UCF – Progress Energy Senior Design Inaugural Symposium
Renewable & Sustainable Energy
April 27, 2009
Partial List of Teams & Projects Participating

Industrial Engineering – Demand Rate Study for Seminole County Environmental Services

Description of Project: Power Allocation Management/ The Industrial Engineering Senior Design Team, Cerberus, has been contracted by Seminole County Environmental Services (SCES) to create a power management and reporting system. This system provides visibility for water plant managers to their power costs and usage, demand analysis, and flow analysis. It also creates the ability to review the impact of process improvements to reduce usage and increase overall efficiency. Cerberus has also determined that, by switching the rate schedule option from each of the power companies to Time of Use scheduling, SCES could save up to $100,000 per year. This system provides SCES with a tool that enables managers to make operational decisions using quantitative data.

Mechanical Engineering - EML - Parallel Hybrid Conversion Kit

The goal of this project is to provide a means of taking an existing vehicle and turning it into a hybrid for the purpose of saving gasoline through using renewable energy. The actual designed kit was implemented on a gas powered golf cart for proof of design. This was accomplished by utilizing a parallel drivetrain implementation through the means of an AC Induction motor/controller powered by 4,12-V deep cycle batteries. This kit improves city gas mileage by over 30% and highway gas mileage by almost 65%.

Mechanical Engineering - Reverse Hydrogen Fuel Cell Group

The group consists of four mechanical engineers with a mix of material and energy systems backgrounds. The project was to build an electrolysis cell capable of generating hydrogen from common renewable materials. This hydrogen gas will be available for on demand use in clean energy systems.

Mechanical Engineering - Hybrid Golf Cart Team

The Hybrid Golf Cart Team is a series drive topology system developed for a 1990 gasoline powered Yamaha golf cart. The system incorporates and utilizes both gasoline and electric power to prove feasibility, flexibility and reliability of hybrid vehicles.

Mechanical Engineering - Coconuts for Biodiesel

This project is to provide research and development into the use of coconut oil as an alternative fuel for third world applications. Consideration was taken into oil extraction as well as refinement for usage in colder climates. Various chemical methods for biodiesel production were used within a designed fuel processor utilizing coconut oil as the primary feedstock.

Mechanical Engineering - GPS SHUTTLE TRACKING AND NOTIFICATION SYSTEM

The team developed a system to display the estimated time of arrival for the shuttles transporting students around the University of Central Florida. The primary objective of the project is to reduce fuel consumption and greenhouse emissions by UCF students, by encouraging them to wait for the next shuttle. Additionally, all components were designed to use renewable power sources. The project included a solar powered kiosk to display the estimated time of arrival, four solar powered relay units to transmit data, and onboard components to determine the location and velocity of the shuttles. All data transmissions were done using radio modems. Radio modems were selected as a cost effective alternative to ongoing "service" costs which are part of most other systems, making this a unique, Earth friendly (green) project

Mechanical Engineering - Solar Power BBQ Introduction

Charcoal and propane grills are the dominant form of outdoor cooking currently. Unfortunately, although effective, both models require the use of fossil fuels to operate. A solar-powered barbeque, on the other hand, harnesses the power of the sun by focusing solar rays onto a cooking surface via a reflective collector. The model presented here is the prototype for to manufacture a solar grill that keeps portability in mind. Clean, safe and effective, the solar-powered barbeque will become the preferred method of outdoor cooking for the future.

Mechanical Engineering - Wave Motion - Capturing & Optimizing Energy from Ocean Wave Motion

The ocean's wave motion is a source of nearly-infinite clean, safe energy. Although methods to extract this energy already exist, they are often inefficient and not implemented in practice. This project seeks to improve these designs by using a buoy's motion to generate power through a unique mechanical system. There is an increasing trend to move towards clean, renewable energy sources to provide power for society's energy needs. One such source comes from the motion of waves within the ocean. Although the concept of harnessing the kinetic energy of ocean waves has been around for many years, the current designs are often inefficient and not used in practice for large-scale power output. If the design were to be modified to extract a larger percentage of the available power given by a wave in motion, the potential for industrial implementation would increase, making wave energy generation a viable source of clean energy for the future.

Mechanical Engineering - Wind Turbine Research – The Development of Simulated Wind Environment for the Testing of Small Wind Turbine Systems.

The goal of this project was to design and construct a way to simulate low speed wind flows similar to those found in Florida and test the feasibility of wind turbine systems operating in these conditions. All testing was done on the ground, so a shield was built to protect people and lab equipment, and a fan frame was built to allow for wind speeds to be altered to test power output at different wind speeds. In order to improve upon commercial wind turbine blades, we constructed composite blades that were designed specifically for low wind speeds, and compared them to wind turbine blades that typically come with commercial wind turbine systems. Power output was measured by measuring the voltage and current that the wind turbine produces at the different wind speeds. Since this is a long term research project, future groups will be responsible for optimizing our design and continuing

to research low wind speed wind turbine systems.

Mechanical Engineering - Shuttle Ridership Data Collection and Optimization

Project Summary: The first part of the project entails the production of a prototype counting system for the UCF Shuttles. The device created is a counter that rides directly on each of the buses. This device collects and transmits the ridership of the bus that it is placed on. The second part of the prototype is the collection system. Once the data is collected, it is transmitted to a main database where it is stored. A website was created that collects the data within the database, and creates multiple charts and figures, depicting the ridership of each bus. This information can later be analyzed in order to properly optimize the UCF shuttles, to maximize their efficiency and reduce energy consumption.

Mechanical Engineering – ASHRAE Senior Design and Selection Teams

The ASHRAE Senior Design and Selection Teams utilized the annual international ASHRAE Student Design Competition requirements as the basis for the project, a 15000 square foot office/retail building in downtown Nashville. The Design Team main goal was to design and draw a complete HVAC system that is optimally sized for the building that may not be the most economical choice. The Selection Team was tasked with finding the most economical HVAC system that fit within the Owners requirements. The result of those goals provides an elegant solution that is extremely sustainable. Both are encouraged to interact with industry professionals so that the project takes on a real life structure to gain practical experience in the HVAC business world.

Electrical Engineering - Dynalite

The Dynalite project aims to fill a void in the currently booming LED lighting market. Most LED bulbs say that they offer light output equivalent to the standard incandescent light bulb, what they fail to mention however is how the color of the output light more closely resemble fluorescent bulbs. An additional shortcoming of most LED bulbs is the inability to adjust the light output using dimmers found in many consumers' homes. The Dynalite corrects both of these current shortcomings by providing the consumer with an incandescent equivalent (both luminous output & color rendering ability), which is self dimming. The Dynalite will utilize light sensors which will compare the ambient light of the room to that defined by the user, and adjusts the light output accordingly. All of the dimming circuitry is included inside the bulb, along with a Zigbee module for wireless communication with the Illuminator software package and hand held control unit. Because the Dynalite is an all-in-one LED lighting solution, the user will not have to supply any additional wiring or circuitry, simply plug and play.

Electrical Engineering – Biodiesel 9000

The Biodiesel 9000 is designed to be an inexpensive and easy to use machine that converts waste vegetable oil into a usable bio fuel that is a direct replacement for petroleum diesel or home heating oil. Waste oil can be obtained for the small scale use from local restaurants that serve any fried food. The machine itself plugs right into a standard wall outlet and requires only the pressing of one button to transform the waste oil into a usable fuel. Each batch requires 24 hours to complete the process and can be repeated indefinitely until reactants are completely consumed.

Electrical Engineering – Energy Efficient Bicycle

The E.E. Byke (Energy Efficient Bicycle) is a bicycle with the ability to generate electrical energy. The goals of this project were to build a completely functional system for a bicycle with the ability to convert

mechanical and solar energy into electrical energy and to store the electrical energy into a battery and to use the battery to supply enough power to operate small appliances, up to 50W. The E.E. Byke uses the mechanical energy produced by pedaling the bicycle. It transforms this mechanical energy into electrical energy**.**

Electrical Engineering – Wind Turbine Maximizer

The UCF senior design team is involved in an international undergraduate competition sponsored by the worldwide IEEE organization. Every two years, the IEEE holds a contest to produce cutting-edge technology in renewable energy concepts. This year we have developed a low-cost, highly-efficient power maximizer for small wind turbines using advanced topologies combined with state-of-the-art controlling algorithms. This will make smaller wind turbines more feasible in years to come. Our design is also a part of the NSF International Research Experience for Students (IRES project), where, in addition to traveling to Washington, DC and Australia, we will travel to Jordan for three weeks to study abroad doing research in renewable energy. At the end of this venture, our design will incorporate solar power and have a wider range of end-user applications.