



WMST TEC (Technology and Engineering Club) students taking on the challenges of STEM education



Team **3'R** (Reduce, Recycle, and Reuse), comprised of 8 junior students are taking on the challenges of STEM education by participating in the Lexus Eco Challenge Air/Climate 2011 -2012 competition.

The Lexus Eco Challenge, designed by Lexus and Scholastic, is a nationwide education program and contest about the environment that empowers teens to create a better world. Middle and high school students across the county can participate in either or both of the two initial challenges addressing environmental issues related to land, water, air and climate. Teams must define an issue, make a plan to address the issue, implement the plan, and report on the results. Up to 16 teams in each challenge will win \$10,000 in grants and scholarships. All the winning teams will be invited to participate in the Final Challenge for a chance to win one of two \$30,000 grand prizes. In all, \$500,000 in scholarships and grants will be awarded.

The Team decided to complete their project on Fossil Fuels and Renewable Energy. Specifically, the team sought to focus on biogas production from biomass waste. In studying the pie chart to the right, it can be seen that energy consumption in the United States is greatly reliant on fossil fuels which are non-renewable energy sources. Because the depletion of fossil fuels as a means of powering the country's automotive and electrical requirements is a current, greatly debated topic in today's media, the team decided that a project that offered a potential fix to the energy crisis would be in order.

The team also explored other benefits to the use of biomass waste as an alternative energy source. The most beneficial results of using dead biomass include the reduction in the threat of global climate change, an increase in available space at landfills, a reduction in the amount of fuel for forest fires, and a reduction in odor and pollution in the areas that use biogas as an alternative method for generating electricity.

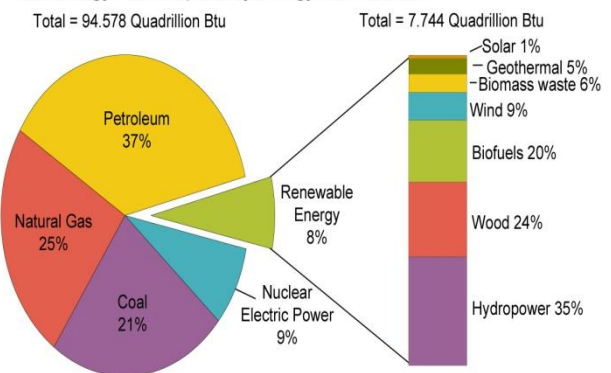
The term biogas is used to describe methane gas produced as a by-product of an anaerobic reaction seen in methanogen bacteria that are common to deoxygenated environments such as lake mud and in the digestive tracts of mammals, including humans, but most notably cows.

In order to produce and harness the biogas, the team built a biogas digester in which the digestive tract of a mammal was somewhat simulated. The digester consists of two barrels of slightly different circumferences. In the larger barrel, the team placed rocks at the bottom and vertical rods to increase the surface area on which the bacteria were to grow. Food was ground with water using an InsinkEerator garbage disposal and poured into the large barrel. Cow manure was added to this mixture as the source of methane producing bacteria. The smaller barrel was inverted and placed inside of the larger barrel to capture the gas as it was produced.

The team was mentored by Dr. Thomas H. Culhane from Solar CITIES and Mr. Moustafa Hussein from Cairo, Egypt. The InsinkEerator was donated by InsinkEerator, a division of Emerson Electric Company.

Team members: Antar Evans, Naje Crawford, Dana Smith, Jeremy Lovell, Evan Polk, Lloyd Williams Pria Smith and Donnell Mann. Team Advisors: Mohammed Nouristani, Shannon Wilson and Vivienne Forrester

U.S. Energy Consumption by Energy Source, 2009



Note: Sum of components may not equal 100% due to independent rounding.
Source: U.S. Energy Information Administration, *Annual Energy Review 2009*, Table 1.3, Primary Energy Consumption by Energy Source, 1949-2009 (August 2010).

Students and Advisors in Action (Biogas Project)

