Max Joseph Krause, PhD

Environmental Engineer
(352) 792-4748

Areas of Interest: sustainable materials management; landfill design; landfill gas modeling; anaerobic digestion; hazardous waste; subsurface heating events; life-cycle assessment; marine debris

EDUCATION

PhD, Environmental Engineering — August 9, 2016
University of Florida, Gainesville, FL
Dissertation: Biochemical and Physical Characteristics of Municipal Solid Waste

ME, Environmental Engineering — May 7, 2013
University of Florida, Gainesville, FL

BS, Environmental Engineering — December 21, 2010
University of Florida, Gainesville, FL

PROFESSIONAL EXPERIENCE

ORISE Post-Doctoral Fellow, US Environmental Protection Agency — 2016 – Present
Cincinnati, OH

Dept. Lab Safety Coordinator, UF Environmental Engineering Sciences — 2011 – 2016
Gainesville, FL

Graduate Research Assistant, UF Environmental Engineering Sciences — 2011 – 2016
Gainesville, FL

Anaerobic Digestion Engineer, USAID-WINNER Program — Mar. 2011 – Aug. 2011
Pétion-Ville, Haiti

CADD Technician, Jones Edmunds and Associates — 2008 – 2009
Gainesville, FL

Survey crewman/CADD Technician, Barraco & Associates — 2006, 2007
Fort Myers, FL

PROJECT EXPERIENCE

ORISE Post-Doctoral Fellow, US Environmental Protection Agency

Hydrologic Evaluation of Landfill Performance (HELP) model v3.5

Developed the VBA source code and formatted the Excel application of the HELP model v3.5; required for use by all lined landfills in the US (Subtitle C and D).

Impact of Elevated Temperatures on Methane Yields of Municipal Solid Waste

BMP assays on mixed MSW samples at 35, 55, 65, and 75 degrees C, monitoring the gas constituents. Methane production decreased above 60 C.

Examination of Post-Closure Care Monitoring Data from Subtitle C Landfills

Reviewed leachate quantity and quality data from 9 hazardous waste landfills. Data was collected from leachate collection and removal system (LCRS) and the leackage detection system (LDS).

Life-cycle inventory of gypsum drywall

Emissions from gypsum drywall were identified and quantified for the purposes of establishing a life-cycle inventory. Drywall samples were analyzed from a number of EPA leaching methods, including SW846 methods 1315 and 1316.

Graduate Research Assistant, University of Florida

Quantifying Potential Aquatic Trash in the Hillsborough River Watershed

Led a team of researchers to develop a geodatabase of recovered litter in the Hillsborough River Watershed. Used GIS tools to identify litter hotspots in the watershed to target future cleanup and preventative efforts. Coordinated efforts with Nestlé Waters North America and Keep America Beautiful affiliates.

Methane Generation from Biodegradable Plastics

Measured the methane generation from several polylactic acid (PLA) products in anaerobic reactors. Compared the experimental values to Life-Cycle Assessment (LCA) models, including EPA's Waste Reduction Model (WARM). Current LCA models may underpredict methane generation from PLA disposed in landfills.

Municipal Solid Waste Composition Study at the University of Florida 2014 – 2015

Led team sorting and analyzing waste composition for the Office of Sustainability. Developed Standard Operating Procedure (SOP) for waste audits, coordinating with Physical Plant Division and Environmental Health & Safety to identify hazards. Presented findings to UF Waste Stakeholder Committee, responsible for implementing Zero Waste and landfill diversion programs.

Critical Review of the Methane Generation Potential of MSW

Reviewed and aggregated data from over 200 peer-reviewed publications concerning the methane generation potential, L_0, of municipal solid waste and waste components worldwide. Average L_0 values were lowest in Europe where biodegradable wastes are prohibited from landfill disposal. Highest L_0 values were reported in North America where biodegradable packaging material and food wastes dominate the municipal waste streams.

Translating Landfill Methane Generation Parameters Among First-Order Decay Models

Demonstrated methods to calculate single-phase methane generation parameters (e.g., DOC, L_0, k, etc.) using first-order decay models and compared results of multiphase models with results from weighted-average single-phase parameters. Cumulative predictions were within 7% of the multiphase predictions (e.g., IPCC model). Decreasing uncertainty in methane generation parameter values will improve predictions.

Effects of Temperature and Particle Size on Methane Generation from MSW Components

Performed the biochemical methane potential (BMP) assay on 8 waste components at mesophilic and thermophilic temperatures as wells as ground and whole samples. Differences of BMP based on particle size were observed in raw wood materials but not in wood products such as office paper and cardboard. Increased temperature was found to increase k but not affect BMP.

Measuring Vertical Stresses in a Municipal Solid Waste Landfill

Deployed Geokon total earth pressure cells into an active MSW landfill to measure static loads. Data was recorded with Campbell Scientific CR6 data logger. Measured values induced by the

landfill compactors were found to display Boussinesq-like behavior as waste height increased. Static loads from the overburden pressure were found to follow a linear increase with respect to unit weight and waste height.

Designing Inverted Landfill Gas Collection Wells

New River Regional Landfill identified an issue with landfill gas wells clogging with leachate, requiring additional maintenance and pumping to remove the leachate for effective gas management. Designed and constructed 1200' landfill gas collection system to collect landfill gas and remove leachate from wells without the use of pumps. Vertical risers attached to the manifold collect landfill gas and are now part of the compliance network.

Characterizing Electronic Cigarette Leachates by Heavy Metal Leaching Concentrations

Performed Toxicity Characteristic Leaching Procedure (TCLP) and Waste Extraction Test (WET) on a variety of disposable electronic cigarettes, a product of growing popularity and consumption. RCRA metals and those identified by the state of California to be contaminants of concern were analyzed by ICP-AES. E-cigarettes were found to leach hazardous amounts of lead and high concentrations of chromium.

PEER-REVIEWED PUBLICATIONS

Chickering, G.W., **Krause, M.J.,** Townsend, T.G. (in preparation). Determination of As-Disposed Methane Generation Potential of Residential and Commercial Municipal Solid Waste

Krause, M.J., Chickering, G.W., Townsend, T.G., Pullammanappallil, P. (submitted). Effects of Temperature and Particle Size on the Biochemical Methane Potential and Methane Rate Constant of Municipal Solid Waste Components. Submitted to Bioresource Technology.

Krause, M.J., Chickering, G.W., Townsend, T.G. (2016). Critical Review of the Methane Generation Potential of Municipal Solid Waste. *Critical Reviews in Environmental Science and Technology* 46(13), 1117-1182. DOI: 10.1080/10643389.2016.1204812

Kim, H., **Krause, M.J.**, Townsend, T.G. (2016). End-of-Life Management of Corrosive Drywall. *Journal of Environmental Management.*182, 322-327 DOI: 10.1016/j.jenvman.2016.07.072

Krause, M.J., Chickering, G.W., Townsend, T.G. (2016). Translating Landfill Methane Generation Parameters Among First-Order Decay Models. *Journal of the Air & Waste Management Association*. 66(11) 1084-1097 DOI: 10.1080/10962247.2016.1200158

Krause, M.J., Townsend, T.G. (2016). Life-Cycle Assumptions of Landfilled Polylactic Acid Underpredict Methane Generation. *Environmental Science & Technology Letters*. 3(4), 166-169. DOI: 10.1021/acs.estlett.6b00068

Krause, M.J., and Townsend, T.G. (2015). Hazardous Waste Status of Discarded Electronic Cigarettes. *Waste Management*, 39(5), 57–62. DOI: 10.1016/j.wasman.2015.02.005

Krause, M.J. and Townsend, T.G. (2014). Rapid Waste Composition Studies for the Assessment of Solid Waste Management Systems in Developing Countries. *International Journal of Waste Resources*. 4(2) 1–6. DOI: 10.4172/2252-5211.1000145

TECHNICAL REPORTS

Townsend, T.G., **Krause, M.J.**, Gustitus S.A., Toms, J. 2015. Towards Trash Free Waters: Quantifying Potential Aquatic Trash Recovery in the Hillsborough River Watershed. http://www.essie.ufl.edu/media/essieufledu/home/townsend/TFW-Final-Report-2015.pdf

Townsend, T.G., Gustitus, S.A., Walsh, A., **Krause, M.J.** 2014. Municipal Solid Waste Composition Study at the University of Florida 2014.University of Florida Physical Plant Division and Office of Sustainability, Gainesville, FL, USA. http://www.ppd.ufl.edu/_library/pdf/refuse/SolidWasteCompositionStudy.pdf

Townsend, T., Kim, H., Lott, R., **Krause, M.** 2013. Investigation of Potential Emerging Groundwater Contaminants at Construction and Demolition Debris Disposal Facilities. Hinkley Center for Solid and Hazardous Waste Management, Gainesville, FL. http://www.hinkleycenter.org/images/stories/TownsendBoron.pdf

OTHER MEDIA OUTLETS

Krause, M.J. (2015). Leveraging Data to Help Restore Florida Watersheds. The Source: Nestle Waters North America Blog. November 11, 2015. https://nwnasourceblog.com/protecting-resources/leveraging-data-to-help-restore-florida-watersheds/

CONFERENCE PRESENTATIONS AND INVITED LECTURES

Krause, M.J., Townsend, T.G. Methane Generation Potential of MSW and its Use in LFG Generation Models. Poster Presentation in Proc: Intercontinental Landfill Research Symposium, June 2016 Japan.

Krause, M.J., Gustitus, S.A., Toms, J., Townsend, T.G. Quantifying Potential Aquatic Trash in the Hillsborough River Watershed - Towards Trash Free Waters. In Proc: BASIS 6. September 28-30, 2015, Tampa, FL, USA.

Krause, M.J., Woolsey, J., O'Neall, D., Sawyer, C., Townsend, T.G. Design and Use of Inverted Wells to Collect Landfill Gas and Remove Leachate in a Bioreactor Cell. In Proc: WasteCON 2015. Aug. 2015, Orlando, FL, USA.

Townsend, T.G., Kim, H., **Krause M.** Sulfide gases from drywall sources. In Proc: Intercontinental Landfill Research Symposium. Oct 22-25, 2014. Crystal River, FL, USA.

Krause, M.J. When are Electronic Cigarettes Hazardous Waste? ENV 4351 Solid and Hazardous Waste Management. Timothy G. Townsend. University of Florida, Gainesville, FL. September 24, 2014.

Krause, M.J. and Townsend, T.G. Assessment of Solid Waste Management in Developing Countries. In Proc: Global Waste Management Symposium. June 22-25, 2014. Orlando, FL, USA.

Krause, M. and Townsend, T. Assessment and Recommendations for the Solid Waste Management of Two Rural Towns in Guatemala. Poster Competition at the Air & Waste Management International Conference. 2012. San Antonio, TX.

SERVICE

Peer-reviewer for: Journal of Environmental Engineering, ASCE

University of Florida Waste Stakeholders Committee	2015 – 2016
UF College of Engineering Safety Action Team	2014 – 2016
ESSIE Envoys - Graduate Student Council	2013 – 2015
College of Engineering Commencement Marshal	2013

HONORS AND AWARDS

American Public Works Association Florida Chapter Scholarship	2016
College of Engineering Attributes of a Gator Engineer - Service to the Global Community	2014
I-Cubed Graduate Interdisciplinary Research Award	2012
Florida Section A&WMA Scholarship	2012, 2013, 2015
Graduate Student Council Travel Grant	2012
UF College of Engineering Goodrum Scholarship	2010

AFFILIATIONS AND MEMBERSHIPS

Air & Waste Management Association - UF Student Chapter, Treasurer	2011 – 2015
Solid Waste Association of North America, Member	2011 – Present
Engineers Without Borders-UF	
Webmaster	2011 – 2012
Bolivia Project Team Lead	2008 – 2009
Local Projects Chair	2007 – 2008