Torsten Wik

Personal Details

Office: Department of Electrical Engineering
Division of Automatic Control, Automation and Mechatronics
Chalmers University of Technology
SE-412 96 Göteborg, Sweden
Email: tw@chalmers.se
Phone: +46(0)31 772 5146

Academic degrees

1994 M.Sc. in Chemical Engineering, majoring in Applied Mathematics.

1996 Licentiate of Engineering in Control Engineering. Thesis title: Dynamic Modeling of Nitrifying Trickling Filters.

1999 PhD in Environmental Sciences, majoring in Automatic Control. Thesis title: On modeling the dynamics of fixed biofilm reactors.

2004 Docent in Electrical Engineering (Automatic Control).

All degrees listed are at Chalmers University of Technology.

Appointments

2017 - Head of Automatic Control, Dept. of Electrical Engineering (former Signals and Systems).

2014 - 2017 Vice head (viceprefekt) of department doctoral programme, Department of Signals and Systems, Chalmers.

2013 - Professor (bitr. 2013 Signals and Systems, full 2021 Electrical Engineering), Chalmers

2007 - 2013 Associate Professor, Post with conditional tenure (Docent). Department of Signals and Systems, Chalmers.

2005 - 2007 Researcher at Department of Physics and Energy Conversion, Volvo Technology, Göteborg, Sweden.

2004 - 2005 Associate Professor (Oavlönad docent), Control and Automation Laboratory, Department of Signals and Systems, Chalmers.

1999 - 2004 Assistant Professor (FoAss), Control and Automation Laboratory, Department of Signals and Systems, Chalmers.

1999 Doctorate researcher. Department of Signals and Systems, Chalmers.

1994 - 1999 PhD-student, Control Engineering Laboratory, Chalmers.

1993 - 1994 Research Engineer, Waterloo Fast Pyrolysis Group. Department of Chemical Engineering, University of Waterloo, Ontario, Canada.

1993 Five months project employment and teaching at Control Engineering Laboratory, Chalmers.

Awarded research grants and project participations

Percentage refers to how large the granted funding of my salary was.

1994 – 1996 *Modelling of Nitrifying Trickling Filters*. PhD project funded by the NUTEK-program STAMP.

1997 – 1999 *Modelling of Nitrifying Trickling Filters*. Main applicant, granted (80%) funding from the School of Environmental Science for continuing my PhD project.

1999 Employment as Assistant Professor at the Department of Signals and Systems, Chalmers, (open competition, diarienummer ED41-99).

1997 – 1999 *Structure and function of nitrifying biofilms in wastewater treatment plants* (5%). Co-applicant in TFR-project (230-97-797) with main applicant Professor Malte Hermansson, Dept. of general and marine microbiology, Göteborg University.

1999 – 2001 TFR project 1999-615 (5%). Co-applicant, continuation of the above project.

2001 – 2007 *Centre for Process Design and Control* (CPDC). Supervision of PhD student Veronica Olesen.

2002 – 2004 *Understanding the dynamics of nitrifying biofilms by combining biological experiments and modeling* (15%). Co-applicant in VR-research programme (Granted 350 000 SEK + overhead/year). Main applicant: Professor Malte Hermansson, Dept. of general and marine microbiology, Göteborg University.

2002 – 2004 *A pilot plant for studies of nitrifying biofilms in wastewater treatment plants* (10%). Co-applicant in VA-forsk project granted 0.5 MSEK/year.

2002 – 2004 *Time Lapse Microscopy and Image Analysis for Cell Migration Modeling*. Co-applicant in VR project granted 550 kSEK/year. Main applicant: Professor Tomas Gustavsson, Imaging and Image Analysis, Department of Signals and Systems, Chalmers University of Technology.

2003 – 2004 A 50 000 + 100 000 SEK personal award (not applied for) to the department by GRYAAB for scientific contributions in the field of wastewater treatment.

2005 – 2008 *Biological wastewater treatment* (50%). Co-applicant in Formas project. Main applicant Malte Hermansson (Mikrobiologi, GU). Total 6MSEK/year. Because I quit Chalmers and started for Volvo Technology this grant was never used by me.

2006 – 2007 *Hydrogen and Fuel Technologies for Road Transport* and FURIM (50%). EC financed Volvo Technology projects where I was responsible/leader for the set-up and development of a control system for a combined diesel reformer and fuel cell APU.

2009 – 2012 *Light matters* (10% PI and one PhD-student). Main/co-applicant in SSF/ProEnviro project together with Heliospectra AB (granted 3.8 MSEK).

2010 – 2012 *Momentgivare I drivlina för ökad verkningsgrad* (10% PI and one PhD student). Co-applicant in FFI-project 32277-1 together with ABB and Volvo GTT Powertrain.

2012 – 2013 *Momentgivare i drivlina för ökad verkningsgrad och biobränslen - Givaregenskaper & signalbehandling* (10% PI and one PhD student). Co-applicant in FFI-project 32277-2 together with ABB and Volvo GTT Powertrain. Continuation of the above project.

2010 – 2012 A (200 kSEK personal award (not applied for) to the department by GRYAAB for scientific contributions in the field of wastewater treatment.

2012 – 2015 *Intelligent Light* (10% PI and one PhD-student). Main/co-applicant, project together with Heliospectra AB funded by Mistra Innovation (granted 6.5 MSEK).

2012 – 2014 *Recirculating aquaculture system configuration* (10%, PI). Main applicant and supervisor for VR financed Licentiate project for PhD-student Eric Windhede.

2012 – 2014 *NÄRFISK testbädd teknik* (240 kSEK). Co-applicant in Vinnova project with Björn Frostell (KTH) as project leader (Total grant 4.1 MSEK).

2012 – 2014 *State of Function* (10% for supervision). FFI project 35550-1 with Volvo GTT, Volvo Cars, SP, Intertek, Viktoria Institute.

2013 *Batman* (20%). PhD supervision and support for WP Function development and algorithms. Project together with Volvo GTT and Volvo Cars, financed by Energimyndigheten (36717-1).

2012 – 2014 *NÄRFISK -14* (40 kSEK). Co-applicant in Vinnova project with Björn Frostell (KTH) as project leader (Total grant 0.5 MSEK).

2014 – 2018 *Nomaculture* (one PhD student). Part of a large Mistra project with GU and SIK. Main Applicant: Kristina Sundell, Department of Biology and Environmental Science.

2014 – 2016 *Skattning av cylinderseparerat moment för effektivare och renare förbränning.* (10%, PI and one PhD student). FFI-project 38572-1. Standalone continuation of 32277-2.

2015 – 2019 *Methods and tools for assessment of dynamic aspects in the design of more efficient industrial energy systems* (10%, PI and one PhD student). Cooperation project with Department of Energy and Environment, CIT Industrial energy systems, and PREEM. Main applicant (Total grant 4.64 MSEK, Vinnova+Preem)

2015 – 2019 *Life-Long Battery Control.* FFI-project with Volvo Cars (10%, PI + one PhD student, 4.3 MSEK). Main applicant: Hannes Kuusisto, Volvo Cars.

2014 – 2015 Authoring a chapter in *Marin fiskodling på svenska Västkusten del 2: Teknisk/ekonomisk möjlighetsstudie.* (100 kSEK) Funded by EU through Göteborg University.

2016 – 2017 *Electrochemical modelling for prediction of long-term battery power.* SHC-projekt (300 kSEK, PI). A cooperation-project with KTH and Volvo Cars to develop first principles models for Li-ion battery cells.

2016 – 2017 *Skattning av cylinderindividuellt cylindertryck för effektivare och renare förbränning* (5%, PI, 1.4MSEK). FFI-project. Continuation of 38572-1. Post doctoral project for Marcus Hedegärd.

2017 – 2018 *Battery Management* (1.5 MSEK, PI). Chalmers Area of Advance project for a Post-doc position.

2017 – 2020 *More efficient and health conscious usage of lithium ion batteries by adaptive modeling* (4.6 MSEK, PI). Energimyndigheten (42787-1).

2018 – 2019 *Optimal Usage of Vehicle Battery by Multi-Scale Modelling* (2.1 MSEK, 50%, PI). Chalmers Area of Advance Transport project for a Post-doc position.

2018 – 2020 WP3 in *Demonstrationsplattform för elektrifierade transportsystem med lastbilar och högkapacitetsbussar* (3 MSEK, PI). Energimyndigheten (44401-1).

2018 – 2019 *Multi-scale modelling of battery aging for optimal usage in vehicles.* (0.8MSEK, PI) Swedish Electromobility Centre.

2018 – 2021 *Classification and optimal management of 2nd life batteries* (3.6MSEK, Co-PI). Swedish Energy Agency (Dnr 2017-013622)

2019 – 2021 *Ny metod för biotisk stressdetektering i hortikulturell produktion.* (3.3MSEK, Academic PI) Jordbruksverket/EIP-Agri.

2020 – 2021 *Next-generation BMS exploiting dynamic battery system reconfiguration.* (2.2 MSEK, PI) Transport Area of Advance, Chalmers.

2020 – 2023 *Dynamiskt konfigurerbara batterier med styrbar utspänning* (3.3(8) MSEK, PI) MISTRA (MI23 19.03)

2021 – 2023 *Less environmentally unfriendly and more performant next generation electric powertrains: Part II. Powertrain control and optimization for performance assessment.* (0.6 MSEK) Area of Advance Sustainable Vehicle Technology, Chalmers.

2020 – 2023 *Värmesäkerhetshantering för fordonets batterisystem.* Sweden-China collaboration project funded by Vinnova (5.7 MSEK, PI).

2021 – 2024 *Fiber optic sensing for in-situ evaluation of lithium ion battery cells.* BASE-funding from Vinnova (0.4MSEK, PI).

2021 – 2023 *Produktionsstyrning och ljusoptimering i växthus.* Postdoc funding from Vinnova (1.75MSEK, PI).

Teaching Experience

Courses for academia

- *Linear Control System Design* (MSc level, 2018-): Lecturer and examiner
- *Digital and Multivariable Control* (MSc level, 2007-2010): Lecturer and examiner.
- *Nonlinear and Adaptive Control* (MSc level, 2011-2012, 2017-2020): Lecturer and examiner.
- *Process control and Measurement Techniques for Chemical Engineers* (BSc level, 2004, 2007-2012 and 2016 - 2022): Lecturer and examiner.
- *Process Control for Chemical and Biochemical Engineers* (BSc level, 2001-2004): Lecturer and examiner.
- *Process Control for Chemical Engineers* (BSc level, 2013-2015): Lecturer and examiner.
- *Nonlinear Dynamical Systems* (PhD level, bi-yearly since 2015): Lecturer and examiner.
- *Recirculating Aquaculture Systems – Technical aspects*: Lecturer in PhD course in *Innovative systems for sustainable marine aquaculture* administrated by Åsa Strand at Göteborg University at Tjärnö Laboratories, 2015.
- *Multivariable Process Control* (MSc level, 1999-2000). Lecturer and examiner.
- *Advanced wastewater treatment* (PhD level, 2000). Separate invited lectures for the Department of Sanitary Engineering, Chalmers.
- *Control Issues in the Biochemistry* (PhD/MSc level, 2000). Separate invited lectures for the Department of Chemical Reaction Engineering, Chalmers.
- 1993 – 1999 exercise demonstrations and laboratory assistance in *Control Engineering* for all the engineering schools at Chalmers, *Process Control*, and *Multivariable Control* (In total approximately 350 hours annually of teaching and administration).

Courses for Industry

- *Process Control* (2010). 2-day course for members of the Centre for Chemical Process Engineering (CPE): Development, lecturing and administration.
- *Kalman filters* (2010). 1-day course for Minesto AB: Development, lecturing and administration.
- *Dynamic systems and automatic control* (2012). 6-day course for Volvo Cars: Development and lecturing.
- *Control engineering and optimization* (2019). 2-day course for Centre for Chemical Process Engineering (CPE): Development, lecturing and administration

Supervision

Graduated PhD students

- Carl-Magnus Fransson (co), PhD thesis: *Optimization methods for robust control*, 2003.
- Veronica Olesen (co), PhD thesis *Model Reduction for Control of Tank Reactor Processes*, 2007.
- Per Rutquist (main), PhD thesis *Methods for Stochastic Optimal Control under State Constraints*, 2017.
- Marcus Hedegärd (main). PhD thesis *Estimation of torque in heavy duty vehicles with focus on sensor hysteresis*. 2017.
- Anton Klintberg (main). Lic thesis *On state and parameter estimation for aged battery cells*, 2018.

- Simon Pedersen (main). Lic thesis *Simulation and Optimization of Recirculating Aquaculture Systems*, 2018.
- Björn Fridholm (main). *Adaptive model-based battery management.* 2019.
- Fredrik Bengtsson (main). PhD thesis *Development and evaluation of methods for control and modelling of multiple-input multiple-output systems.* 2020.
- Linnea Ahlman, Chalmers (main). PhD thesis *Chlorophyll fluorescence as a biological feedback signal -for optimized plant growth conditions and stress diagnosis*. 2021.

Current PhD students

- Godwin Peprah (Co). *Temperature control of battery packs.*
- Yao Cai (main). *More efficient and health-conscious usage of lithium-ion batteries by adaptive modelling*
- Albert Skegro (main). *Dynamic reconfiguration of battery cells.*
- Yizhou Zhang (Co). *Data-driven battery ageing prediction.*
- Huang Zhang (Co). *Classification and Optimal Management of 2nd life xEV Batteries.*
- Viktor Lindström (main, 50%). *Autonomous water jet ski.*

Supervision and examination of 1 BSc thesis project and 4-8 MSc thesis projects annually.

Hosted postdocs

- Changfu Zou (2017-2019).
- Weiji Han (2018-2021)
- Guangzhong Dong (2018-2020)
- Yicun Huang (2021-2022)
- Xiaolei Bian (2022-2023)

Scientific evaluations

- Opponent Allyne Machado dos Santos, NTNU, Oct 2022.
- PhD grading committee for Taouba Jouini, LTH, Jan 2022.
- Evaluation for Full Professor at Technion – Israel Institute of Technology (Raphael Linker), 2021.
- Evaluation for Full Professor at University of Oxford (David Howey), 2021.
- PhD grading committee for Oscar Samuelsson, Uppsala University, Feb 2021
- PhD grading committee for Mikael Yamanee-Nolin, LTH, May 2020.
- PhD grading committee for Sergii Voronov, Linköping University, Mar 2020.
- PhD Defence committee for Henrik Beelen, Eindhoven University of Technology, Sep 2019.
- PhD Jury for Yi Li, Vrije Universiteit, Brussel, July/Sep 2019.
- PhD grading committee for Tatiana Chistiakova, Uppsala University, April 2018.
- Opponent (PhD), Ali Khaki-Sedigh, Luleå University of Technology, April 2018.
- PhD grading committee for Josefin Berner, LTH, Nov. 2017.
- PhD grading committee for Olle Trollberg, KTH, Sep. 2017.

- Opponent (PhD). *Design of low-order controllers using optimization techniques* by Martin Hast, LTH, June 2015.
- Associate Editor *Control Engineering Practise*, 2015-2018.
- Opponent (Lic). *On solution multiplicity and convergence rate in extremum seeking control* by Olle Trollberg, KTH, December 2014.
- PhD grading committee for Egi Hidayat, Uppsala University, Mars. 2014. Title: *On identification of biological systems.*
- PhD grading committee for Miguel Castano Arranz, Luleå University of Technology, Nov. 2012. Title: *Practical tools for the configuration of control structures.*
- PhD grading committee for Almir Heralic, Department of Signals and Systems, Chalmers University of Technology (University West, Trollhättan). March 2012. Title: *Monitoring and Control of Robotized Laser Metal-Wire Deposition.*
- PhD grading committee for Soheil Salehpours, Luleå University of Technology, Sep. 2009. Title: *Applied estimation of piecewise constant parameters.*
- Reviewer of Volvo Cars PhD program 2008.
- Opponent (Lic), *Interaction analysis and control of bioreactors for nitrogen removal*, by Björn Halvarsson, Uppsala University, December 2007.
- Reviewer for *Applied Energy, Aquacultural Engineering, Aquaculture, Automatica, Control Engineering Practice, IEEE Control Systems Technology, International Journal of Control, Journal of Energy Storage, Water Research, Water Science and Technology, etc.* and miscellaneous conferences in control engineering and wastewater treatment.
- Session Editor for *Modeling Systems Biology from the point of view of Discrete and Hybrid Systems* for WODES (9th International Workshop on Discrete Event Systems) 2008.
- Opponent (Lic), *Modelling and control of acitvated sludge processes with nitrogen removal*, by Per Samuelsson, Uppsala University, September 2001.

Committee memberships

- Member of the council of Sustainable Vehicle Technology, AoA Chalmers (2018-).
- Member of the *Nordic Process Control Workshop* Committee (2014-).
- Member of the department council (2009-2013).
- Member of the board for *Centre for Chemical Process Engineering* (CPE) (2009-2020).
- Additional member of the *Nordic Process Control Workshop* Committee (1998 and 2000).
- Swedens representative in the board for the *Nordic Network on Recirculating Aquaculture Systems* (www.NordicRAS.net) (since 2010).

Administration

2017 - Head of the Automatic Control research group at Chalmers, currently 8 professors, 6 postdocs and 19 PhD students (of which 6 in the industry).

2014 - 2017 Vice head of the department (Signals and systems). Responsible for the doctoral programme at the department (approximately 80 PhD-students).

2008 - 2014 Representative of gender equality (jämställdhetsombud) at the department.

2000 - 2004 Responsible for the planning of the teaching carried out by the PhD students at the division (appr. 14 courses, 900 students, 16 PhD-students doing appr. 3800 h of teaching and preparations).

External commissions (selected)

2010 Construction of a simulator and a control system for classroom lighting for Lumen Radio AB, Göteborg.

2005 - 2007 Responsible for the setup of a control system for a new experimental one-cylinder diesel engine test cell (approximately 30 controllers and 150 I/O) at Volvo Technology, Göteborg.

2006 - 2007 Leader for the modelling, control and control system development and implementation of a combined APU diesel reformer hydrogen power cell (5 pumps, 5 catalytic reactors, fuel cell, 2 burners, 8 heat exchangers and 1 vaporizer) at Volvo Technology (now PowerCell).

2001 – 2002 Development of the dynamic simulator FISHSIM (C, Matlab, and Simulink) for recirculating aquaculture systems combining fish growth and gastric evacuation modelling with biological water treatment modelling.

2004 Design, specification and project leader for the implementation of a PLC- and a SCADA-system for a recirculating aquaculture system in Kungälv (Greenfish AB).

2003 Design of a recirculating aquaculture system for 100 tons production of *Pangasius* and *Clarias* (Hajmal och Ålmal) per year. This work led to a patent and the start of a company, Greenfish AB, which built an indoor pilot plant producing 20 tons/year of exotic fish and have had 5 employees and a total investment exceeding 10 MSEK. Greenfish no longer exist as a company but the farming concept has been inherited by at least two later companies.

2003 Development of a simulation program for molten metal dispensing for LMI Selcom (Partille).

Awards

- Receiver of Volvo Cars Technology Award 2017 for best research (Adaptive battery control).
- Best paper award, *2nd IWA International Conference on Instrumentation, Control and Automation*, Busan, Korea, 2005.
- GRYAAB Award for important scientific contributions in the field of wastewater treatment (5 times between 2003 and 2012)
- Adlebertska scholarship foundation award for excellent study results (1990)

Publications

Peer Reviewed Journal Articles

1. Bengtsson, F. and Wik, T. (in press). Stochastic optimal control over unreliable communication links. *Automatica.*
2. Zhang, Y., Wik, T., Bergström, J., Pecht, M. and Zou, C. (2022). A machine learning-based framework for online prediction of battery ageing trajectory and lifetime using histogram data. Journal of Power Sources, 526: 231110. Doi: 10.1016/j.jpowsour.2022.231110.
3. Han, W., Altaf, F., Zou, C. and Wik, T. (2022). State of power prediction for battery systems with parallel-connected units. *IEEE Transactions on transportation electrification,* 8(1): 925-935.

4. Han, W., Kersten, A., Zou, C., Wik, T., Huang, X. and Dong, G. (2022). Analysis and estimation of the maximum switch current during battery system reconfiguration. *IEEE Transactions on Industrial Electronics*. 666 5931-5941. doi: 10.1109/TIE.2021.3091923.

5. Han, W., Altaf, F., Wik, T. and Zou, C. (2022). Sensitivity Analysis of the Battery System State of Power. *IEEE Transactions on transportation electrification,* 8(1): 976-989. https://10.1109/TTE.2021.3116658

6. Ahlman, L., Bånkestad, D., Khalil, S., Bergstrand, K.J., Wik, T. (2021). Stress detection using proximal sensing of chlorophyll fluorescence on canopy level. *AgriEngineering* 3:648-668.

7. She, C., Li, Y., Zou, C., Wik, T., Wang, Z. and Sun, F. (2021). Offline and online blended machine learning for lithium-ion battery health state estimation. *IEEE Transactions on Transportation Electrification*. https://10.1109/TTE.2021.3129479

8. Han, W., Altaf, F., Wik, T. and Zou, C. (2022). Sensitivity Analysis of the Battery System State of Power. *IEEE Transactions on transportation electrification,* 8(1): 976-989.

9. Bengtsson F. and Wik, T. (2021). Finding feedforward configurations using gramian based interaction measures. *Modeling, Identification and Control*, 42(1):27-35.

10. Li, Y., Wik, T., Xie, C., Huang, Y., Xiong, B., Tang, J. and Zou, C. (2021). Control-oriented modeling of all-solid-state batteries using physics-based equivalent circuits. *IEEE transactions on Transportation Electrification*. https://10.1109/TTE.2021.3131147

11. Li, Y., Vilathgamuwa, M., Wikner, E., Wei, Z., Zhang, X., Thiringer, T., Wik, T. and Zou, C. (2021). Electrochemical model-based fast charging: Physical constraint-triggered PI Control. *IEEE transactions on energy conversion,* 36(4): 3208-3220. https:// 10.1109/TEC.2021.3065983

12. Razi, M., Murgovski, N., McKelvey, T. and Wik, T. (2021). Design and comparative analyses of optimal feedback controllers for hybrid electric vehicles. *IEEE Transactions on Vehicular Technology*, 70(4):2979-2993.

13. Razi, M., Murgovski, N., McKelvey, T. and Wik, T. (2021). Predictive energy management of hybrid electric vehicles via multi-layer control. *IEEE Transactions on Vehicular Technology*, 70(7): 6485 – 6499.

14. Bengtsson, F., Wik, T. and Svensson, E. (2020). Resolving issues of scaling for gramian based input-output pairing methods. *International Journal of Control,* 95(3):679-691.

15. Han, W., Zou, C., Dong, G., Kersten, A. and Wik, T. (2020). Next generation battery management systems: Dynamic reconfiguration. *IEEE Industrial Electronics Magazine*.

16. Bengtsson, F., Karlström, A. and T. Wik (2020). Modeling of tensile index using uncertain data sets. *Nordic Pulp & Paper Research Journal,* https://doi.org/10.1515/npprj-2019-0089

17. Pedersen, S. and Wik, T. (2020). A comparison of topologies in recirculating aquaculture systems using simulation and optimization. *Aquacultural Engineering,* 89,102059

18. Tang, X., Zou, C., Wik, T, Yao, K., Xia, Y., Wang, Y.m Yang, D. and Gaoa, F. (2020). Run-to-Run Control for Active Balancing of Lithium Iron Phosphate Battery Packs. *IEEE Transactions on Power Electronics*, 35(2): 1499-1512.

19. Han, W., Zou, C., Zhang, L., Ouyang, Q. and T. Wik. (2019). Near-fastest battery balancing by cell/module reconfiguration. IEEE Transactions on Smart Grid, 10(6):6954-6964.

20. Wikander, L., Fridholm, B., Gros, S. and Wik, T. (2019). Ideal benefits of exceeding fixed voltage limits on lithium-ion batteries with increasing cycle age. *Journal of Power Sources*, 441, 227179.

21. Ahlman, L., Bånkestad, D. and Wik, T. (2019). Relation between Changes in Photosynthetic Rate and Changes in Canopy Level Chlorophyll Fluorescence Generated by Light Excitation of Different Led Colours in Various Background Light. *Remote Sensing*, 11(4).

22. Klintberg, A., Fridholm, B. and Wik, T. (2019). Kalman filter for adaptive learning of 2-D look-up tables applied to OCV-curves for aged battery cells. *Control Engineering Practice*, 84:230-237.

23. Tang, X., Gaoa, F., Zou, C., Yaoa, K., Hub, W. and Wik, T. (2019). Load-responsive model switching estimation for state of charge of lithium-ion batteries. *Applied Energy*, 238: 423-434.

24. Zou, C., Klintberg, A., Wei, Z., Fridholm, B., Wik, T. and Egardt, B. (2018). Power capability prediction for lithium-ion batteries using economic nonlinear model predictive control. *Journal of Power Sources*, Vol 396:580-589.

25. Liu K., Zou, C., Li, K. and Wik, T. (2018). Charging Pattern Optimization for Lithium-Ion Batteries with An Electrothermal-Aging Model. *IEEE Transactions on Industrial Informatics*, Vol 14(12):5463-5474.

26. Zou, C., Zhang, L., Hu, X., Wang, Z., Wik, T., Pechtd, M. (2018). A review of fractional-order techniques applied to electrochemical energy storage systems. *Journal of Power Sources,* 390, 286-296.

27. Fridholm, B., Wik, T., Kuusisto, H. and Klintberg, A. (2018). Estimating power capability of aged lithium-ion batteries in presence of communication delays. *Journal of Power Sources.* 383:24-33.

28. Zou, C., Hu, X., Zhongbao, W., Wik, T. and Egardt, B. (2018). Electrochemical Estimation and Control for Lithium-Ion Battery Health-Aware Fast Charging. *IEEE Transactions on Industrial Electronics.* 65(8), 6635-6645.

29. Hedegärd, M., Wik, T., Wallin, C. and Åsbogård, M. (2017). Adaptive hysteresis compensation using reduced memory sequences. *IEEE/ASME Transactions on Mechatronics.*Vol 22(5): 2296-2307.

30. Hedegärd, M., Wik, T., Fredriksson, K. and Engbom, J. (2017). Convex Identification of Minimal Function Bases for Cylinder Pressure by using Pressure Values as Basis Weights. *IEEE Transactions on Control Systems Technology.*

31. Ahlman, L., Bånkestad, D., and Wik, T. (2017). Using chlorophyll a fluorescence gains to optimize led light spectrum for short term photosynthesis. *Computers and Electronics in Agriculture.* Vol 142:224-234

32. Bånkestad, D., and Wik, T. (2016). Growth tracking by proximal remote sensing of chlorophyll fluorescence in a greenhouse environment. *Computers and Electronics in Agriculture.* Vol 128:77-86.

33. Carstensen, A-M., Pocock, T., Bånkestad, D. and Wik, T. (2016). Remote detection of light tolerance in Basil through frequency and transient analysis of light induced fluorescence. *Computers and Electronics in Agriculture.*Vol 127: 289-301.

34. Ahlman, L., Bånkestad, D., and Wik, T. (2016). LED Spectrum Optimisation using Steady-state Fluorescence gains. *Acta Horticulturae*, 1134:367-374.

35. Carstensen, A-M, Wik, T., Bånkestad, D. and Pocock, T. (2016). Exploring the dynamics of remotely detected fluorescence transients from Basil as a potential feedback for lighting control in greenhouses. *Acta Horticulturae*, 1134:375-383.

36. Fridholm, B., Wik, T. and M. Nilsson (2016). Kalman filter for adaptive learning of look-up tables with application to battery ohmic resistance estimation, *Control Engineering Practice*, 48:78-86,

37. Fridholm, B., Wik, T. and M. Nilsson (2016). Robust recursive impedance estimation for automotive lithium-ion batteries, *Journal of Power Sources*, 304:33-41.

38. Wik, T., Fridholm, B. and Kuusisto, H. (2016). Implementation and robustness of an analytically based battery state of power. *Journal of Power Sources*, 287:448-457.

39. Svensson, E., Wik, T. and Eriksson, K. (2015). Reasons to apply operability analysis in the design of integrated biorefineries. *Biofuels, Bioproducts & Biorefining.*

40. Hedegärd, M. and Wik, T. (2014). Non-parametric convex identification of extended generalized Prandtl.Ishlinskii models. *Automatica,* 50: 465-474.
41. Hedegärd, M. and T. Wik (2011). An online method for estimation of degradable substrate and biomass concentrations in an activated sludge. *Water Research*, 45(19) s. 6308-6320 (doi: 10.1016/j.watres.2011.09.003).
42. Fransson, C-M, Wik, T, Lennartson, B., Saunders, M. and Gutman, P-O (2009): Non-conservative robust control: Optimized and constrained sensitivity functions. *IEEE Transactions on Control Systems Technology*, 17(2): 298-308.
43. Wik, T., Linden, B. and Wramner, P. (2009). Integrated Dynamic Aquaculture and Wastewater Treatment Modelling for Recirculating Aquaculture Systems, *Aquaculture* 287: 361-370.
44. Olesen, V., Breitholtz, C. and T. Wik (2008). Closed loop model reduction applied to a tank reactor process. *Chemical Engineering Science*, 63:674-684.
45. Rutqvist P., Breitholtz, C. and T. Wik (2008). On the infinite-time solution to state-constrained stochastic optimal control problems. *Automatica.* 44(7):1800-1805.
46. Wik, T., Göransson, E., Breitholtz, C. (2006). Low model order approximations of continuously stirred biofilm reactors with monod kinetics. *Biochemical Engineering Journal*, 30(1): 16-25.
47. Wik, T (2004). Trickling Filters and biofilm reactor modelling. *Reviews in Environmental Science and Biotechnology* 2: 193-212.
48. Wik, T, D. Olsson, D. Lumley (2004). Model based control of external carbon dose rate in a full-scale predenitrification system. *Water Intelligence Online.* IWA Publishing (www.iwaponline.com).
49. Persson, F., T. Wik, F. Sörensson, M. Hermansson (2002). Distribution and activity of ammonia oxidizing bacteria in a large full-scale trickling filter . *Water Research*, 36(6): 1439-1448.
50. Wik, T. (2000). Strategies to improve the efficiency of tertiary nitrifying trickling filters. *Water Science and Technology*, 41(4):477-485.
51. Piskorz, J., P. Majerski, D. Radlein, T. Wik, D.S. Scott (1999). Recovery of carbon black from scrap rubber . *Energy and Fuels*, 13(3):544-551.
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