

Denise A. McKahn (McKay)

Assistant Professor, Smith College
353 Ford Hall, 100 Green St, Northampton, MA 01063

Degrees

Ph.D. in Civil and Environmental Engineering; University of Michigan, Ann Arbor MI; 2008

Dissertation: Stack Level Modeling and Validation of Low Temperature Fuel Cells and Systems for Active Water Management

M.S. in Mechanical Engineering; University of Michigan, Ann Arbor MI; 2005

Thesis: Modeling and Control of PEM Fuel Cell Stack Membrane Humidity

B.S. in Environmental Resources Engineering; Humboldt State University, Arcata CA; 2002

Thesis: Design and Construction of an Educational PEM Fuel Cell

Awards

- **Dr. Bernard S. Baker Student Award for Fuel Cell Research**, Fuel Cell Seminar and Exposition, award recognizes exceptional students in the pursuit of fuel cell research (2008)
- **Best Presentation**, International Federation of Automatic Control's American Controls Conference (2008, 2003)
- **Homer Arnold Award**, Humboldt State University, presented to one senior for outstanding work in applied engineering (2001)

Employment History

Smith College ~ Northampton, MA

Assistant Professor of Engineering (6/2008-present)

School for Renewable Energy Science, University of Iceland ~ Akureyri, Iceland

Invited Faculty Lecturer (7/2009, 7/2010)

Fuel Cell Control Laboratory, University of Michigan ~ Ann Arbor, MI

Graduate Student Research Assistant and Laboratory Manager (1/2003 – 5/2008)

Schatz Energy Research Center (SERC) ~ Arcata, CA

Research Engineer (7/1998 – 12/2002)

Publications

Refereed Journal Manuscripts

1. **McKay, D.A.**, Stefanopoulou, A.G., and Cook, J., *A Controllable Membrane-Type Humidifier for Fuel Cell Applications, PART B: controller design, analysis and implementation*, Journal of Fuel Cell Science and Technology, Vol. 8, 2011.
2. **McKay, D.A.**, Stefanopoulou, A.G., and Cook, J., *A Controllable Membrane-Type Humidifier for Fuel Cell Applications, PART A: operation, modeling and experimental validation*, Journal of Fuel Cell Science and Technology, Vol. 7, 2010.

3. Muller, E.A., Kolb, F., Stefanopoulou, A.G., **McKay, D.A.**, and Guzzella, L., *Correlating Nitrogen Accumulation with Temporal Fuel Cell Performance*. Journal of Fuel Cell Science and Technology, Vol. 6, 2009.
4. Siegel, J., **McKay, D.A.**, Stefanopoulou, A.G., Hussey, D., and Jacobson, D., *Measurement of Liquid Water Accumulation in a Proton Exchange Membrane Fuel Cell with Dead-Ended Anode*, Journal of the Electrochemical Society, Vol. 155, Issue 11, pp. B1168-B1178, 2008.
5. **McKay, D.A.**, Siegel, J., Ott, W., Stefanopoulou, A., *Parameterization and Prediction of Temporal Fuel Cell Voltage Behavior During Flooding and Drying Conditions*. Journal of Power Sources, Vol. 178, No. 1, 2008.
6. Ingimundarson, A., Stefanopoulou, A.G., **McKay, D.A.**, *Model Based Detection of Hydrogen Leaks in a Fuel Cell Stack*, IEEE Transactions on Control System Technology, Vol. 16, Issue 5, 2008.

Refereed Conference Papers

1. **McKahn, D.A.** and Zhao, X, *Channel Dimension Constraints for Miniature Low Humidity PEM Fuel Cells*, Proceedings of the ASME 10th International Conference on Fuel Cell Science, Engineering and Technology, ESFuelCell2012-91504, July 2012. [under review]
1. **McKahn, D.A.** and McMackin, W, *Characterizing Performance of a PEM Fuel Cell for a CMET Balloon*, Proceedings of the ASME 9th International Conference on Fuel Cell Science, Engineering and Technology, ESFuelCell2011-54532, August 2011.
2. Grover-Silva, E., **McKahn, D.A.**, and Weisbord, D., *Campus Assessment of Building Thermal Energy Losses - Informing the Climate Action Plan*. ASME Proceedings of the International Mechanical Engineering Congress, IMECE2010-39156, 2010.
3. **McKay, D.A.**, Stefanopoulou, A.G., Cook, J., *Model and Experimental Validation of a Controllable Membrane-Type Humidifier for Fuel Cell Applications*, IEEE Proceedings of 2008 American Control Conference, 2008. (invited paper)
4. **McKay, D.A.**, Stefanopoulou, A.G., Cook, J., *A Membrane-Type Humidifier for Fuel Cell Applications: Controller design, analysis and implementation*, Proceedings of the ASME 6th International Conference on Fuel Cell Science, Engineering and Technology, FUELCELL2008-65257, June 2008.
5. Siegel, J., **McKay, D.A.**, Stefanopoulou, A.G., *Modeling and Visualization of Fuel Cell Water Dynamics using Neutron Imaging*, IEEE Proceedings of 2008 American Control Conference, 2008.
6. Siegel, J., **McKay, D.A.**, Stefanopoulou, A.G., *Measurement of Liquid Water Accumulation in a Proton Exchange Membrane Fuel Cell with Dead-Ended Anode*, Proceedings of the ASME 6th International Conference on Fuel Cell Science, Engineering and Technology, FUELCELL2008-65053, June 2008.
7. Schilter, A., **McKay, D.A.**, Stefanopoulou, A.G., *Parameterization of fuel cell stack voltage: issues on sensitivity, cell to cell variation, and transient response*. Proceedings of the ASME 4th International Conference on Fuel Cell Science, Engineering and Technology, FUELCELL2006-97177, June 2006.
8. Ingimundarson, A., Stefanopoulou, A.G., **McKay, D.A.**, *Model Based Detection of Hydrogen Leaks in a Fuel Cell Stack*, 44TH IEEE Conference on Decision and Control, 2005 and 2005 European Control Conference, Issue 2006-01-30, 2005.
9. **McKay, D.A.**, Ott, W., Stefanopoulou, A.G., *Modeling, Parameter Identification, and Validation of Reactant and Water Dynamics for a Fuel Cell Stack*. ASME Proceedings of the International Mechanical Engineering Congress, IMECE2005-81484, 2005.

10. **McKay, D.A.**, Stefanopoulou, A.G., *Parameterization and Validation of a Lumped Parameter Diffusion Model for Fuel Cell Stack Membrane Humidity Estimation*. IEEE Proceedings of 2004 American Control Conference, 2004. (invited paper)

Non-refereed Conference Papers

1. **McKay, D.A.**, and Grover-Silva E., *The Design, Fabrication and Testing of PEM Fuel Cells in an Undergraduate Course*. Fuel Cell Seminar and Exposition, 2009.
2. **McKay, D.A.**, and Stefanopoulou, A.G., *Real-Time Control of PEM Fuel Cell Reactant Humidity*. Fuel Cell Seminar and Exposition, 2006.
3. **McKay, D.A.**, Ott, W., and Stefanopoulou, A.G., *Reactant and water dynamics during flooding: a low order calibrated PEM fuel cell stack model*. Fuel Cell Seminar and Exposition, 2005.
4. **McKay, D.A.**, Stefanopoulou, A.G., *Modeling and Validation of a Real-Time Estimator for Fuel Cell Membrane Humidity*. Fuel Cell Seminar and Exposition, 2004.
5. Lehman, Chamberlin, Chapman, Coleman, Engel, **McKay**, Marshall, Reis, Zoellick. *Field Testing of a PEM Fuel Cell in an Integrated Power System*. Fuel Cell Seminar and Exposition, 2002.
6. **McKay, D.A.**, and Marshall, M., *Automated Control and Monitoring of a Solar Hydrogen Energy System*. Best Applications of Measurement and Automation Paper Contest, NI Week 2002, National Instruments Conference on Test and Measurement, 2002.

Technical Reports

1. Weisbord, D. Fuller, C., Smith, L.D., and **McKay, D.** Sustainability and Climate Action Management Plan, Smith College, 2010.

Teaching Experience

Thermodynamics I

University of Michigan, Teaching Assistant (W06)
Humboldt State University, Laboratory Design (S01)

Renewable Energy Power Systems

Humboldt State University, Invited Lecturer (F02)
Humboldt State University, Laboratory Instructor (S02, F01)
Humboldt State University, Laboratory Curriculum Development (S01)

Photovoltaic and Fuel Cell System Design

Smith College, Instructor (F08, F09, F10)

Engineering Senior Design Clinic

Smith College, Faculty Technical Coach (AY08-09 and 09-10)

Mass and Energy Balances

Smith College, Instructor (S09, S10, S11)

Engineering for Everyone

Smith College, Instructor (F10)

Fuel Cell Systems and Technologies

Univ. of Iceland, Graduate School of Renewable Energy Science, Invited Faculty Lecturer, (Sum 09 and 10)

Scholarly Lectures and Professional Presentations

To Tear Down or Retrofit – Reducing Building Energy Footprint without Data, Annual Conference of the Association for the Advancement of Sustainability in Higher Education, Denver, CO, October 12, 2010.

Neutron Radiography Studies of PEM Fuel Cell Dynamics, American Society of Materials International Education Symposium on Advanced Characterization Methods: Understanding the Structure and Functionality of Materials, Oak Ridge, TN, April 20, 2010.

Dynamic Modeling of Membrane Based Systems - Informing Active Water Management, Civil and Environmental Department Seminar Series, University of Massachusetts - Amherst, MA, March 6, 2009.

Dynamical Analysis of Renewable Energy Technologies, Renewable Energy Research Laboratory, University of Massachusetts - Amherst, MA, December 2, 2008.

Fuel Cell Reactant Pre-Treatment and Active Water Management Strategies, Ford Motor Company, Fuel Cell Center, Dearborn MI, October 21, 2008.

Control-Oriented Modeling of Dynamical Fuel Cell and Gas Humidification Systems, Schatz Energy Research Center, Arcata CA, August 14, 2008.

A Controllable Membrane Based Gas Humidifier for Active Fuel Cell Water Management, Fundamentals and Latest Developments in Automotive Control, Applied Technology Control Consortium, Dearborn Michigan, April 1, 2008.

Towards Sustainability: Building Renaissance Engineers, Seminar Series in Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, March 20, 2008.

Parameterization of Fuel Cell Dynamics Using Stack Level Measurements, Annual Automotive Research Center Conference, Ann Arbor MI, May 16 2007 and Automotive Research Center Thrust Area 1 Technical Presentation, Ann Arbor MI, Nov 28, 2007.

Sensing Sensitive Stuff – A Review of Data Acquisition and Signal Conditioning/Filtering, Workshop to College of Engineering graduate students and faculty, University of Michigan, Ann Arbor, June 30, 2006.

Modeling and Identification of a Membrane Humidifier for Dynamic Fuel Cell Power and Fuel Processing, Annual Automotive Research Center Conference, Ann Arbor MI, May 24, 2006 and Automotive Research Center Thrust Area 1 Technical Presentation, Ann Arbor MI, Aug 31, 2006.

Control of Fuel Cell Power Systems, Automotive Research Center Collaborative Research Seminar on Progress Towards Integrated Vehicle System, Driver and Environment Modeling, Simulation and Control, Ann Arbor MI, March 23, 2006.

Fuel Cell Technology Research Topics, University Undergraduate Outreach Program Research Seminar, University of Michigan, Ann Arbor, Feb 15, 2006.

Combined Heat-Power PEM Fuel Cell Systems: A Membrane Gas Humidifier, Automotive Research Center Thrust Area 1 Technical Presentation, Feb 14, 2006.

Modeling and Control of PEM Fuel Cell Stack Membrane Humidity, Seminar Series in Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, January 26, 2006.

Overview of Fuel Cell Research at the University of Michigan, Schatz Energy Research Center, Arcata CA, July 25, 2005.

Fuel Cell Stack Membrane Humidity: Modeling and Experimental Validation, Annual Automotive Research Center Conference, Ann Arbor MI, May 19th 2003.

Other Professional Activities

- **Conference Track Chair/Organizer**
American Society of Mechanical Engineers Conference on Fuel Cell Science and Technology
Modeling, Design, and Optimization for Low Temperature Fuel Cells – Track 2-5 (2011)
- **Conference Session Chair/Organizer**
American Society of Mechanical Engineers Conference on Fuel Cell Science and Technology
PEFC Systems, Controls and Operation Session (2009)
Optimal Design and Fabrication of PEM Fuel Cell and Components Session (2010)
Special Topics Session and Durability and Performance Session (2011)
- **Conference Session Moderator**
International Federation for Automatic Control, American Control Conference (2008)
American Society of Mechanical Engineers, Conference on Fuel Cell Science and Technology (2008)
- **Associate Editor**
American Society of Mechanical Engineers, Dynamic Systems and Control Division Newsletter (2010-2011)
- **Editor**
American Society of Mechanical Engineers, Dynamic Systems and Control Division Newsletter (2011-2012)
- **Reviewer**
American Society of Mechanical Engineers
Conference on Fuel Cell Science and Technology
International Association for Hydrogen Energy:
International Journal of Hydrogen Energy
International Society of Electrochemistry:
Electrochimica Acta
European Union Control Association:
European Control Conference
IEEE Control Systems Society:
International Conference on Control Applications
International Conference on Control and Automation
International Federation of Automatic Control:
Control Engineering Practice
American Control Conference
- **Advisory Board**
Engineer of the Future, Unleashing Student Engagement in and for the Transformation of Engineering Education, 2010.
- **Consultant**
Occupational Safety and Environmental Health Staff along with Facilities Manager on the safety design, installation and operation of fuel cell and hydrogen test equipment, reviewed schematics, University of Michigan, Ann Arbor, (2003-2008)
- **M.S. Thesis and Ph.D. Dissertation Committees**
M.S. in Renewable Energy Science, School for Renewable Energy Science, Iceland
1. Advisor to Daniel Chade, “Mass Dynamics and Voltage Predictions for High Temperature Proton Exchange Membrane Fuel Cell Stacks”, 2010.

Professional Memberships

- Electrochemical Society
- American Society of Mechanical Engineers – Dynamic Systems and Controls Division
- Sigma Xi
- American Society of Engineering Education
- Institute of Electrical and Electronics Engineers – Control Systems Society