

Senior Design Day 2016

April 29, 2016

Discovery Park

Engineering Technology

9 AM- 12 PM poster presentations on **first level**

Presentations beginning at 1 PM:

Construction Engineering Technology

B192

Electrical Engineering Technology

F183

Mechanical Engineering Technology

F187

COLLEGE OF
ENGINEERING



CONSTRUCTION ENGINEERING TECHNOLOGY

Team Name: Mean Green Construction Team

Sponsor: Ridgemont

Program/Department: Construction Engineering Technology

Team Members:

Brian Labac

Matt Abusamra

Travis Butler

Westin Ramsey



The area designated for this new project is located in Southlake, TX at the corner of East Hwy 114 and Reserve St. The area around the project is zoned as commercial and will be used as the home for several businesses. It is the goal of Granite Place at Southlake Town Square to supply a monument of current and future business for this area.

Granite Place At Southlake will be the first “high-rise” of Southlake and will provide an aesthetical focus point for business as it will house 15-20 businesses in a building that is six stories tall, 165,000 SF of total office area, and a Five story parking garage. This building is not only functional, but is sustainable as green building techniques will be a focus of this project.



Team Name: Carvanguin Engineering

Client/Sponsor: TX-MORROW Construction, Inc.

Program/Department: Construction Engineering Technology

Team Members:

Lee Vanderwerken

Edgar Carranza

Yvonne Olguin

Located in Frisco, TX at the northeast corner of State Highway 289 and County Rd 25, the proposed project will consist of 17 two to three-story at-grade, wood-frame apartment buildings and one clubhouse. As per the owner, a soil test has been performed in order to determine the stability of the soil. The soil test has concluded that clay soils will be found in the subgrade, and that the use of hydrated lime will be necessary in order to stabilize the soil to improve and maintain their support value. However, one of the concerns of using lime is that it would be used over a large area where only light-duty traffic will be using the pavement on the property. The use of lime for paved areas will excessively outperform the required need for the intended use of the pavement. Our team will be researching different alternatives to lime to help save time and/or money for TX-Morrow Construction, Inc. for the paving subgrade. Comparisons will be provided in order to establish its validity as an alternative. The goal is that the alternatives proposed will be better suited to meet our projects' needs and use.

Team Name: SAMAXTO

Sponsor: Cadence McShane Corporation

Program/Department: Construction Engineering Technology

Team Members:

Eloisa Amaya

Roni Ramirez

Juan Sanchez



The Villas at the Rim are new luxury living apartments located off Vance Jackson Road outside loop 1604 in San Antonio, Texas. This project is under the supervision of Legacy Alliance, with Cadence McShane as their General Contractor. The urban wrap complex consists of 32,000 sq. ft. providing space for 427 units in two buildings, as well as two parking garages. Cadence McShane expects the Villas at the Rim to have a project completion time of twenty-six months.

Samaxto's purpose is to provide consultation to all aspects of project management with a focus in identifying geotechnical solutions for the limestone/flint the project is being built on. We are to provide solutions that will positively impact the schedule, work sequence, budget, design and environmental pollution control.

Team Name: SD Construction, LLC

Sponsor: Ridgemont

Program/Department: Construction Engineering Technology

Team Members:

Nathan Derrick

Joseph Alsobrook

Doug Joseph

Chris Lavezo



The Sprouts Farmers Market will be located at 4930 Teasley Lane in Denton, TX. The 30,000 square foot farmers market will bring "new life" to the southern portion of Denton. Sprouts Farmers Market is proud to be known for its fresh produce from the local areas and their large variety of organic foods. This new market will be the heart of a new shopping area, and will feature shops located on each adjacent side of the building. The organic features of the market is a perfect fit for the city of Denton, and will offer shoppers an alternate shopping experience from their

traditional grocery store.

As a team we will be focusing on creating an environmentally friendly structure and site through the implementation recyclable building materials, waste water usage, and controlling site runoff. By conducting a market analysis, modifying the current schedule and implementing green building codes in the area we hope to accomplish this goal.

ELECTRICAL ENGINEERING TECHNOLOGY

Team Name: Edison and the IoT

Sponsor: NSF (partial support)

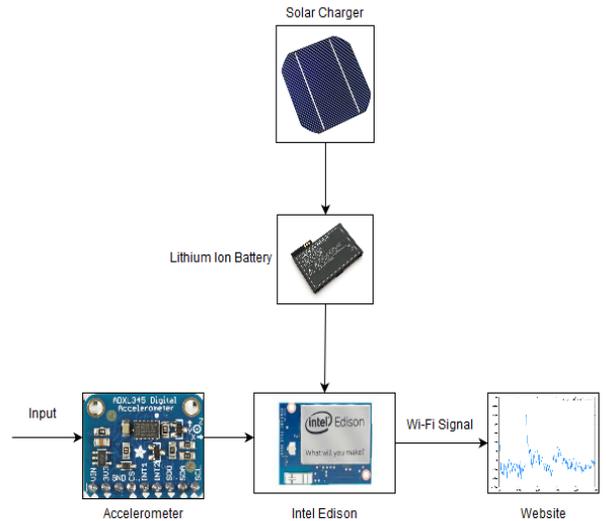
Program/Department: ETEC/ELET

Team Members:

Chris Harris

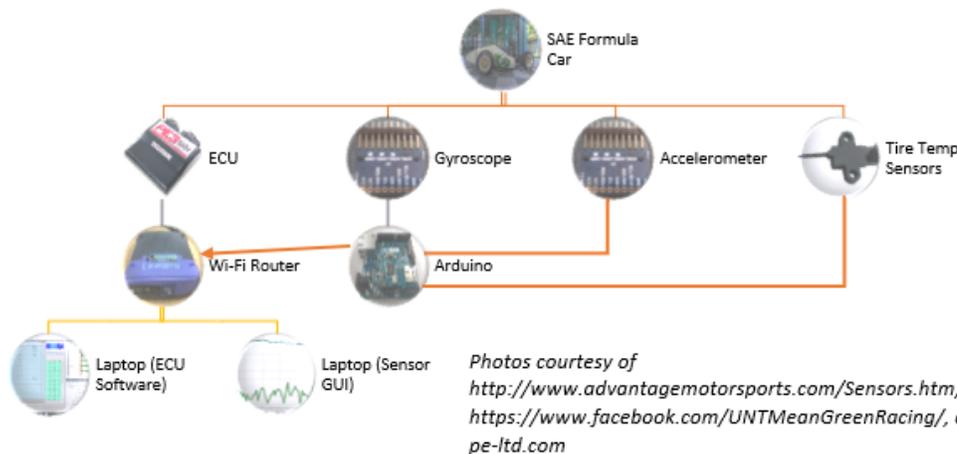
George Dunson

The IoT Enabled Wireless Sensor Network for Structural Health Monitoring is a system of nodes that can be deployed on a bridge or building to measure extremely subtle movements in any direction. The nodes collect and process the data before pushing it to the cloud to be reviewed by a local or remote user. Each node includes an Intel Edison development module as well as an Analog Devices ADXL345 accelerometer to measure movement. Each node also stores a copy of the recorded data to its SD card before sending it to the server. In each sensor network there is one master node and multiple slave nodes. The master node is responsible for identifying each node in the network and associates the data recorded to its unique identifier. The master node can also manage and monitor the status of each node in permanent sensor networks. This is useful to provide longer battery for the network by putting the nodes into low power mode when needed, or to alert the user (local or remote) of any problem with the network or a specific node so that it can be addressed as soon as the issue arises.



Team Name: UNT SAE Car telemetry

Program/Department: ETEC/ELET



Team Members:

Tony Mcjohnston

Russel Rice

Justin McClesky

Our project is an attempt to acquire real-time wireless data from the UNT SAE Formula car from a distance of about 1500 feet, which is the length of the SAE Formula track used for tournaments, without the need for antenna towers around the track. The data we will be

acquiring will be the ECU data and data from sensors added to the vehicle. The sensors we will be adding are a Gyroscope/Accelerometer/Magnetometer for determining the speed and acceleration of the race car, and tire temperature sensors for the rear tires. A simplified flowchart of our project is shown in Figure 1 below.

Team Name: Remote Water Leakage Detection

Program/Department: ETEC/ELET

Team Members:

Robert King
Robert Walters
Dustin Black



Unchecked, a leak can quickly turn into large amounts of water gushing into a home or business damaging the structure, electrical wiring, or belongings. Our goal is to create a water leak detection system that will alert users of

leaks in real time through an IoT network. Our leak detection network first starts with a series of leak detection nodes which consist of the MSP-EXP430G2 LaunchPad board with a 430BOOST-CC110L SubGHz RF Radio to communicate with the host board. They communicate with the host TI Simplelink CC3200 with a CC110L RF Booster. These radio boosters are for the Sub1-GHz communication between the host and node devices. After communicating its data to the host, this data will then be sent via Wi-Fi to a router/modem and sent out to the internet. This data will then be communicated to the user via a MQTT broker. The data path for this is shown below in the diagram.

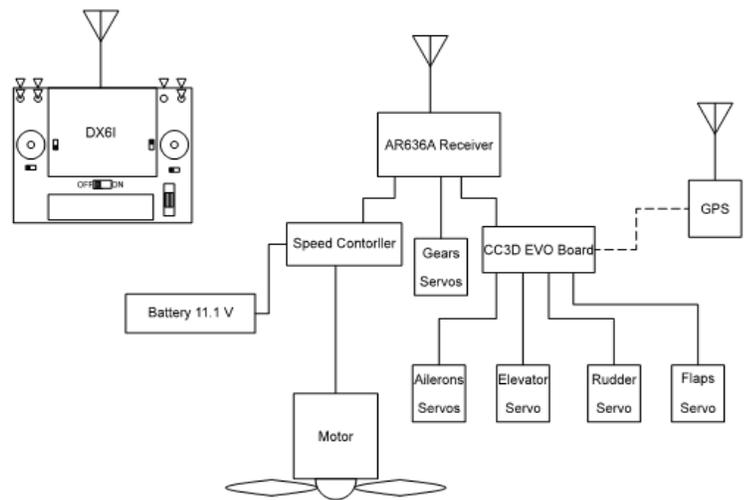
Team Name: M Cubed

Program/Department: ELET/ETEC

Team Members:

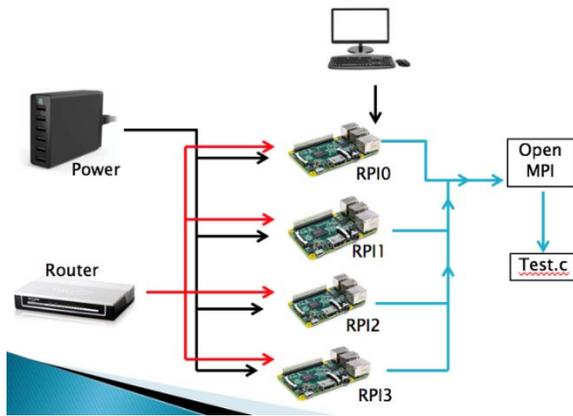
Eleazar Mendoza
Betson Mathew
Sayed Mawazeb

The objective of our team is to modify a remote controlled airplane to be able to fly on auto pilot. We begin with a six channel controller necessary to control all of the components to get the airplane in the air. The last channel on the control is used to switch the airplane into auto pilot so that it will fly unmanned. An on-board GPS will communicate with the CC3D master board to control the components on the airplane on their own. We will be using a P-51 Mustang RC scaled airplane for this project. The components that will be used for the autopilot are shown below.



Team Name: Design, Implementation, and Characterization of a Raspberry Pi Cluster for High-Performance Computing

Program/Department: ELET/ETEC



Team Members:

Ralph Walker II
Michael Vistine
Katy Rodriguez

For our senior design project, we are testing high-performance computing using the latest Raspberry Pi model 2. The Raspberry Pi 2 offers a powerful 900 MHz quad-core ARM CPU that we will be testing to its limits by running different test such as wired vs. wireless networking, number of cores vs. execution time, and chip temperature vs. clock speed. The wired design is set up with 1 master pi talking to the 3 other slave pi's via a router that we are

using as a switch. The master pi runs the testing program while it is connected via SSH to the slave pi's which are the main horsepower. Our program is compiled with the Open MPI parallel computing protocol.

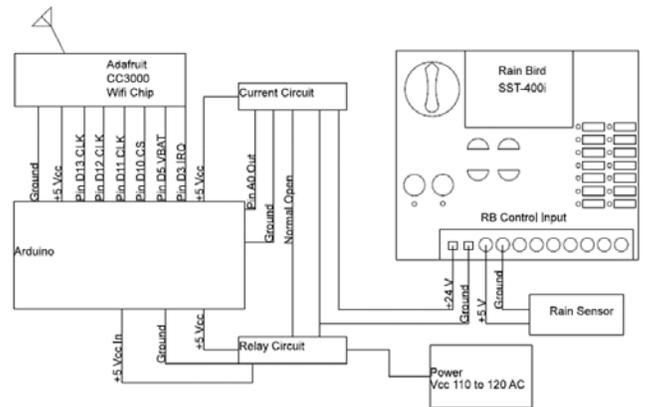
Team Name: IoT-Enabled Sprinkler System

Program/Department: ELET/ETEC

Team Members:

Arebria Burr
Kevin Scott
Diandria Wright

This project designs and implements an Internet-of-Things (IoT) enabled sprinkler system for residential applications. A local microcontroller provides control through relays to turn the sprinkler system on or off. The microcontroller board (Arduino-based) communicates via a WiFi shield with the Internet. The user can check the status of the system remotely via an app and can control the function of the system as well as collect statistics.



MECHANICAL ENGINEERING TECHNOLOGY

Team 1

Sponsor: LinkUp International

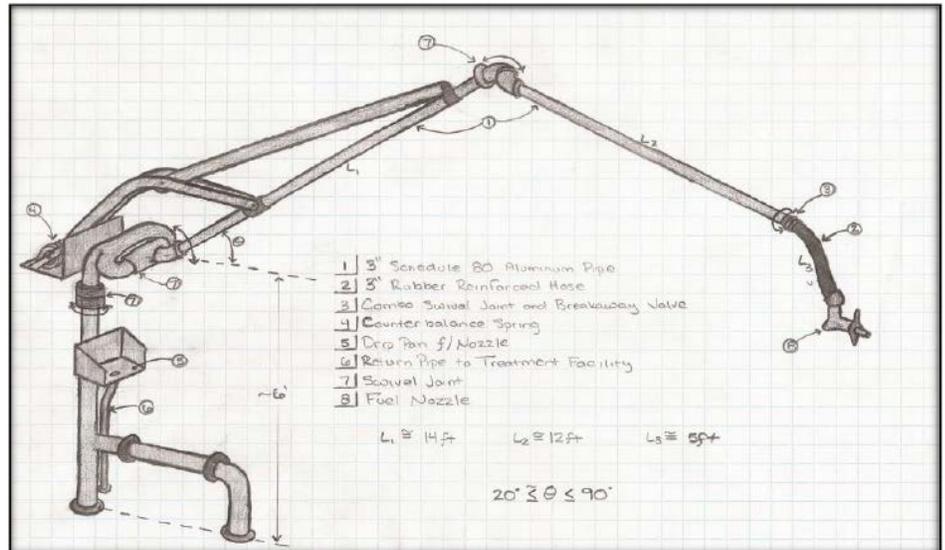
Program/Department: Mechanical Engineering Technology and Mechanical and Energy Engineering

Team Members:

William Becker
Allison Carlton
Reed Cheatham
Garrett Jonse
Drew Trojacek

The LinkUp International Fuel Crane is a unique project that will increase the overall efficiency of fueling locomotives in the railroad industry. The ergonomic design is based on the idea of using only mechanical parts that can be maintained regularly in a simplistic and timely manner. Incorporating this idea into each aspect of the

device presents many advantages that can be realized daily. When controlling the mechanism, the operator will observe that large amounts of physical exertion are not required in order to manipulate the members, movement of the device is smooth and consistent, and the wide range of positions and distances that can be reached will decrease the amount of resets that are done in order to place the locomotive within reach of the fuel nozzle. Additionally, the mechanical configuration allows for parts to be interchanged and replaced in the field by properly trained personnel. This allows workers to manage and repair necessary parts at any given point in time in order to avoid the equipment being out of commission for an extended period of time. The fuel crane also includes a waste treatment system that is intended to protect from any environmental hazards that may occur.



Team Name: Formula SAE Suspension

Sponsors: College of Engineering, Monster Tool, Bell Helicopter, Mayday Manufacturing, Fastenal

Program/Department: Mechanical Engineering Tech. ETEC

Team Members:

Reid Cloud
Trevor Davies
Clayton Geer
Kevin Hill

The University of North Texas (UNT) Mean Green Racing team is responsible for the design and manufacturing of the 2016 Formula SAE racecar suspension system. Formula SAE is a competition composed of only active college students where each participating University has a team that constructs and tests a small Formula-style racecar based on set restrictions. The prototype race car is then evaluated for its potential as a production item for the non-professional, weekend, competition market. This racecar then enters a competition located in Lincoln, Nebraska to compete against other Universities in both design and performance. This team is specifically responsible for the steering system, control arms, shocks, hubs, uprights, anti-roll bar, and tires for this racecars suspension system. SolidWorks, a type of computer-aided design (CAD) software, is used to

precisely design these suspension components to meet design specifications. Advanced suspension software and finite element analysis (FEA) is then used to test how each design responds to forces, vibration, heat, and other physical effects. This team was able to build off the foundation laid out by previous UNT Formula SAE teams by reducing weight, optimizing designs, and refining manufacturing processes. Several of our sponsors are machining parts to specifications using CNC technology.

Team Name: Formula SAE– Ergonomics

Sponsors: Fastenal, Mayday Manufacturing, Wheatridge Manufacturing, Monster Tool

Program/department: Mechanical engineering Technology ETEC

Team Members:

Travis Kerr

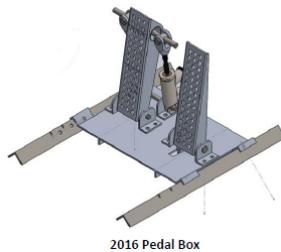
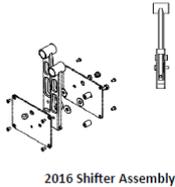
David Gradinaru

Kennith Hindman

David Robertson

Daniel Sieberhagen

William Stephens



A fictional manufacturing company has contracted us to design a small Formula-style race car. The prototype race car is to be evaluated for its potential as a production item. The target marketing group for the race car is the non-professional weekend autocross racer.

As the ergonomics team it is our task to make the car as comfortable and safe to operate as can be. The areas of the car which we are focused on are the pedal box, shifter/clutch, seat, dash, and harness. There are several rules which we need to take into consideration as we design these different components. One such rule states how much force the brake pedal must withstand, for example. We did a complete redesign of the seat, pedal box and shifter. The seat will be made of moldable foam and set to fit around the driver's body. The shifter will be simple and quick to use with the ability to up shift in one motion with an auto-clutch mechanism. The pedal box has been made lighter, more efficient and adjustable by using rails.

Team Name: T4 Impact Innovations

Sponsor: RECARO Aircraft Seating, Inc.

Program/Department: Mechanical Engineering Technology

Team Members:

Dennis Tatsch

Kimberly Krueger

Jacobus Peterson

Joseph Thompson

Our sponsor requires an impact tester so that they may observe how their aircraft seats withstand routine fatigue and abuse (e.g. trolley cart impacts, falling luggage, or kicking children).

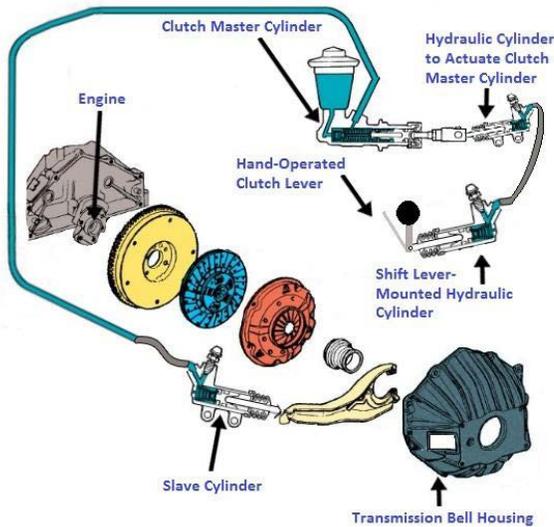
The testing apparatus is built around a pendulum with adjustable weights, and powered by a motor through a series of gears. The swinging arm is allowed to free fall thanks to a clutch mounted to the shaft. A braking system, attached to the rotary shaft, holds the impact arm at the specified height prior to testing, and will stop secondary impacts from occurring afterwards. The side supports adjust vertically, allowing for different impact positions along the seat. The seat itself is secured to a platform immediately in front of the testing apparatus. This platform uses inserts to accommodate different seat designs so that different seat models

can be tested. The entire process is automated for repeatability and user convenience. An automated test system was created using National Instruments LabVIEW, which allows for a computer to control and record test cycles. Thanks to this system, an operator can input a specific height or energy with which to impact the seat, and the impact tester would set up and conduct the test automatically.

Team Name: Manual Clutch Level Displacement

Sponsor: Self-funded

Program/Department: Mechanical Engineering Technology / ETEC



Team Members:

- Khoa Bui
- Colin Clarke
- Luan Nguyen
- Rob Rudeau

The intention of this project is to convert the foot-operated clutch pedal in a manual transmission vehicle to a hand-operated lever located on the shift lever to allow for use by a single-leg amputee. The team will make a hydraulic cylinder which will convert the new clutch lever movement into enough fluid pressure to activate the clutch assembly. The team will try to make this device as modular and noninvasive to the vehicle as possible, to accommodate users that wish to remove it from the vehicle in the future. Once the initial design is complete and installed, the team will thoroughly test the device in real world situations, such as

driving through small towns, highway driving, bumper-to-bumper traffic, and long distance driving. The team hopes to continue testing in high performance driving events, such as autocross, where the driver must react much more quickly than in everyday driving, which would require the clutch operation to be as natural as possible. Upon the project’s completion, the team would like to donate the finished device to a member’s friend that had a leg amputated after being diagnosed with cancer.

Team Name: Advanced Motorcycle Technology

Sponsor: Self-funded

Program/Department: Mechanical Engineering Technology

Team Members:

- Luis Bermeo
- Jorge Cardona
- Anson Donahue
- Brandon Johnson
- Quentin Mackie

The Advanced Motorcycle Technology team designed a new control panel for a motorcycle to help with awareness and safety for riders. The team used ultrasonic sensors to display the distance of other vehicles near the motorcycle.



Figure 1: Diagram of Sensor Detection Area



Figure 2: Project Motorcycle

These sensors will give car drivers awareness of their presence and would then sound the horn and shine a pulse of light at the vehicle that is approaching the motorcycle enough

to catch the attention of the driver. The taillight will also be reconstructed to resemble those of a car for better visibility at night. The sensors will be set off by the commands in a microcontroller. The microcontroller will provide different modes and show different “zones” of distance. The zones will be displayed on an LED screen that is mounted on the motorcycle. Figure 1 illustrates the desired area of detection for the sensors. Other issues that were taken care of were the addition of a built-in stand and a compressor. These will allow the motorcyclist to take care of a flat on the side of the road with more ease.

Team Name: Project Redesign

Sponsor: Linkup International

Program/Department: Mechanical Engineering Technology/EETEC

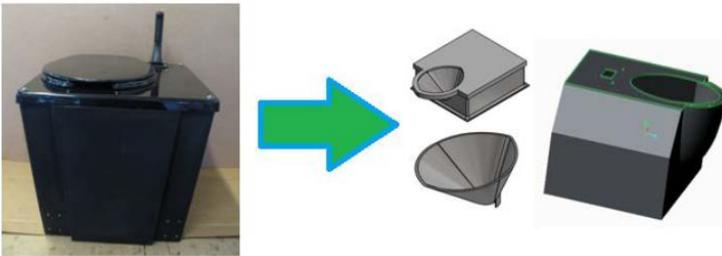
Team Members:

Angelica Aguilar

James Mason

Peter Tally

Sandeep Joseph



Linkup International enlisted Project Redesign to change selected features on their current locomotive toilet design. The company’s current design allows for easy use and the availability of exchangeable parts in the field. In case there is a problem with the pump, a new lid can be purchased and easily replaced. This reduces down time and increases productivity. Project Redesign was tasked to address

four design aspects of the toilet. The toilet height does not accommodate the height of women whose population is increasing in the locomotive industry. With the straight edge on the front of the current toilet, the legs and pants of those using the toilet are touching the holding tank. Another issue concerns the varying bathroom dimensions and door widths due to variety of locomotive models in use. To successfully address these issues, the new locomotive toilet design needs to resemble a home toilet with a round edge design on the front, decrease the height of the toilet or design a stepping stool, maintain the current design’s holding capacity, and be easy to install in all locomotive models. The final toilet design will be approved by Linkup International and locomotive companies invested in this product.

Team Name: Aeropak

Sponsor: Self-funded

Program/Department: Mechanical Engineering Technology / ETEC

Team Members:

Tyler Farmer

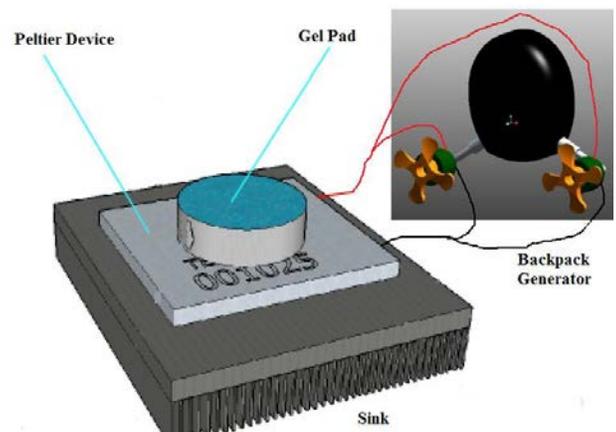
Jeff Brown

Cory Clark

Michael Lira

Tom Luepke

Our project is built around the premise of converting wind energy into electrical energy to power a Peltier device to provide heating/cooling for a wearer of a specialized gel pad armor. The armor is an insert that will be able to be used by



any motorcyclist in any jacket to further protect against road rash in the event of an accident.

The largest weather condition many people fight with is temperature. Over half of the group rides a motorcycle on an almost daily basis. All of which have failed to wear full protective gear because of the extreme temperatures. The necessity of being able to protect one's self while riding is how this project came about. This armor gives people the protection they need, while also providing personal comfort.

Our design is to use a small dc motor generator attached to a wind turbine to generate electricity to power a Peltier device attached to a gel pad to distribute a heating/cooling effect under a protective armor. The generator will be either permanently attached to the motorcycle, or set up in a portable backpack to be able to use the armor on any motorcycle, at any given time.