Dr. Michael Edward Walker

Instructor – Environmental Engineering, Mechanical Engineering
Director – Energy Engineering Minor Program
University of Colorado – College of Engineering and Applied Science
Department of Mechanical Engineering
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Education:

- Doctor of Philosophy in Chemical Engineering
  - Illinois Institute of Technology – Chicago, 2006-2012

- Bachelor of Science in Chemistry, Mathematics Minor
  - University of Illinois at Urbana-Champaign, 2000-2004

Academic Appointments:

- Director – Energy Engineering Minor Program
  - University of Colorado – Boulder, August 2017-present
    - Responsible for curriculum development, hiring lecturers and advising students

- Instructor – Environmental Engineering, Mechanical Engineering
  - University of Colorado – Boulder, August 2014-present
  - Instructor rating average: 5.6/6.0 (based on student course evaluations)
    - MCEN Sustainable Energy (2 semesters)
    - MCEN Thermodynamics II (9 semesters)
    - EVEN Senior Design (4 semesters)
    - ENEN Interdisciplinary Energy Engineering Projects (1 semester)
    - EVEN Process Modeling (2 semesters)
    - First-Year Engineering Projects (4 semesters)

- Postdoctoral Fellow – Chemical and Biological Engineering
  - Northwestern University – Evanston, July 2012-August 2014
  - Energy and Resource Systems Analysis Laboratory (ERSAL)
    - Worked with California EPA to improve the application of carbon cap-and-trade to the food production industry
    - Developed models and methodologies to estimate the consumption of water and energy in complex industrial systems

Industrial Experience:

- United States Gypsum Corporation September 2005-August 2006
  - Member of Technical Staff - level 1 professional in the Engineering Gypsum Board Lab

- United States Gypsum Corporation – On Assignment Lab Support January 2005-September 2005
  - Laboratory Assistant in the Engineering Gypsum Board lab

Thesis:

- Thermoelectric Power Systems and the Energy-Water Nexus
  - This thesis focuses on the development of a computer-based tool to evaluate the total cost of using degraded water sources in the recirculating cooling loops of thermoelectric power plants. This includes supply, transport, and treatment costs, as well as those that arise from condenser tube fouling. The analyses performed in this thesis indicate that the use of treated municipal wastewater to replace freshwater for cooling is not economically viable under current water cost conditions. However, it was shown that economics of using municipal wastewater is at a breakeven point with the use of freshwater when the price differential of degraded water to freshwater is 0.53 $/1000 Gal. Furthermore, the results indicate that the use of treated municipal wastewater for cooling will be five times more cost effective than the use of dry air cooling technology (DACT).

- In addition, this thesis presents a coal conversion process concept, the Dry Gasification Oxy-Combustion (DGOC) power production cycle. This process is estimated to achieve carbon capture and sequestration goals at a higher efficiency than leading alternative production technologies fitted for the same purpose, with a reduced water usage rate compared to conventional combustion and oxy-combustion.

Publications:

- Briam, R.B.; Walker, M.E.; Masanet, E. (2015). A Comparison of Product-based Energy Intensity Metrics for Cheese and Whey Processing. *Journal of Food Engineering*, *151*, 25-33.

- Walker, M.E.; Arnold, C.S.; Lettieri, D.J.; Hutchins, M.J.; Masanet, E. (2014). Energy Intensity Comparisons of Concentrated Food Products. *Environmental Science & Technology*, *48(20)*, 12370-12377.

- Walker, M.E.; Lv, Z.; Masanet, E. (2013). Industrial Steam Systems and the Energy-Water Nexus. *Environmental Science & Technology*, *47(22)*, 13060-13067.

- Masanet, E.; Walker, M.E. (2013). Energy-Water Efficiency and U.S. Industrial Steam. *AIChE Journal (Cover Article)*, *59*(7), 2268-2274.

- Walker, M.E.; Theregowda, R.B.; Safari, I.; Hsieh, M.K.; Abbasian, J.; Arastoopour, H.; Dzombak, D.A.; Miller, D.C. (2013). Utilization of Municipal Wastewater for Cooling in Thermoelectric Power Plants: Evaluation of the Combined Cost of Makeup Water Treatment and Increased Condenser Fouling. *Energy*, *60*, 139-147.

- Safari, I.; Walker, M.E.; Abbasian, J.; Hsieh, M.K.; Theregowda, R.B.; Dzombak, D.A.; Miller, D.C. (2013). Utilization of Municipal Wastewater for Cooling in Thermoelectric Power Plants. *Fuel*, *111*, 103-113.

- Safari, I; Hsieh, M.K.; Chien, S.H.; Walker, M.E.; Dzombak, D.A.; Vidic, R.; Abbasian, J. (2013). Effect of CO_2 Stripping on pH in Open-Recirculating Cooling Water Systems. *Environmental Progress & Sustainable Energy*. http://dx.doi.org/10.1002/ep.11769

- Theregowda, R.B; Hsieh, M.K.; Walker, M.E.; Safari, I.; Landis, A.E.; Abbasian, J.; Vidic, R.; Dzombak, D.A. (2013). Life Cycle Costing for Treating Secondary Municipal Wastewater for Reuse in Cooling Systems. *Journal of Water Reuse and Desalination*. http://dx.doi.org/10.2166/wrd.2013.078

- Walker, M.E.; Safari, I.; Theregowda, R.B.; Hsieh, M.K.; Abbasian, J.; Arastoopour, H.; Dzombak, D.A.; Miller, D.C. (2012). Economic Impact of Condenser Fouling in Existing Thermoelectric Power Plants. *Energy*, *44*, 429-437.

- Hsieh, M.K.; Walker, M.E.; Safari, I.; Chien, S.H.; Abbasian, J.; Vidic, R.; Dzombak, D.A. (2012). Ammonia Stripping in Open-Recirculating Cooling Water Systems. *Environmental Progress & Sustainable Energy*, *32*(3), 489-495.

- Walker, M.E.; Abbasian, J.; Chmielewski, D.J.; Castaldi, M.J. (2011). Dry Gasification Oxy-Combustion Power Cycle. *Energy & Fuels*, *25*, 2258-2266

Technical Reports:

- Walker, M.E., Lettieri, D.J., Romanin, V., Hutchins, M.J., Jaquez, M., Blinde, P., Dornfeld, D., and Masanet, E. (2013). Establish GHG Emissions Efficiency Benchmarks for Covered Industrial Sectors. Prepared for the California Air Resources Board and the California Environmental Protection Agency by Northwestern University, University of California, Berkeley, and Ecofys. June 30, 2013.

Selected Presentations:

- Grand Challenges Facing the Implementation of Carbon Cap-and-Trade Policy for Complex Manufacturing Industries
    - Food & Beverage Environmental Conference: Napa, California – March 2014

- Industrial Boiler Systems and the Energy-Water Nexus
    - AIChE Annual Meeting: San Francisco, California – November 2013

- Economic Evaluation of Freshwater Conservation Strategies for Thermoelectric Power Plants
    - AIChE Annual Meeting: San Francisco, California – November 2013

- Development of Product-Based Energy Intensity Metrics for the California Food Industry
    - AIChE Annual Meeting: San Francisco, California – November 2013
    - Carbon Management Technology Conference: Alexandria, Virginia – October 2013

- Analysis of Freshwater Usage in Advanced Gasification Based Power Systems
    - AIChE National Meeting: Chicago, Illinois – March 2011

- The Dry Gasification Oxy-Combustion Power Cycle
    - AIChE National Meeting: Chicago, Illinois – March 2011
    - AIChE Annual Meeting: Salt Lake City, Utah – November 2010

- Utilization of Municipal Wastewater in Thermoelectric Power Production for FW Minimization
    - AIChE Annual Meeting: Salt Lake City, Utah – November 2010

Selected Professional Service:

- University Service: University of Colorado – Boulder
    - Civil engineering computing committee (August 2016 – present)
    - Environmental engineering curriculum committee (January 2015 – present)
    - Energy engineering minor committee (January 2015 – present)
    - Undergraduate research supervisor (Spring 2017 & Summer 2017)

- Postdoctoral research supervisor: Northwestern University
    - 5 M.S. students
    - 5 Undergraduate Students

- Professional society programming service
    - Co-Chair – Environmental Division: Legislation and Regulation Programming Area
        - AIChE Annual and National Conferences: December 2014 – October 2016
    - 2nd Vice Chair – Environmental Engineering Programming Area
        - AIChE Midwest Regional Conference: Chicago, Illinois – March 2015
    - Chair – Energy, Sustainability and the Environment Session
        - AIChE Midwest Regional Conference: Chicago, Illinois – March 2014

- Referee for peer reviewed journals
    - *Chemical Engineering Research & Design*
    - *Desalination & Water Treatment*
    - *Energies*
    - *Energy*
    - *Energy Efficiency*
    - *Energy & Fuels*
    - *Environmental Science & Technology*

- *Environmental Studies & Sciences*
- *Fuel*
- *IEEE Access*
- *International Journal of Greenhouse Gas Control*
- *International Journal of Heat and Mass Transfer*
- *International Journal of Thermal Sciences*
- *Process Safety & Environmental Protection*
- *Resources, Conservation & Recycling*
- *Scientific Research & Essays*
- *Water Science & Technology*

Awards & Honors:

- Environmental Engineering Faculty Appreciation Award – 2019
  - University of Colorado – Boulder, Environmental Engineering Program
- John and Mercedes Peebles Innovation in Education Award – 2017
  - University of Colorado – Boulder, College of Engineering and Applied Science
- Marinus Smith Award – University of Colorado – Boulder 2017
- Big Dog Award – Food & Beverage Environmental Conference 2014
- ARCS Scholarship Award 2011
- ARCS Scholarship Award 2010
- ChBE Departmental Excellence in Teaching Award (TA of the Year) 2010
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- ChBE Departmental Excellence in Teaching Award (TA of the Year) 2008