPE 9 (1999), Budapest, Hungary, 31-05 / 02-06	1999
76.	Philips, P P H H Ramkumar, K Lim, K W Preisig, H A Weiss, M	Automation-Based Fault Detection and Isolation	Computers & Chemical Engineering , 23 pp S215-S218	1999
77.	Philips, P P H H Ramkumar, K Lim, K W Preisig, H A Weiss, M	Automation-Based Fault Detection and Isolation	ESCAPE 9 (1999), Budapest, Hungary, 31-05 / 02-06	1999
78.	Philips, P P H H Weiss, M Preisig, H A	Control based on discrete-event models of continuous systems	ECC 99, Karlsruhe, Germany, 31-08 / 03-09	1999
79.	Ramkumar, K Philips, P P H H Ho, W K Preisig, H A	A real-time realisation of fault-detection and diagnosis using finite-state automaton	IFAC World Congress 99, Bejing, China, 05-06 / 09-06, P, 7e-08-6 pp 211	1999

	Lim, K W			
80.	Verdijck, G J C Hertog, M L A T M Weiss, M Preisig, H A	Modelling of a potato storage facility for Product Quality Control purposes	Computers & Chemical Engineering , 23 pp S911-S914	1999
81.	Verdijck, G J C Hertog, M L A T M Weiss, M Preisig, H A	Modelling of a potato storage facility for Product Quality Control purposes	ESCAPE 9 (1999), Budapest, Hungary, 31-05 / 02-06	1999
82.	Verdijck, G J C Weiss, M Preisig, H A	Model based product quality control for a potato storage facility	ACC 99, San Diego, USA, 02-06 / 04-06	1999
83.	Weiss, M Preisig, H A	A systemic framework for first principles modelling and control of physical processes	IFAC World Congress 99, Bejing, China, 05-06 / 09-06, N, 7a-03-2 pp 55-60	1999
84.	Westerweele, M R Preisig, H A Weiss, M	Concept and Design of Modeller, a Computer-Aided Modelling Tool	ESCAPE 9 (1999), Budapest, Hungary, 31-05 / 02-06	1999
85.	Westerweele, M R Preisig, H A Weiss, M	Concept and Design of Modeller, a Computer-Aided Modelling Tool	Computers & Chemical Engineering , 23 pp S751-S754	1999
86.	Balkema, A J Preisig, H A Otterpohl, R Lambert, A D J	Developing a model-based decision support tool for the identification of sustainable treatment options for domestic wastewater	Watermex 2000, Gent, Belgium, 18 pp 6	2000
87.	Weijers, S R Preisig, H A	Nonlinear model reduction of bioprocess models through singular perturbation for control: an analytical scaling approach	MATHMOD 3, Vienna, Austria, 02-02 / 04-02 pp 615	2000
88.	Weijers, S R Preisig, H A	Robustness Analysis of MPC Controlled Activated Sludge Plants	ADCHEM 2000, Pisa, Italy, 14-06 / 16-06	2000
89.	Weiss, M Preisig, H A	Structural Analysis in the Dynamical Modelling of Chemical Engineering Systems	Mathematical and Computer Modelling of Dynamical Systems , 6, 4 pp 325-364	2000
90.	Westerweele, M R Akhssay, M Preisig, H A	Modelling of systems with equilibrium reactions	MATHMOD 3, Vienna, Austria, 02-02 / 04-02	2000
91.	Balkema, A J Preisig, H A Otterpohl, R Lambert, A D J Weijers, S R	Developing a Model-Based Decision Support Tool for the Identification of Sustainable Treatment Options for Domestic Wastwater	Water Science Technology , 43, 7 pp 265-269	2001
92.	Balkema, A J Preisig, H A Otterpohl, R Lambert, A D J Weijers, S R	The use of indicators in the sustainability assessment of wastewater treatment systems	Water Science Technology , 43, 7 pp 265-269	2001
93.	Preisig, H A	Concentration Control of Fast Reactions in ICSTR	DYCOPS-6, Jejudo (Chejudo), Korea, 4-6 June 2001 pp 696-699	2001
94.	Preisig, H A	Using Wavelets in Process Identification: A New Link to the State Space	ESCAPE 11 (2001), Kolding, Denmark, 27-05 / 30-05	2001
95.	Verdijck, G J C	A Control Methodology for Product Quality	ESCAPE 11 (2001),	2001

	Lukasse, L J S Preisig, H A	Control in climate controlled operations involving Agro-materials	Kolding, Denmark, 27-05 / 30-05	
96.	Verdijck, G J C Straten van, G Preisig, H A	A Modelling and Control Structure for Product Quality Control in Climate Controlled Processing of Agro-Material	Journal of Control Engineering Practice , in print	2001
97.	Westerweele, M R Preisig, H A	First Principle Modelling of Processes as Relevant to Process Industry	ESCAPE 11 (2001), Kolding, Denmark, 27-05 / 30-05	2001
98.	Xi, Y X Lim, K W Ho, W K Preisig, H A	Fault Diagnosis using Dynamic Finite-State Automaton	IECON'01, Denver, Colorado, USA, Nov 29 - Dec 02	2001
99.	Balkema, A J Preisig, H A Otterpohl, R Lambert, A D J	Indicators for the sustainablility assessment of wastewater treatment systems	Urban Water , 4, 2 pp 153-161	2002
100.	Preisig, H A	On Concentration Control of Fast Reactions in Slowly-Mixed Plants with Slow Inputs	ACC 2002, Anchorage, USA, 8-10 May 2002 pp FP 06-6	2002
101.	Preisig, H A Lim, K W Xi, Y X	Computation of Min and Max Transition Times in Automata Representing Discrete-Event-Observed Continuous, Monotone Plants	4th ASCC, Singapore, Singapore, 25-27/09/2002	2002
102.	Verdijck, G J C Sillekens, Preisig, H A	A Model Structure for Product Quality in Processing Agro-Material for Process Control Purposes	Journal of Food Engineering , 51 pp 151-161	2002
103.	Balkema, A J Preisig, H A Otterpohl, R Lambert, A D J	Augmenting design with sustainability	PSE 8 (2003), Kunming, China, 5-10/01/2003 pp 714-719	2003
104.	Philips, P P H H Heemels, W P M H Preisig, H A Bosch van den, P P J	Control of Quantised Systems Based on Discrete-Event Models	International Journal of Control, 76, 3 pp 277-294	2003
105.	Preisig, H A Westerweele, M R	Effect of Time-Scale Assumptions on Process Models and Their Reconciliation	ESCAPE 13 (2003), Lappeenranta, Finland, 1-4/6/2003 pp 875-880	2003
106.	Preisig, H A Westerweele, M R	Modeller--An interactive model editor for physical-chemical-biological models	FOCAPO 2003, Coral Springs, Florida, USA, 12-15 Jan 2003, paper 92 pp 531-534	2003
107.	Preisig, H A Xi, Y X Lim, K W	Fault Deagnosis Based on Limited Measurements of Process Variables	ADCHEM 7, Hong Kong, Hong Kong, 11-14/01/2004, 141	2003
108.	Preisig, H A Xi, Y X Lim, K W	Tailoring Automata for Fault Diagnosability	29th IEEE Ind Elec Soc Conf, Roanoke, Virginia, USA, 2-6 11 2003	2003
109.	Verdijck, G J C Straten van, G Preisig, H A	Optimisation of Product Quality and its Variatio in Climate Controlled Operations	Computers and Electronics in Agriculture , in print	2004
110.	Verdijck, G J C Straten van, G Preisig, H A	Direct Product Quality Control for Energy Efficient Climate Controlled Transport of Agro-Material	International Journal of Control , in print pp 42	2004
111.	Preisig, H A	Modelling: Compartmental Networks and Topologies - A Comparison with Bond	ESCAPE 14 (2004), Lisabon, Portugal, 16-	2004

		Graphs	19/05/2004 pp 1111-1116	
112.	Preisig, H A	Gymnastic Exercises with Topologies Relating to Time-Scale Assumptions	ESCAPE 14 (2004), Lisabon, Portugal, 16- 19/05/2004 pp 1105-1110	2004

June 5, 2004

SIGURD SKOGESTAD

Born: 14 Aug. 1955 in Flekkefjord, Norway.

Education

- 1978: Diploma Engineer (*Siv.ing.*) in Chemical Engineering at University of Trondheim, Norwegian University of Science and Technology (NTNU). Thesis: "Characterization of reaction conditions for cracking of heavy oil fractions" (Thesis advisor: Terje Hertzberg).

- 1987: Ph.D. in Chemical Engineering at California Institute of Technology (Caltech). Thesis: "Studies on Robust Control of Distillation Columns" (Thesis advisor: Manfred Morari).

Awards

- *Innstilling* awarded for the *Siv.ing.* degree (that is, the result was communicated to the Norwegian King), 1979.

- *Fullbright Fellowship* (travel grant) awarded for graduate studies at Caltech, 1983.

- *Utdanningsstipend* awarded from Univ. of Trondheim for graduate studies at Caltech, Sept. 1983 – Feb. 1987.

- Elected member to *The Norwegian Academy of Technical Sciences* (NTVA), 1988.

- *Ted Peterson Best Paper Award* by the CAST division of AIChE (The American Institute of Chemical Engineers), 1989.

- *George S. Axelby Outstanding Paper Award* by the Control System Society of IEEE (The Institute of Electrical and Electronic Engineers), 1990 (for journal paper no. 14).

- Elected member to *Det Kongelige Norske Vitenskapers Selskab*, 1991.

- *O. Hugo Schuck Best Paper Award* by the American Automatic Control Council, 1992 (for conference paper no. 28).

- Book "Multivariable Feedback Control" (Wiley, 1996) selected first runner-up for International federation of Automatic Control award for best texbook of the last 3 years (IFAC World Congress, Beijing, 1999).

Work experience

- 1979: Military Service at Norwegian Defence Research Center (FFI). Projects involved batteries and fuel cells.

- 1980–83: Research engineer at Norsk Hydro's Research Center in Porsgrunn, Department of Chemical Engineering. Projects involved process modelling, simulations and thermodynamics. Appointed Group leader of the Process Modelling and Simulation Group in 1983.

- 1983–87: Ph. D. student and Research Assistant at California Institute of Technology

- 1987– present : Professor in Chemical Engineering at NTH (after 1997: name changed to NTNU).

- 1994–95: Visiting Professor at University of California, Berkeley (Departments of Chemical Engineering and Mechanical Engineering).

- 2001–02: Visiting Professor at University of California, Santa Barbara (5 months).

Publications

- Book: S. Skogestad and I. Postlethwaite, "Multivariable feedback control - analysis and design," Wiley, Chichester, 572 pages (1996).

- Book: S. Skogestad, "Prosessteknikk" (In Norwegian), Tapir Publishers, Trondheim, 340 pages (2000). Second edition, 380 pages (2003).

- Morer than 100 journal publications

- 6 book chapters

- Editor of 3 special journal volumes

- More than 150 publications at international conferences

See separate publication list for details.

Plenary/keynote lectures

- "Analysis and Control of Distillation Columns", CHISA '87, Praha, Sept 1987.

- "Towards integrating design and control: Use of frequency-dependent tools for controllability analysis", Process Systems Engineering (PSE) '91 Canada, Aug. 1991.

- "Dynamics and Control of Distillation Columns - A Critical Survey", *IFAC-symposium DYCORD+'92*, Maryland, Apr. 1992

- "Robust multivariable control using H_∞ methods – Analysis, design and Industrial Applications", Invited short course at 1993 European Control Conference (with I. Postlethwaite), July 1993.

- "Interactions between process design and control", CHISA'93, Praha, Aug.-Sept., 1993.

- "Input-Output Controllability Analysis", Reglermöte, Västerås, Sweden, Oct. 1994.

- "Dynamics and control of distillation columns - A tutorial introduction", *Symposium Distillation and Absorbtion 97*, Maastricht, Netherlands, Sept. 1997.

- "Self-optimizing control: the missing link between steady-state optimization and control", Process Systems Enginneering (PSE) 2000, Keystone, Colorado, July 2000.

- "Plantwide control - towards a systematic procedure", European Symposium on computer-aided process engineering (ESCAPE'12), The Hague, Netherlands, May 2002.

- "Feedback control theory: An overview and connections to biochemical systems theory", 7th Intl. Symp. on Biochemical systems theory. Averoy, Norway, 17-20 June 2002

-

"Control structure design: What should we control, measure and manipulate?", First African Control Conference, Cape Town, South Africa, 03-05 December 2003.

Some other activities

- Chair of the dr.ing.committee for the Faculty of Chemistry and Chemical Technology NTH (1989-1993)

- Chair of the University committee for dr.ing. (1995 - 1999)

- Founding chair of the Nordic Process Control Working group (1994-1998)

- Board member of Norwegian Academy of Technical Sciences (NTVA) (1992- 1999)

- Head of NTNU/SINTEF's strong point center in process systems engineering (PROST) (1994 -   ),

- Chair of NTHs fund (1996 - 2002)

- Board member of Professorforum NTH (1991-1993), Chair of Professorforum NTNU (1997-2001),

- Board member at the Faculty of chemistry and biology NTNU (1996-1999),

- Head of Department of Chemcical Engineering NTNU (1999-   ).

- Member of the Norwegian research council expert network (1998-2002)

- Member of the Jury for Norsk Hydro's Birkeland Award, 1999-

Professional Activities

- *Editor* of Automatica (1996-2002).
  Member Editorial Board: *Chem. Eng,. and Processing* (from 2001).
  Member Advisory Panel: *Chem. Eng. Sci* (from 2002).
  Member Editorial Board: *Comput. Chem. Engng.* (from 2002).

- Member of American Institute of Chemical Engineers (AIChE), The Institute of Electrical and Electronic Engineers (IEEE), Norwegian Chemical Society (NKS), Norwegian Society of Professional Engineers (NIF), Norwegian Petroleum Society (NPF).

- Chairman of Organizing Committee for NTVA Seminar on Chemical Engineering 40 years in Norway, Trondheim, Aug. 1989.

- Chairman of international program committee for symposium PSE-ESCAPE'97, Trondheim, Norway, May 1997.

- Member of international program committee and/or session chairman for a large number of international conferences.

- Member of European Federation of Chemical Engineers working group on Computer-Aided Chemical Engineering (1990 -)

- Member of European Federation of Chemical Engineers working group on Distillation and Absorbtion (1998 -)

- *Member of evaluation committees professorship:* Telemark College (1990), Luleå Technical University, Automatic control (1997), Lund University, Automatic control (1999).

- External Examiner at the University of Dar es Salaam, Tanzania, at three occasions: March 1988, April 1989 and March 1991.

- *Reviewer for:*   AIChE J., Automatica, Canadian J. of Chem. Eng., Chem. Eng. Res. Des. (UK), Chem. Eng. Sci., , Comp. and Chem. Engng., Ind. Eng. Chem. Res., Int. J. of Control, Int. J. of Adaptive Control and Signal Processing, Int. J. of Robust and Nonlinear Control, IEEE Trans. of Autom. Control, National Science Foundation (US), J. of Process Control, Systems and Control Letters.

External examiner at doctoral dissertations

- Kurt Erik Häggblom, "Consistent control structure modeling with application to distillation control", Åbo Akademi, Finland, Dec. 1988.

- Charlotte Stub Nielsen, "Multivariable identification and control of an experimental distillation column with heat pump", DTH, Denmark, May 1990.

- Anders Karlström, "Modelling of packed bed distillation columns", CTH, Sweden, April 1991.

- John Delich, "The role of excess manipulated variables within control system development", Univ. of Sydney, Australia, Sept. 1992 (written statement only).

- Ronaldo G. Correa, "Control design of heterogeneous azeotropic distillation plants", DTH, Denmark, Oct. 1992.

- Stephen Walsh, "Integrated design of chemical waste water treatment systems", Imperial College, UK, July 1993.

- Ghassan A. Murad, "Robust multivariable control of industrial processes: A discrete-time multi-objective approach", University of Leicester, UK, Oct. 1995.

- Johan Pensar, "Parametric methods for optimaland robust control", Åbo Akademi University, Finland, Feb. 1996.

- Yi Cao, "Control structure selection for chemical processes using input-output controllability analysis", University of Execeter, UK, March 1996.

- Jobert Ludlage, "Controllability analysis of industrial processes", Eindhoven University of Technology, Netherlands, November 1997.

- Samara D. Chenery, "Process controllability analysis using linear and nonlinear optimisation", Imperial College, London, Jan. 1998

- Thomas E. Guttinger, "Multiple steady states in azeotropic and reactive distillation", ETH, Zurich, June 1998.

- Jens Erik Hansen, "Plant wide dynamic simulation and control of chemical processes", Technical University of Denmark, Lyngby, June 1998.

- Mads E. Hangstrup, "Strategies for industrial multivariable control - with application to power plant control", Aalborg University, Denmark, Feb 1999.

- Thomas S. Brinsmead, "Limits of controlled performance: Closing the gap via optrimosation", Univ. of Newcastle, Australia, Dec. 1999 (written statement only).

- Sander Groenendijk, "Plantwide controllability and structural optimization of plants with recycle", University of Amsterdam, March 2000.

- Torben Ravn Andersen, "Operating design and operation of process integrated distillation", Technical University of Denmark, Lyngby, November 2002.

- Shehzaad Koachali, "Development of process synthesis tools for reaction and separation networks", University of Witsvatersrand, South Africa, June 2003 (written statement only).

- Birgitta Kristiansson, "PID controllers design and evaluation", Chalmers University of Technlology, Sweden, August 2003.

Examiner at dr.ing. dissertations at NTNU: 1) Dag Ljungquist,"Online estimation in nonlinear state-space models with application to catalytic cracking", Div. of Eng. Cybernetics, 1990. 2) Peter Singstad, "Modeling and multivariable control of high pressure autoclave reactors for polymerization of ethene", Div. of Eng. Cybernetics, 1992. 3) Erling Aa. Johannessen, "Synthesis of dissipative output feedback controllers: Application to mechanical systems", Div. of Eng. Cybernetics, April 1997. 4) Bente H. Sannæs, "Solids movement and concentration profiles in column slurry reactors", Dept. of Chemical Enginerring, May 1997. 5) Knut Bakke, "Experimental and theoretical study of reflux condensation", Dept. of Refrigeration and Air Conditioning, Dec. 1997. 6) Olav Slupphaug, "On robust constrained nonlinear control and hybrid control: BMI- and MPC-based state-feedback schemes", Dept. of Eng. Cybernetics, Dec. 1998. 7) Gelein M. de Koeijer, "Energy efficient operation of distillation columns and a reactor applying irreversible thermodynamics", May 2002.

Teaching Responsibilities

I teach the course TKP4120 Prosessteknikk for students in the 2nd year of Chemical Engineering and 3rd year of petroleum engineering.

Undergraduate course: SIK2050 Process Control (approx. 50 students each year). 2003: Course is taught by Professor Heinz Presig.

Until 1999: Graduate course (at Division of Electrical Engineering): 43917 Multivariable Frequency Analysis (approx. 10 students each year).

I also teach the process control part (about 6 lectures) of the course SIK2010 Separasjonsteknikk, and I give about 3 lectures on dynamic modelling and simulation as part of the course SIK2067 Prosessutforming.

I also coteach two modules for the 5th year specialization: SIK20AH Advanced process control and SIK20AQ Special topics (distillation).

Graduated Dr.Ing. (Ph.D.) students

1. Thor Mejdell, *Estimators for product composition in distillation columns*, Nov. 1990.

2. Elling W. Jacobsen, *Studies on dynamics and control of distillation columns*, Dec. 1991.

3. Morten Hovd, *Studies on control structure selection and design of robust decentralized and SVD controllers*, Oct. 1992.

4. Knut W. Mathisen, *Integrated design and control of heat exchanger networks*, April 1994.

5. Erik A. Wolff, *Studies on control of integrated plants*, July 1994.

6. Eva Sørensen, *Studies on optimal operation and control of batch distillation columns*, Aug. 1994

7. H. Petter Lundström, *Studies on robust multivariable control of distillation columns*, Aug. 1994.

8. John C. Morud, *Dynamics and control of integrated plants with reactors* , Apr. 1996.

9. Ying Zhao, *Studies on modeling and control of continuous biotechnical processes*, Aug. 1996.

10. Atle C. Christiansen, *Studies on optimal design and operation of integrated distillation arrangements*, Jan. 1998.

11. Kjetil Havre, *Studies on controllability analysis and control structure design*, Feb. 1998.

12. Bernd Wittgens, *Experimental verification of dynamic operation of continuous and multivessel batch distillation*, Dec. 1999.

13. Truls Larsson, *Studies on plantwide control*, Aug. 2000.

14. Eva-Katrine Hilmen, *Separation of azeotropic mixtures: Tools for analysis and studies on batch diatillation operation*, Des. 2000.

15. Ivar J. Halvorsen *Minimum energy requirements in complex distillation arrangements*, May 2001.

16. Marius S. Govatsmark Integrated optimization and control, Sept. 2003.

17. Audun Faanes Controllability analysis and control structures, Sept. 2003.

18. Hilde K. Engelien Process integration applied to the design and operation of distillation columns, Mar. 2004.

19. Stathis Skouras Heteroazeotropic batch distillation: Feasibility and operation, May 2004.

Co-supervisor for:

1. Bjørn Glemmestad, *Optimal operation of integrated processes. Study on heat recovery systems*, , Telemark Institute of Technology, Dec. 1997 (Supervisor: Truls Gundersen)

Present Dr.Ing. (Ph.D.) students

1. **Vidar Alstad** (Siv.ing. Chem.Eng., NTNU, 1999), *Petronics*

2. **Antonio Brandao Araujo** (M.Sc., Fed.Univ. Paraiba, Brazil, 2002), *Controllability analysis with applications to natural gas systems*

3. **Elvira M.B.Aske** (Siv.ing., NTNU, 2001), *Natural Gas systems engineering* (also at Statoil)

4. **Pål Flatby** (Siv.ing. Chem.Eng., NTNU, 1986), *Dynamics and control of distillation processes.* (presently at Statoil)

5. **Jrgen B. jensen** (Siv.ing., NTNU. 2003), *Plantwide control with application to LNG plants*

6. **Tore Lid** (Siv.ing., Engineering Cybernetics, NTNU, 1991), *Integrated optimization and control with application to crude oil distillation*

7. **Heidi Sivertsen** (Siv.ing., NTNU, fysikk, 2001), *Stabilization of multiphase flow.*

8. **Espen Storkaas** (Siv.ing., NTNU kjemiteknikk, 1999), *Operation of chemical processes in unstable regions.*

9. **Jens P. Stransberg** (BS. Honors, Univ. Edinborough, 2001), *Natrual Gas systems engineering*

10. **Mari Undeli** (Siv.ing., NTNU kjemiteknikk, 1999), *Petronics.*

11. **Federico Zenith** (M.Sc, Polytecnio di Milano, 2002), *Hydrogen systems engineering*

BOOKS

1. S. Skogestad and I. Postlethwaite, "Multivariable feedback control - analysis and design," Wiley, Chichester, 572 pages (1996). (see http://www.chembio.ntnu.no/users/skoge/book.html for more information)

2. S. Skogestad, "Prosessteknikk. Masse- og energibalanser," Tapir, Trondheim, 340 pages (2000). (see http://www.chembio.ntnu.no/users/skoge/bok.html for more information)

PUBLICATIONS

International Journals

1. S. Skogestad, "Experience in Norsk Hydro with Cubic Equations of State", *Fluid Phase Equilibria*, **13**, 179-188 (1983).

2. T. Haug-Warberg and S. Skogestad, "Prediction of VLE Behavior in Concentrated Electrolyte Solutions", *Fluid Phase Equilibria*, **13**, 341-350 (1983).

3. M. Morari and S. Skogestad, "Effect of Model Uncertainty on Dynamic Resilience", *I.Chem.E. Symposium Series*, **No. 92**, 493-504 (1985). (From PSE 85: The Use of Computers in Chemical Engineering, Cambridge, UK, April 1985).

4. S. Skogestad, T. Gundersen and O. Johnsen, "Compositional Simulation of a Refinery Coker Furnace: An Industrial Example of Two-phase Flow with Chemical Reaction", *Modeling, Identification and Control*, **7**, 25-44 (1986).

5. D.E. Rivera, M. Morari and S. Skogestad, "Internal Model Control 4. PID Controller Design", *Ind. & Eng. Chem. Process Des. Dev.*, **25**, 252-265 (1986).

6. S. Skogestad and M. Morari, "Design of Resilient Processing Plants – IX. Effect of Model Uncertainty on Dynamic Resilience", *Chem. Eng. Sci.* **42**, 7, 1765-1780 (1987).

7. S. Skogestad and M. Morari, Letter to the Editor on pairing selection for decentralized control, *AIChE Journal*, **33**, 7, 701-702 (1987).

8. S. Skogestad and M. Morari, "The Effect of Disturbance Directions on Closed Loop Performance", *Ind. & Eng. Chem. Research*, **26**, 10, 2029-2035 (1987) .

9. S. Skogestad and M. Morari, "Control Configuration Selection for Distillation Columns", *AIChE Journal*, **33**, 10, 1620-1635 (1987).

10. S. Skogestad and M. Morari, "The Dominant Time Constant for Distillation Columns", *Comp. & Chem. Eng.*, **11**, 6, 607-617 (1987).

11. S. Skogestad and M. Morari, "Implications of Large RGA-Elements on Control Performance", *Ind. & Eng. Chem. Research*, **26**, 11, 2323-2330 (1987). (Also see *correction* to Eq. 13 in **27**, 5, 898 (1988)).

12. S. Skogestad and M. Morari, "A Systematic Approach to Distillation Column Control", *I.Chem.E. Symposium Series*, **No. 104**, A71-A86 (1987) (From Distillation and Absorption 87, Brighton, UK, Sept. 1987).

13. S. Skogestad and M. Morari, "LV-Control of a High-Purity Distillation Column", *Chem. Eng. Sci.*, **43**, 1, 33-48 (1988).

14. S. Skogestad, M. Morari and J.C. Doyle, "Robust Control of IllConditioned Plants: High-Purity Distillation", *IEEE Trans. Autom. Control*, **33**, 12, 1092-1105 (1988). (Also see *correction* to μ-optimal controller in **34**, 6, 672 (1989)).

15. S. Skogestad and M. Morari, "Some New Properties of the Structured Singular Value", *IEEE Trans. Autom. Control*, **33**, 12, 1151-1154 (1988).

16. S. Skogestad and M. Morari, "Understanding the Dynamic Behavior of Distillation Columns", *Ind. & Eng. Chem. Research*, **27**, 10, 1848-1862 (1988).

17. S. Skogestad and M. Morari, "Robust Performance of Decentralized Control Systems by Independent Designs", *Automatica*, **25**, 1, 119-125 (1989).

18. S. Skogestad, P. Lundström and E. W. Jacobsen, "Selecting the best distillation control configuration", *AIChE Journal*, **36**, 5, 753-764 (1990).

19. S. Skogestad, P. Lundström and E. W. Jacobsen, "Reply to comments by J. Riggs", *AIChE Journal*, **36**, 7, 1125-1126 (1990).

20. S. Skogestad and P. Lundström, "Mu-optimal LV-control of distillation columns", *Computers and Chem. Engng.*, **14**, 4/5, 401-413 (1990).

21. S. Skogestad, E. W. Jacobsen and M. Morari, "Inadequacy of steady-state analysis for feedback control: Distillate-bottom control of distillation columns. ", *Ind. Eng. Chem. Res.*, **29**, 12, 2339-2346 (1990).

22. E. W. Jacobsen and S. Skogestad, "Multiple Steady States in Ideal Two Product Distillation", *AIChE Journal*, **37**, 4, 499-511 (1991).

23. S. Skogestad, "Consistency of Steady-State Models Using Insight about Extensive Variables", *Ind. Eng. Chem. Res.*, **30**, 4, 654-661 (1991).

24. S. Skogestad and E. Wolff, "TANKSPILL - A Process Control Game", *CACHE News*, Published by CACHE Corporation, Austin, Texas. No.32, 1-4, Spring 1991.

25. S. Skogestad, E.W. Jacobsen and M. Morari, Comments on "Tuning Controllers on Distillation Columns with the Distillate-Bottoms Structure" (Correspondence), *Ind. Eng. Chem. Res.*, **30**, 2019-2020 (1991).

26. T. Mejdell and S. Skogestad, "Estimation of Distillation Compositions from Multiple Temperature Measurements using Partial-Least-Squares Regression", *Ind. Eng. Chem. Res.*, **30**, 12, 2543-2555 (1991).

27. T. Mejdell and S. Skogestad, "Composition Estimator in a Pilot Plant Distillation Column using Multiple Temperatures", *Ind. Eng. Chem. Res.*, **30**, 12, 2555-2564 (1991).

28. P. Lundström, S. Skogestad and Z-Q. Wang, "Performance weight selection for H-infinity and μ-control methods", *Trans. Inst. of Measurement and Control*, **13**, 5, 241-252 (1991).

29. Elling W. Jacobsen, Lionel Laroche, Manfred Morari, Sigurd Skogestad and Henrik W. Andersen, "Robust Control of Homogeneous Azeotropic Distillation Columns", *AIChE Journal*, **37**, 12, 1810-24 (1991).

30. S. Skogestad, M. Hovd and P. Lundström, "Simple frequency-dependent tools for analysis of inherent control limitations", *Modeling, Identification and Control*, **12**, 4, 159-177 (1991).

31. K. W. Mathisen, S. Skogestad and E. Wolff, "Bypass Selection for Control of Heat Exchanger Networks", *Computers and Chem. Engng.*, **16**, Suppl., S263-S272 (1992). (Supplement from symposium ESCAPE-1, Elsinore, Denmark, May 1992).

32. M. Hovd and S. Skogestad, "Simple Frequency-Dependent Tools for Control System Analysis, Structure Selection and Design", *Automatica*, **28**, 5, 989-996 (1992).

33. S. Skogestad and M. Morari, "Variable Selection for Decentralized Control", *Modeling, Identification and Control*, **13**, 2, 113-125 (1992) (reprint of Paper 128c presented at AIChE Annual Meeting, Washington DC, Nov. 1988; see paper 11 in the list of conference publications).

34. E. Sørensen Leversund, S. Macchietto, G. Stuart and S. Skogestad, "Optimal control and on-line operation of reactive batch distillation", *Computers and Chem. Engng.*, **18**, Suppl., S391-S395 (1994). (Supplement from symposium ESCAPE-3, Graz, Austria, July 5-7, 1993). Extended version in: *Computers and Chem. Engng.*, **20**, 1491-1498 (1996).

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159. V. Kariwala, S. Skogestad, J.F. Forbes, E.S. Meadows, "System stabilization using minimum input energy" (poster), AIChE Annual Meeting, San Francisco, Nov. 2003, Poster 439z.

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161. S. Skogestad, "Self-optimizing control: From key performance indicators to control of biological systems", . 8th International symposium on Process Systems Engineering (PSE-2003), 05-10 Jan. 2004, Kunming, China (extended version to be published in special issue of CCE).

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- S. Skogestad, "Robust control of distillation columns", Chemical Engineering Departemental Seminar, University of Maryland, 23 June 1987.

- S. Skogestad, "Robust control of distillation columns", Seminar at DuPont Experimental Station, Wilmington, Delaware 24 June 1987.

- S. Skogestad, "Robust control of distillation columns", Seminar at Shell research Center, Houston, Texas, 25 June 1987.

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- S. Skogestad, "Prosessutforming", Presentation at *Kursdagene 1988: Konvertering av naturgass*, NTNU, Trondheim, 06 Jan. 1988, (11 pages + 7 pages Appendix; available from NIF, Oslo).

- S. Skogestad, "The μ-method" and "Control of distillation columns", Invited lectures at Lund University, Sweden, 06-07 Apr 1988

- S. Skogestad, "Robust control of distillation columns", Seminar at Åbo University, Finland, 08 Dec. 1988.

- S. Skogestad, "Why and how to publish", Engelsk-kurs, NTNU, 7. June 1989

- S. Skogestad, "DB-control" and "Use of secondary measurements in distillation", Departmental seminar, Lehigh University, 19 June 1989

- S. Skogestad, "Destillasjon - En interessant anvendelse av multivariable regulering", Foredrag ved *Servomøtet 1989*, NTNU, 26. October 1989

- S. Skogestad, "Estimation of process outputs from multiple secondary measurements", Workshop *Control for profit*, University of Newcastle, 30. November 1989

- S. Skogestad, "Frequency-dependent RGA analysis", Gjesteforelesning ved EE Dep., Caltech, 12. March 1990

- S. Skogestad, "Statiske og dynamiske modeller til prosessovervåkning. Myk kontra hard modellering", Foredrag ved *NKS Temadag - Miljø/ kjemiometri*, Porsgrunn, 23. March 1990

- S. Skogestad, "Multiple steady-states in distillation columns", Gjesteforelesning ved DTH, Denmark, 10. May 1990

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- S. Skogestad, "Satsvise prosesser. Optimalisering, regulering og produksjonsplanlegging - metoder", Foredrag ved Kursdagene 91, NTNU, Jan. 1991

- S. Skogestad, "Dynamics, multiple steady states and control of distillation columns", Chem. Eng. Departmental Seminar, Univ. of Wisconsin, 15. Feb. 91.

- S. Skogestad, "Robust Control", Gjesteforelesning ved Sivilingeniør utdannelsen i Telemark (SiT), 22. Apr. 91

- "Systemer med kompleks dynamikk - destillasjon som et enkelt eksempel", Foredrag NTVA, Trondheim, 24. Apr.91.

- S. Skogestad, "Dynamics, multiple steady states and control of distillation columns", Chem. Eng. Departmental Seminar, Auburn University, 24. June. 1991.

- S. Skogestad, "Dynamics, multiple steady states and control of distillation columns", Chem. Eng. Departmental Seminar, Georgia Tech, 25. June. 1991.

- S. Skogestad, "Dynamics, multiple steady states and control of distillation columns" and "Control of Heat Exchanger Networks", Seminars given at Centre for Process Systems Engineering, Imperial College, London, 15-16. July. 1991.

- S. Skogestad. "Short Course on Distillation Dynamics and Control" and "Controllability Analysis using Frequency-Dependent Measures for Disturbances and Interactions", Lectures at *Nordisk Destillationsregulering Forskning Workshop*, Trondheim, Aug. 1991.

- S. Skogestad, "Modelling and Dynamic Simulation for Process Control", , Lecture and lecture notes for seminar on *Modelling and Optimization of Chemical Processes*", NTNU, Trondheim, Aug. 1991.

- S. Skogestad, "Inconsistency in low-order models of ill-conditioned plant", Seminar given at DTH, Denmark, 16. March 1992.

- S. Skogestad, "Kurs i destillasjonsregulering", Statoil Mongstad, 19. March 1992.

- S. Skogestad, "Analyse av regulerbarhet", Lecture at Norsk Forening for Automatisering (NFA) Seminar i "Integrert Prosessdesign", Oslo, 6-7. April 1992.

- S. Skogestad, "Controllability of integrated process systems - the relation between design and control", Lecture at *Short course on Process design tools and techniques*, Trondheim, 20-21 May 1992.

- S. Skogestad, "Analysis of multivariable control systems" - 4 lectures held at Norsk Hydro Research Centre, 13-21 July 1992.

- S. Skogestad, "Controllability measures for disturbance rejection", Lecture at *4th Nordic Process Control Workshop*, Gøteborg, 28 Aug. 1992.

- S. Skogestad, "Control of heat exchanger networks", Lecture at Edinburgh University, 9 Sept. 1992 and at UMIST, Manchester, 10 Sept. 1992.

- S. Skogestad, "Controllability measures for disturbance rejection", Lecture held at Leicester University on 11 Sept. 1992.

- S. Skogestad, "Controllability analysis for unstable plants", Seminar at DTH, Lyngby, Denmark, 9 Oct. 1992.

- S. Skogestad, "Controllability assessment as a tool for control structure selection", *Invited lecture* at *IMA Workshop on Control system design for advanced engineering systems: Complexity, uncertainty, information and organization*, Institute for Mathematics and Its Applications, Minneapolis, 13 Oct. 1992.

- S. Skogestad, "Regulerbarhet av prosesser", Foredrag ved *Kursdagene NTNU'93*, Kurs: "Økonomisk gevinst ved automatisering og drift av prosesser", Trondheim, 7-8. Jan. 1993.

- S. Skogestad, "Controllability Analysis", Lecture at *European Forum for CAPE Research Workshop*, Trondheim, 9-10. Jan. 1993.

- S. Skogestad, "Effect of recycle and other sources of positive feedback on the dynamics of chemical processes", Seminar at Centre for Process Systems Engineering, Imperial College, London, 19 July 1993.

- S. Skogestad, "Dynamics, multiple steady states and control of distillation columns", Seminar at Techniske Universitat Berlin, 27 Aug. 1993.

- S. Skogestad, "Effective control of distillation columns using temperature measurements", Lecture at Shell Research Center (KSLA), Amsterdam, 3 sept. 1993.

- S. Skogestad, "Regulerbarhetsanalyse av prosesser - et middel for bedre prosessdesign", Servo-møtet'93, Norsk Forening for Automatisering,

- S. Skogestad, "Controllability analysis", Nordic Process Control Workshop, Lyngby, Jan. 94.

- S. Skogestad, "Plantwide control", Nordic Process Control Workshop, Lyngby, Jan. 94.

- S. Skogestad, "A systems approach to distillation processes - The rebirth of a research area", Chemical Engineering Departmental seminars, University of California at Berkeley Jan. 23 1995,
University of California at Davis Feb. 13 1995, and
University of California at Santa Barbara May 9 1995.

- S. Skogestad, "A systems approach to distillation processes - The rebirth of a research area", Seminar, University of Massachusetts at Amherst, 31 March 1995.

- S. Skogestad, "Controllability analysis of SISO systems", Seminar, Department of Electrical Engineering, University of California at Berkeley, April 5, 1995.

- S. Skogestad, "A systems approach to distillation processes - The rebirth of a research area (including our first results on multivessel batch distillation)", *Plenary lecture*, IFAC Symposium DYCORD+95, Helsingor, Denmark, June 8, 1995.

- S. Skogestad, "Controllability analysis of SISO systems", Seminar, DuPont Experimental Station, Wilmington, Delaware, USA, July 28, 1995.

- S. Skogestad, "Multivessel batch distillation", Nordic Process Control Workshop, Åland, August 1995.

- S. Skogestad and K. Havre, "Control strategy selection and partial control", Lecture and poster, European HCM meeting on chemical process control, Imperial College, London, 14-15 September 1995.

- S. Skogestad and J. Morud, "Analyse av ustabilitet i ammoniakk-reaktorer", Servomøtet 1995, Trondheim, Nov. 1995.

- S. Skogestad, "Control structure design", Åbo Akademi, Finland, 15 Feb. 1996.

- S. Skogestad, "Control structure design", Workshop on controllability analysis and plantwide control, DTU, Denmark, 21 May 1996.

- S. Skogestad, "Selection of feedback variables for optimizing control of Petlyuk columns", Workshop on Petlyuk distillation, NTNU, Trondheim, 9 Sep. 1996.

- S. Skogestad, "Tutorial introduction to linear model predictive control", Nordic process control Workshop, Wadahl, Norway, 12 Jan 1997.

- S. Skogestad, "Multivariabel regulering og optimalisering", Norsk Forening for Automatisering (NFA) Årsmøteseminar, Vettre, 17. april 1997.

- S. Skogestad, "Model based tuning of PID controllers", Norsk Hydro Research Center, Porsgrunn, 04 Aug. 1997.

- S. Skogestad, "Important issues in process systems engineering using distillation as an example", Seminar, Aristotle University of Thessaloniki, Greece, 29 Sep. 1997.

- S. Skogestad, "Controllability analysis and control structure design", Seminar, Department of Electrical Engineering, Eindhoven Technical University, Netherlands, 11 Nov. 1997.

- S. Skogestad, "Introduction to controllability analysis", Taped lecture at Arizona State University, Tempe, 21 Nov. 1997.

- S. Skogestad, "Controllability analysis and plantwide control" , Shortcourse (4 hours) at Honeywell, Phoenix, 21 Nov. 1998.

- S. Skogestad, "Plantwide control" , Invited talk at Tutzing Symposium, Germany, 11 March 1998.

- S. Skogestad, "Control structure design and plantwide control - The search for the self-optimizing control structure" , Invited talk at 1998 Process Systems Engineering Seminar Series, Imperial College, London, 22 May 1998.

- S. Skogestad, "Self-optimizing control", Seminar at Automatic Control Department, ETH, Zurich, 15 June 1998.

- S. Skogestad, "Self-optimizing control", Seminar at Department of Chemical Engineering, DTU, Lyngby, 18 June 1998.

- S. Skogestad, "Self-optimizing control", Seminar at Department of Automatic Control, Aalborg University, 11 February 1999.

- S. Skogestad, "Self-optimizing control", Presentation at CAPE-OPEN workshop, Toulouse, 15 June 1999 [5 handwritten transparancies] .

- S. Skogestad, "Plantwide control: The search for the self-optimizing control structure", Seminar at University of Amsterdam, 29 March 2000.

- S. Skogestad, "Multivessel batch distillation - Experimental verification", Seminar at University of Essen, 14 June 1999.

- S. Skogestad, "Controllability analysis and plantwide control", Talk at short-course, Trondheim, 11-12 Oct. 1999.

- S. Skogestad, "Plantwide control: The search for the self-optimizing control structure", . Seminar at Univ. of Amsterdam, Netherlands, 29 March 2000.

- S. Skogestad, "Plantwide control: The search for the self-optimizing control structure", . Seminar at Dow Co., Terneuzen, Netherlands, 30 March 2000.

- S. Skogestad, "Feedback: The forgotton trick", Control group seminar, T.U. Delft, Netherlands, 11 Dec. 2000.

- S. Skogestad, "Plantwide process control", One-day lecture series given for the Taiwanese PSE Group at National Taiwan University of Science and Technology (NTUST), Taipei, Taiwan, 12 March 2001.

- S. Skogestad, "Feedback: The forgotton trick", Seminar at ITRI (Ind. Tech. Res. Inst.), Hsin Chu, Taiwan, 13 March 2001.

- S. Skogestad, "Feedback: The forgotton trick", Seminar at ABB Corporate research, Billingstad, Norway, 30 March 2001.

- S. Skogestad, "Flowsheet controllability assessment tools", Lecture at Eureca/Cache Workshop on Integration of design and control, , DTU, Lyngby, Denmark, June 2001.

- S. Skogestad, "Feedback: The forgotton trick", Seminar at University of California, Los Angeles, 20 Nov. 2001.

- S. Skogestad, "Feedback: The forgotton trick", , Dept. seminar at University of Colorado, Boulder, 12 Feb. 2002.

- S. Skogestad, "Feedback: The forgotton trick", Dept. seminar at University of Texas, Austin, 14 Feb. 2002.

- Sigurd Skogestad, "Plantwide control: Towards a systematic procedure" , Plenary lecture at European Symposium on Computer Aided Process Engineering 12, den Haag, Netherlands, 26-29 May 2002, and also presented at PROST Annual Meeting, Trondheim, 11 June 2002.

- S. Skogestad, "Feedback control theory: An overview and connections to biochemical systems theory", , Invited lecture at VIIth International Symposium on Biochemical Systems Theory Avery, Norway, 17-20 June 2002

- The Page Pucklet Colloquia in process dynamics and control, DuPont, Wilmington, 08 Nov. 2002, "Plantwide control: What should we control?"

- PSE-seminar at Cranfield University, 01 Sep. 2003, "A low-dimensional model of severe slugging for control design and analysis"

- Servomtet, 23. okt. 2003, Trends in process control

- 05 Jan 2004, South China University of Technology, Guangzhou, China, "Feedback: Applications to self-optimizing control and stabilization of slugging"

- 27 April 2004, IEEE Advanced Process Control Workshop, Vancouver, Canada. 3 hours plenary on "Control structure design".

- 29 April 2004, University of Alberta, Edmonton, Canada. Department of Chemical Engineering Seminar, "Feedback control: The simple and best solution".

CV - Professor Bjarne A. Foss

Name:	Bjarne Anton Foss
Date and place of birth:	July 31, 1957 in Tønsberg, Norway
Nationality:	Norwegian
Present position:	Department head and Professor of systems and optimization theory, The Department of Engineering Cybernetics, The Norwegian University of Science and Technology
Email and telephone:	Bjarne.Foss@itk.ntnu.no/+47-73594376

Education:

1980: Diploma engineer (siv.ing.) in Electrical engineering, The Norwegian Institute of Technology.
1987: Dr.ing. in Engineering Cybernetics, The Norwegian Institute of Technology.

Work experience:

1980	Research assistant at The Norwegian Institute of Technology.
1981-82:	Military Service at Gråkallen Air Force Radar Station. Work task: System Programming
1982-85:	Research Scientist at SINTEF Automatic Control (non-profit research organization)
1985-87:	Graduate student (doctorate degree), partly on leave from SINTEF
1988-90:	Head of System Control Group at SINTEF Automatic Control
1989 :	Full professor at The Norwegian Institute of Technology (later The Norwegian University of Science and Technology)
1995-96:	Visiting professor at The University of Texas at Austin
1999-2001:	Department head
2002- :	Member of the University Senate at NTNU
2003- :	Co-leader of Gas Technology Center NTNU-SINTEF

Other positions and activities:

1989- :	Scientific advisor for SINTEF (www.sintef.no)
1997- :	Scientific advisor for Elkem ASA (producer of light metal - www.elkem.com)
1998- :	Co-founder and board member of Cyberlab.Org AS (internet-based company for remote experimentation - www.cyberlab.org)
1999- :	Co-founder and board member of Cybernetica AS (company for application of advanced control - www.cybernetica.no)
2000-02:	Co-founder and board member of FIRST Scandinavia (non-profit organization to inspire children's interest in science and technology - www.hjernekraft.org)
2001-03:	Board member of SINTEF Electronics and Cybernetics

Publications: (for details see: www.itk.ntnu.no/ansatte/Foss_Bjarne)
More than 100 refereed journal papers, conference publications and book-chapters.
Co-author of one book. Guest editor Int.J.Control.
A large number of restricted technical reports and international guest lectures.

Research projects:
Supervised 14 completed dr.ing. degrees.
Lead several national industry development projects.

Co-lead in two international development projects (for ESA and EU).

Professional activities:
Member The Norwegian Academy of Technical Sciences (1993), Senior Member IEEE (1997), Member IFAC Technical Committee on Chemical Process Control (1996), Associate editor, Journal of Process Control (1996), Member editorial board - Mathematical Modelling (1996), Co-chair and member several IPCs (International Program Comittees), Review of a large number of scientific papers,
Organized two international workshops.

Awards:
1980: Innstilling awarded for the siv.ing. degree (ie., the result was communicated to the Norwegian King).
1995: The Karl Diesel Best Paper Award from Society of Design & Process Science. (www.sdpsnet.org)

Publication list – Professor Bjarne A. Foss

1994-2004

Book

J. G. Balchen, T. Andresen and B. A. Foss. Control Engineering (in Norwegian). *Tapir forlag,* 1999.

International Journals and book chapters

1. T. A. Johansen and B. A. Foss. Identification of non-linear system structure and parameters using regime decomposition. *Automatica,* 31:321--326, 1995. Also in Preprints 10th IFAC Symposium on Identification and System Parameter Estimation, Copenhagen (SYSID '94), Vol.1 ,pp.131-7.
2. B. A. Foss, T. A. Johansen, and Aa. V. Sørensen. Nonlinear predictive control using local models - applied to a batch process. *Control Engineering Practice,* 3:389--396, 1995.
3. B.A. Foss and S.O. Wasbø. Benchmark IFAC 93: Adaptive predictive PI-control of an unknown plant. *Automatica,* 30(4), 1994.
4. K.Uhlen, B.A.Foss, and O.B.Gjøsæter. Robust control and analysis of a wind-diesel hybrid power plant. *IEEE Trans. on Energy Conversion,* 9(4), 1994.
5. T.A. Johansen and B.A. Foss. *Advances in Neural Networks for Control Systems,* chapter Semi-Empirical Modeling of Non-Linear Dynamic Systems through Identification of Operating Regimes and Local Models Springer Verlag, 1995.
6. B. A. Foss and T. A. Johansen. *Neural Networks for Chemical Engineers,* chapter Local modelling as a tool for semi-empirical or semi-mechanistic process modeling. Elsevier, Amsterdam, 1995.
7. F.A. Michelsen and B.A. Foss. A comprehensive mechanistic model of the continuous kamyr digester. *Applied Mathematical Modelling,* 20:523--533, 1996.
8. F.A. Michelsen and B.A. Foss. A dynamic model of the interaction between the chemical reactions and the residence time in the continuous kamyr digester. *Tappi Journal,* 79:170--176, 1996.
9. B. A. Foss and S. J. Qin. Interpolating optimizing control. *J. of Process Control,* 7(2):129--138, 1997.
10. T. A. Johansen and B. A. Foss. Operating regime based process modelling and identification *Computers and Chemical Engineering,* 21:159--176, 1997.
11. O.B.Gjøsæter and B.A.Foss. On the use of diagonal control vs. decoupling for ill-conditioned plants. *Automatica,* 33(3), 1997.

12. A. Mjaavatten and B. A. Foss. A modular system for estimation and diagnosis *Computers and Chemical Engineering*, 21:1203--18, 1997.

13. S.O.Wasbø and B. A. Foss. Modelling unit processes using formal language description and object orientation. *Mathematical Modelling, 4: 185--206, 1998.*

14. T. Drengstig and D. Ljungquist and B.A. Foss. On AlF3 and temperature control of an aluminum electrolysis cell. *IEEE Trans. on Control System Techn., 6:157--171, 1998.*

15. B.A.Foss, B. Lohmann and W. Marquardt. A Field Study of the Industrial Modeling. *J. of Process Control*, 8(6):325--338, 1998. Also in *Modeling, Identification, and Control,* 19(3):153-174, 1998.

16. T. A. Johansen and B.A.Foss, ORBIT - Operating Regime Based Modeling and Identification Toolkit , *Control Engineering Practice*, Vol. 6, pp. 1277-1286, 1998.

17. O. Slupphaug and B. A. Foss, Constrained quadratic Stabilization of Discrete-Time Uncertain Multi-Model Systems using Piecewise Affine State-Feedback. *International Journal of Control*, Vol.72, pp.686-701, 1999 and in *Modeling, Identification, and Control,* Vol.20, pp.137-164, 1999.

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20. J.Vada, O. Slupphaug, T.A.Johansen and B. A. Foss, Linear MPC with optimal prioritized infeasibility handling: Application, computational issues and stability, *Automatica* 37 (11)*,* 2001.

21. B. A. Foss and S.O.Wasbø, An integration scheme for stiff solid-gas reactor models, *Computer Methods in Applied Mechanics and Engineering,* Vol.190/45, pp 6009-6021, 2001. Also in *Modeling, Identification, and Control,* 22(2):103-118, 2001.

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23. R. Findeisen, L. Imsland, F. Allgöwer, B. A. Foss, Output feedback stabilization of constrained systems with nonlinear predictive control, *Int. Journal of Robust and Nonlinear Control* Vol.13, pp.211-227, 2003.

24. R. Findeisen, L. Imsland, F. Allgöwer, B. A. Foss, Towards a sampled-data theory for nonlinear model predictive control, In W. Kang, C. Borges, and M. Xiao, editors, *New Trends in Nonlinear Dynamics and Control, and their Applications*, Lecture Notes in Control and Information Sciences, 295, pages 295-313, New York, 2003. Springer-Verlag.

25. R. Findeisen, L. Imsland, F. Allgöwer, B. A. Foss, State and Output Feedback Nonlinear Model Predictive Control: An Overview, *Europ. J. Contr.*, Vol.9, 2003.

26. F. Martinsen, L. Biegler, B.A. Foss, A new optimization algorithm with application to MPC, *J. of Process Control (in press)*, 2004.

International Refereed Conference Papers

1. B.A. Foss and O. Øgård. On structural models for fault detection and isolation in complex plants. In *Proc. Process System Engineering (PSE '94), Korea*, pages 1147--1151, 1994.
2. B.A. Foss, T.A. Johansen, and Å. Sørensen. Nonlinear predictive control using local models - applied to a batch process. In *Preprints Advanced Control of Chemical Processes (ADCHEM '94), Japan*, pages 225--230, 1994.
3. F.A. Michelsen and B.A. Foss. Modelling of a continuous digester for supervision and prediction. In *Preprints Advanced Control of Chemical Processes (ADCHEM '94), Japan*, pages 552--557, 1994.
4. B.A. Foss, R. Klev, M. Levin, and K. Lien. Integrated production systems for the process industries. In *Proc. The First World Congress on Integrated Design and Process Technology, Austin, USA*, pages 276--282, 1995.
5. T. A. Johansen and Bjarne A. Foss. Empirical modeling of a heat transfer process using local models and interpolation. In *Proc. The 1995 American Control Conference, Seattle, Wa.*, 1995.
6. A. Mjaavatten, B.A. Foss, and K. Fjalestad. Operator support for diagnosis in a fertilizer plant. In *Proc. ISPE'95, Colorado, USA*, 1995.
7. S.O.Wasbø and B.A.Foss. An object-oriented method for process modelling. In *Preprints DYCORD'95, Lyngby, Denmark*, pages 117--122, 1995.
8. S.O.Wasbø and B.A.Foss. Object-oriented model of a ferromanganese furnace. In *Proc. INFACON 7, Trondheim, Norway*, pages 545--554, 1995.
9. G. Tangen and B.A. Foss. Decision support for planning upgrading of a hydro power plant. In *Proc. IEEE International Conf. on Systems, Man and Cybernetics, Vancouver, Canada*, volume 2, pages 1562--1567, 1995.
10. J. Simensen and B.A. Foss. A concept for modelling batch plant operation. In *Preprints ESCAPE-6, Rhodes, Greece*, 1996.
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12. T.A.Johansen and B.A.Foss. ORBIT - Operating Regime Based Modeling and Identification Toolkit. In *Proc. SYSID'97, Fukuoka, Japan*, pages 961--7, 1997.
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15. O.Slupphaug and B.A.Foss. Model predictive control for a class of hybrid systems. In *Proc. European Control Conference, Brussels*, 1997.

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18. S.J.Qin, V.M.Martinez, and B.A.Foss. An Interpolating Model Predictive Control Strategy with Application to a Waste Treatment Plant. In *Proc. PSE/Escape7*, Trondheim, Norway, pages 881--6, 1997.

19. S.O.Wasbø, B.A.Foss, and R.Tronstad. Object-oriented ferromanganese furnace model. In *Proc. ADCHEM'97, Banff, Canada*, pages 345--50, 1997.

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21. O.Slupphaug and B.A.Foss, Robust Stabilization of Discrete-Time Multi-Model Systems using Piecewise Affine State-Feedback, In *Preprints DYCOPS-5, Corfu, Greece*, 1998.

22. J.Vada, O.Slupphaug and B.A.Foss, Infeasibility handling in linear MPC subject to prioritized constraints, In *Preprints IFAC World Congress, Beijing*, 1999.

23. B.A.Foss and S.B. Cong, Nonlinear MPC based on Multi-model for Distillation Columns, In *Preprints IFAC World Congress, Beijing*, 1999.

24. F.Martinsen, B.A.Foss and T.A:Johansen, A control relevant dynamic model of grate sinterering, In *Proc. IEEE CCA Conference, Hawaii*, 1999.

25. R.K.Pearson and B.A.Foss, Some Relations between Stability and Smoothness in Discrete-Time Dynamic Models, In *Proc. American Control Conference, Chicago*, pages 1385--1389, 2000.

26. B.A.Foss, Tor I. Eikaas and M. Hovd, Merging Physical Experiments back into the Learning Arena, In *Proc. American Control Conference, Chicago*, pages 2944--2948, 2000.

27. J. Vada, O. Slupphaug, T.A. Johansen and B.A.Foss, Stabilizing Linear MPC with Efficient Prioritized Infeasibility Handling, In *Proc. ADCHEM'2000, Pisa, Italy*, 2000.

28. O. Slupphaug and B.A.Foss, Multi-model based uncertatinty and robust control design (postscript-file), In *ADCHEM'2000, Pisa, Italy*, 2000.

29. D. diRuscio and B.A.Foss, On state space model based predictive control (postscript-file), In *Preprints DYCOPS-5, Corfu, Greece*, 1998, pp.304-9.

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31. L. Imsland, O. Slupphaug and B. A. Foss. Robust observer-based output feedback for nonlinear discrete-time systems with constraints. In *Prepr. NOLCOS 2001 St. Petersburg, Russia,* 2001.

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33. T.S.Schei, H.Ludvigsen, P. Singstad. Operator Support System for Optimization of Suspension PVC Batch Polymerization Reactors, In *ECC 2001 (Industry Day), Porto, Portugal*, 2001.

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37. R.Findeisen, L. Imsland, F.Allgower and B. A. Foss. Output feedback nonlinear predictive control - a separation principle approach. In *IFAC World Congress, Barcelona,* 2002.

38. G.O.Eikrem, B. A. Foss, L.Imsland, B.Hu and M.Golan. Stabilization of gas-lifted wells. In *IFAC World Congress, Barcelona,* 2002.

39. F.Martinsen, L.Biegler and B. A. Foss. Application of optimization algorithms to nonlinear MPC. In *IFAC World Congress, Barcelona,* 2002.

40. B.A.Foss, H.Ludvigsen and S.O.Wasbø. Optimization-based control - Some critical issues. In *MMAR'02, Szszecin, Poland,* 2002.

41. L. Imsland, R.Findeisen, Allgower and B. A. Foss. Output feedback stabilization with nonlinear predictive control: Asymptotic properties. In *ACC03, Denver,* 2003.

42. R.Findeisen, L.Imsland, F.Allgower, B.A. Foss. Stability Conditions for Observer Based Output Feedback Stabilization with Nonlinear Model Predictive Control. In *CDC'03, Hawaii,* 2003.

43. S.Drageset, L.Imsland, and B. A. Foss. Efficient model predictive control with prediction dynamics. In *ECC03, Cambridge,UK,* 2003.

44. L.Imsland, B.A. Foss and G.O.Eikrem. State feedback control of a class of positive systems – Application to gaslift stabilization. In *ECC03, Cambridge,UK,* 2003.

45. R.Findeisen, L.Imsland, F.Allgower, B.A. Foss. Output-feedback nonlinear model predictive control using high-gain observers in original coordinates. In *ECC03, Cambridge,UK,* 2003.

46. B.F.Lund, B.A. Foss, K.R:Løvåsen and B.E.Ydstie. Sensitivity analysis of a dynamic model for submerged arc silicon furnaces. In *INFACONX, Cape Town, South Africa,* 2004.

47. L.Imsland and B.A. Foss. State feedback set stabilization for a class of positive systems. In *IFAC POSTA, Rome,* 2003.

48. L.Imsland and B.A. Foss. Set stabilization of a class of positive systems. In *ADCHEM'2003, Hong Kong,* 2004.

49. G.O.Eikrem, L.Imsland and B.A. Foss. Stabilization of gas-lifted wells based on state estimation. In *ADCHEM'2003, Hong Kong,* 2004.

50. G.S.Landsverk, T.Mejdell and B.A. Foss. Modelling and simulation og an unsaturated polyester process. In *Polymer Reaction Engineering: Modelling, Optimisation and Control, Lyon,* 2003.

51. B.F.Lund, B.A. Foss, K.R:Løvåsen and B.E.Ydstie. System analysis of complex reactor behavior – A case study. Accepted for *DYCOPS-7, Boston,* 2004.

52. L.Imsland, D.Snarheim, R.Ulfsnes, O.Bolland and B.A.Foss. Modelling and control of a O_2/CO_2 gas turbine cycle for CO_2 capture. Accepted for *DYCOPS-7, Boston,* 2004.

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