



Environmental Research & Education Foundation

Lighting a path to sustainable waste management practices

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Hi-res photos available upon request

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Environmental Research and Education Foundation Awards Four Scholarships

Raleigh, NC – The Board of Directors of the Environmental Research and Education Foundation (EREF) is pleased to announce the award of scholarships to one Master's degree and three doctoral students. A Robert P. Stearns/SCS Engineers master's scholarship was given to Theodore McMahan, Gannon University. A Riethmiller/PTR Baler doctoral scholarship was given to Dean Straub, Purdue University. Both the Stearns and Riethmiller scholarships are named in honor of the current EREF Board members and their companies. Doctoral candidates Richa Karanjekar, University of Texas at Arlington, and Dianjun Ren, University of Virginia, received EREF scholarships. Details on the scholars and their topics of research are described below.



Theodore McMahan

*Gannon University, MS
Stearns/SCS Scholar 2011*

Evaluating Torrefaction as a Process to Convert Organic Waste to Energy

Torrefaction is a mild pyrolysis process that improves the fuel properties of solid organic materials such as woods and organic wastes. When heated in an anoxic environment to temperatures between 200 and 400 degrees Celsius, organic material decomposes producing volatile gases. The resulting solid material has an increased energy density and improved physical characteristics and can be utilized as a solid fuel. The major goal of Ted's research is to determine the optimum heating profile to maximize mass and energy

yield for each of the selected feedstocks while generating sufficient off-gases to provide the fuel for heating the system. A number of organic waste feedstocks are being investigated, including biosolids and commercial food wastes. Beyond the optimization research for this process, Ted is leading a team of researchers and engineers in developing a prototype reactor which will be able to handle mass quantities of local organic solid waste and convert said waste into valuable solid fuel. Ted was raised in a small town in Massachusetts, and attended Tufts University for his undergrad where he studied engineering. He took a year off between undergraduate and graduate school before continuing his research in environmental engineering.

Dean Straub

*Purdue University, Ph.D.
Riethmiller/PTR Scholar 2011*

Non-Destructive Recovery of Polymers from a Waste Stream

Plastics constitute a large part of our everyday usage of materials that end up as waste. Unfortunately, a large number of plastic products contain many different types of plastic polymers and other materials, such as metals, which makes recycling these items difficult. Previous methods have utilized chemical recycling or thermal decomposition to break polymer chains. Unfortunately, this is a very energy-intensive process, due to having to re-assemble these fragments into useable polymers. To find a better way to recycle, a non-destructive separation of complete polymer chains is being pursued. This has the advantage of producing polymers that can then be mixed with virgin material. This also saves energy when compared to other recycling processes, as the polymers do not need to be re-made. This non-destructive recovery process could greatly increase the sustainability of a wide range of consumer and industrial products. Dean graduated from the Rose-Hulman Institute of Technology, Summa Cum Laude, with a Double Major in Chemical Engineering and Chemistry in 2010. He hopes to utilize his skills, after graduation, in a private sector position. Outside of professional pursuits, Dean enjoys outdoor activities such as fishing and boating, as well as singing and playing the violin.





Richa Karanjekar
University of Texas at Arlington, Ph.D.
EREF Scholar 2011

An Improved Model for Estimating Methane Generation Rates from Landfills Based on Waste Composition, Rainfall and Ambient Temperature

Landfills are the third largest human-related source of methane in the U.S., accounting for 17 percent of all methane emissions. Accurately estimating methane emissions from landfills is important to assess its potential of generating greenhouse gases (GHG), as well as to assess if tapping the landfill's power generation potential is economically viable. Previous studies have shown that methane generation from landfills depends on waste composition, moisture content, temperature, pH and particle size. The goal of this research is to develop a model, for predicting methane generation rates from landfills worldwide, which can be used by any country to estimate methane potential of its landfills, regardless of waste composition or climate. The improved model, "Capturing Landfill Emissions for Energy Needs (CLEEN)," will allow methane generation to be estimated for any landfill with basic information about waste composition, annual rainfall and ambient temperature. Richa is currently studying the methane generation from laboratory scale simulated landfill reactors. These reactors are installed at varying levels of rainfall, temperature and waste composition using a statistical incomplete block design. Based on the laboratory scale data, a comprehensive regression equation for predicting methane generation rate constant (k) will be developed and will be incorporated in the CLEEN model. Finally, the prediction efficiency of CLEEN model will be compared against the current landfill methane generation models. Richa's research interests include landfill gas modeling and climate change. She received a bachelor's degree in Civil Engineering from the University of Pune, India and she obtained a master's in Environmental Engineering from University of Mumbai, India. Her bachelor's and master's thesis focused on removal of heavy metals from industrial wastewater. After completing her master's degree, Richa worked as a proposal and design engineer for 3 years in a multinational company in India. She enjoys reading, painting and travelling in her spare time.

Dianjun Ren
University of Virginia, Ph.D.
EREF Scholar 2011

Effect of Silver Nanoparticles on Microbe Populations Found in Landfill and Nanoparticle Transport through Liners

The primary goal of Dianjun's research is to identify silver nanoparticle (AgNP) transport and fate in a landfill, to determine whether the antimicrobial capability of AgNPs will deactivate the beneficial bacterial group responsible for degradation of municipal solid waste. Silver nanoparticles are a new class of cost-effective antimicrobial agents that have been widely used in recent years. However, materials that contain AgNPs are subject to deterioration, which has the potential to release AgNPs from the manufactured materials. In this form, the AgNPs have the ability to detrimentally impact the environment. As the use of AgNPs increases, the risk of AgNPs released into the environment increases. In a landfill, there is concern silver nanoparticles may transport through the earthen liner and contaminate groundwater. It is expected that the interaction between nanoparticles and transport environment would have a direct influence on transport behavior through landfill liner systems. Dianjun received a bachelor degree and master degree in environmental engineering from Hohai University and Tongji University in China, respectively. During that time, he had the opportunity to work with nanomaterials (titanium dioxide) and its application in wastewater treatment. Dianjun is an avid photographer and tennis player.



The four scholars awarded this year were selected from numerous highly qualified finalists. The EREF scholarship program recognizes students with academic excellence, professional involvement and an interest in solid waste management issues at the post-doctoral, doctoral, and master's levels. Doctoral/post-doctoral scholarships are given in memory of Francois Fiessinger, P.E., Ph.D., a graduate of Rutgers University, who was a founding director of the foundation; and by EREF. Additional scholarships are made possible by Robert P. Stearns, P.E., DEE of SCS Engineers, former Chairman of EREF; and by Robert J. Riethmiller of PTR Baler and Compactor.

EREF annually awards scholarships based on merit. EREF is a 501(c)3 class charity that funds and directs scientific research and educational initiatives for waste management practices to benefit industry participants and the communities they serve. For more complete information on EREF funded research, its scholarship program and how to donate to this great cause, visit www.erefdn.org.