39th Conference on Senior Engineering Design Projects

College of Engineering and Applied Sciences
39th Conference on
Senior Engineering Design Projects

Tuesday, December 5, 2006, 9 a.m. to 3 p.m.
College of Engineering and Applied Sciences
Parkview Campus

WESTERN MICHIGAN UNIVERSITY
--Directions--

From I-94
At exit #74, turn north onto U.S. 131, go 2.8 miles, follow the directions listed below for U.S. 131.

From U.S. 131
At exit #36A, turn east onto Stadium Drive. Turn right at first light which is Drake Rd. Continue on Drake Rd. through the next light (at Parkview Ave.) into the WMU Parkview Campus. You will now be on Campus Drive.

From WMU Main Campus
From the corner of Stadium Dr. and Howard, go west on Stadium Dr. until you come to Drake Rd. Turn left onto Drake and continue south through the next light (at Parkview Ave.) and into the WMU Parkview Campus. You will now be on Campus Drive.
Conference on Senior Engineering Design Projects

You are invited to attend the thirty-ninth Conference on Senior Engineering Design Projects. The conference will be held from 9 a.m. to 3 p.m., Tuesday, December 5th, 2006 at the College of Engineering and Applied Sciences on the Parkview Campus of Western Michigan University. The College of Engineering and Applied Sciences sponsors the conference to showcase the work of its graduating seniors, who are required to complete a capstone project that puts into practice what they have learned. Many of the projects are sponsored by business and industry. The conference is free and open to the public. You are welcome to attend all or part of the day's events. Reservations are not necessary.

High school and community college teachers are encouraged to bring students to the conference. Buses can drop off passengers in the College Circle in front of the building and then park in lot P-2. (See map)

Teachers who cannot accompany their students to the conference may ask their students to sign in and out at the information table in the lobby on the first floor of the College. Sign-in sheets will be mailed to teachers the day after the conference.

Parking is available in the ramps behind the College of Engineering and Applied Sciences (See Map: Lots P3 and P4). There is no charge for parking for those attending the Conference.

Presentations begin on the hour and half hour. Please do not enter a room after a presentation has begun.

Session locations, times, and page number for project descriptions:

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A lunch break is scheduled from 12 p.m. to 1 p.m. There is a café available on site.

For more information about the conference, call Laura Decker at (269) 276-3248.
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STUDENT HOUSING DESIGN
by Nicholas Krug, Nathan Moloney, and John Paepke
Faculty Advisor: Jun-Seok Oh and Sherif Yehia
9:00 a.m. to 9:25 a.m., Room D-201

A university student housing development was designed which included civil, structural, and traffic engineering. The structural design included the design of beams, girders, columns, footings, and slabs. All roads, parking lots, and traffic signals were designed to optimize flow and safety and conform to all city ordinances. The design was done to accommodate both building space and parking accessibility. Proper drainage was also analyzed. The final design of the complex reflected the current and future needs of college students.

NEW CHEMISTRY BUILDING
by Jacqueline Frencher and Jacob Miller
Faculty Advisor: Ahmad Jrade
9:30 a.m. to 9:55 a.m., Room D-201

The construction of a new chemistry building was designed and built for a university campus. A work breakdown structure (WBS) was created to acquire a quantity take-off, prepare a schedule, and prepare a detailed cost estimate. The quantity take-off was used to identify the activities and their units. The schedule was created using the critical path method to keep track of construction progress. A project management system was created which included data collection forms, periodic reports, and a safety plan. In order to accomplish these tasks Microsoft Project, Microsoft Excel, and Primavera were used.

PARKVIEW STUDENT HOUSING COMMUNITY
by Anthony Hale, Andrew Smedley, and Michael Styf
Faculty Advisor: Sherif Yehia and Jun-Seok Oh
10:00 a.m. to 10:25 a.m., Room D-201

The lack of student housing facilities on an engineering campus has been a negative aspect and an inconvenience for those attending. To tackle this issue a plot of land was chosen in proximity to the campus which was convenient for residents. The impact on the current traffic was involved in locating this facility and a determination on how to reduce or improve current traffic patterns was made. The designed housing and supplemental facilities were meant to meet the engineering student needs. Structural design of all building members (beams, columns, slabs, foundation) was completed and achieved through the use of concrete and steel. An attempt to match the exterior with that of previously existing structures was crucial. Building codes, which included Michigan construction and Kalamazoo city zoning, were followed in the application of this design.
The growing number of students at a university required a new student housing complex to be erected. This complex was needed to accommodate and support the existing facilities. The complex provided 1,000 units of housing and social buildings. Social buildings included recreation rooms, student lounges, washer and dryer facilities, and meeting rooms. The design was multiple stories and included the structural design for the elements in the buildings. Traffic design and analysis was conducted to evaluate the impact of the proposed facility on the surrounding environment. The study also included geotechnical and environmental evaluations of the proposed site.
DUAL FUNCTION SHOCK DYNAMOMETER SOFTWARE
by Matthew Dahl
Faculty Advisor: Robert Trenary
9:00 a.m. to 9:25 a.m., Room D-206

A software package that will be used with a dual function shock dynamometer was developed, tested, and implemented. This software provided an interface to control the dynamometer, gathering and displaying data in various graphs, and saving the data for later use. The extreme programming methodology was used in the development of this software. The package was designed with an ADI layer that will later allow it to be used with a custom DAQ board that is currently being designed.

PERIODICAL SALES WITH ONLINE CREDIT CARD PROCESSING
by Andrew Ellis
Faculty Advisor: John Kapenga
9:30 a.m. to 9:55 a.m., Room D-206

A campus organization that produces an academic periodical needed a credit card processing solution to facilitate their ability to sell their subscriptions. A solution was designed under Windows using secure programming technologies that facilitated the purchase of any inventory items from a web site, using a credit card as a payment method. The solution meets all PCI (Payment Card Industry) security standards.
SURGICAL TOOL WIRELESS DATA ACQUISITION SYSTEM
by Shawn Brier, Patrick Johnson, and Aravind Mathyara
Sponsor: Stryker Instruments
Faculty Advisor: Liang Dong
9:00 a.m. to 9:25 a.m., Room D-115

A wireless data-acquisition system was constructed for heavy-duty, battery-operated surgical tools. The device was designed to sample battery terminal voltage and the current being drawn by the tool. A transmitter board was optimized in order to fit within an existing battery enclosure and the components were selected to survive the thermal stress of steam sterilization. Data samples were processed by a microcontroller and wirelessly transmitted via WirelessUSB protocol to a receiver board. A program was developed using Labview to read the data from the receiver, display it graphically, and save it to a PC hard drive.

PROGRAMMABLE MULTIPLE OUTPUT MICROCONTROLLED ADJUSTABLE POWER SUPPLY
by Megan Donajkowski, Jaclyn Leske, and Georges Tchankwe
Sponsor: Smiths Aerospace
Faculty Advisor: Bradley Bazuin
9:30 a.m. to 9:55 a.m., Room D-115

A laboratory bench top power supply unit has been developed to provide multiple sequenced signal voltages for the testing of complex avionics circuit card assemblies. The power supply system provided user programmability of up to twelve regulated voltage outputs. Each of the supply outputs was continuously monitored by an embedded microcontroller to appropriately ramp voltages, maintain stable voltage within a strict tolerance, and to provide current limiting with both automatic and manual shutdown for safety.
RADIO FREQUENCY LESION GENERATOR TEST SET
by Drew Hoffman, Jason Traczynski, and Andrew Wieczorkowski
Sponsor: Michael Strickler, Stryker Interventional Pain
Faculty Advisor: Dean Johnson
10:00 a.m. to 10:25 a.m., Room D-115

A test set has been designed and built to diagnose the proper operation of a Radio Frequency Lesion Generator (RFLG). A circuit board was designed and constructed to house all necessary hardware. To diagnose the RFLG, three parameters of measurement were needed. The test set independently measured temperature and waveform characteristics. The characteristics of focus were amplitude, frequency, and width. An impedance check was also implemented. A microcontroller was built into the test set and software developed to handle logic operations and future communication with the RFLG. The project included a broad range of hardware and software design.

VOLTAGE AND CURRENT METER DEVICE FOR A POWER SUPPLY
by Raed Khalil and Darius Machado
Faculty Advisor: Johnson Asumadu
10:30 a.m. to 10:55 a.m., Room D-115

A Voltage and Current Meter was designed to display the value of voltage and current more accurately. The design converted the input current signal into voltage. The meter used a Motorola 68HC11 micro-controller. A mechanical switch toggled the display of current and voltage on a liquid crystal display (LCD). This meter displays the value of voltage and current digitally with more decimal digits making it more convenient and accurate.

"GEO-CACHING" LOCATION SYSTEM
by Nathan Cronenwett, Robert Frantz, and Chris Sjoquist
Sponsor: Keith Ruckstuhl, Pfizer, Inc.
Faculty Advisor: Ikhas Abdel-Qader
11:00 a.m. to 11:25 a.m., Room D-115

Geo-caching exercises are used to help strengthen employee relations. Coordinators of this program experience difficulty in completing these exercises because an accurate location system is not in place. This geo-caching design utilized a handheld 915 MHZ RFID reader that located an active tag. Using phase and signal strength, the reader was able to determine distance and direction to the tag.
SURFACE MOUNT DESIGN AND FABRICATION OF A RF SPECTRUM ANALYZER

by Kachi Anyikwa, Michael LeZotte, and Shazia Peeran
Faculty Advisor: Bradley Bazuin
11:30 a.m. to 11:55 a.m., Room D-115

A spectrum analyzer was designed, fabricated, and tested to provide a handheld, low-cost measurement device for field testing Radio Frequency Identification (RFID) installations. The RFID spectrum analyzer is able to scan the 902-928 MHz RF band in 25 kHz steps, digitize the down-converted analog information, perform embedded signal processing on the data samples, and display spectral data on an LCD screen based on the desired settings. An embedded microcontroller has been incorporated to input command and control information from a keypad and direct RF scanning. To achieve size and cost goals, the prototype employed modern surface mount technology (SMT) components, layout, and fabrication tools and techniques.

SERIAL DATA STORAGE, TRANSFER, AND PROCESSING SYSTEM

by Elzbeair Mustafa, Jonathan Ross, Steve VandenBrink, and Phillip Warner
Sponsor: Michael Strickler and Andy Staats, Stryker Interventional Pain
Faculty Advisors: Janos Grantner and Ikhlas Abdel-Qader
1:00 p.m. to 1:25 p.m., Room D-115

A nerve lesion generator, used in pain-relieving medical procedures, can only print data out in tabular form. A device was needed to collect this data, make it portable, and process it in a useful way that doctors and researchers could use. Procedural data from a nerve lesion generator was collected serially and stored on a SD card. This data can be downloaded to any PC via a USB port and then exported to any database or spreadsheet program. Java software on the PC was used to manage the data and a PIC microcontroller was used to facilitate the communication between the lesion generator, SD card, and PC.

ELECTRONIC RACE CAR POSITION MEASUREMENT SYSTEM

by Juin Jack Hong, Meghbhushan Mungur, and Vui How Wong
Sponsor: Hathaway Motorsports
Faculty Advisor: Hossein Mousavinezhad
1:30 p.m. to 1:55 p.m., Room D-115

A Local Positioning System (LPS) that would triangulate and compute information, such as position, velocity, and acceleration of a race car using an array of sensors, was designed, constructed, and tested. The LPS used several circuits, a microprocessor, distance sensors, and software that triangulated the car’s position. The system then computed the race car’s velocity and acceleration. The sensors that were used provided more accurate values as compared to most sensors used for racing purposes.
PORTABLE AUDIO/VIDEO COMMUNICATION SYSTEM
by Jasmin Bajric, Christopher Early, and Bashyam Yuvaraj
Sponsor: Chris Comer, Komtronix LLC
Faculty Advisor: Ralph Tanner
2:00 p.m. to 2:25 p.m., Room D-115

A portable audio/video communication system was designed and built for the i-glasses Head Mounted Display (HMD). A conventional wired HMD required a PC gamer to remain in a relatively stationary position. However, by liberating the player from his/her desk, a wireless HMD greatly enhanced the PC gaming experience. This enhancement was accomplished by designing, building, and testing a system which consists of two units. One of the units was a microcontroller which interfaced with the PC and controlled the transmitter. The transmitter interfaced with the PC through its audio/video outputs. The second unit was a receiver that interfaced with the HMD through its conventional audio/video inputs. The receiver and HMD were powered by a custom built battery pack.

SWARM BEHAVIOR
by Karan Kohli
Faculty Advisor: Ralph Tanner
2:30 p.m. to 2:55 p.m., Room D-115

Theoretical code was implemented onto four mobile robots. The code, which had been developed in Matlab, provided a capability for a swarm of robots to navigate autonomously around an obstacle. This project redeveloped the code for the physical robots. Two of the robots used Parallax processors and two robots used Brain-Stem processors. In each case, the code was translated into the processor’s native language. The robots were then tested using several test courses.
REDSIGNING INNOVATION STRATEGIES FOR MANUFACTURING AND DESIGN

by Gregory Giudici, Eric Korbecki, Elbert Lai, and Jody Sanders
Sponsor: Tim St. Onge and Phil Newberg, Eliaison Corporation
Faculty Advisor: Betsy Aller
10:30 a.m. to 10:55 a.m., Room D-208

A major manufacturer of impact traffic doors has experienced an increase in warp in the wood cores of their doors. A virtually flat core is essential in appearance and functionality. Analysis of the current materials and manufacturing processes was performed to determine the effects of warp. Time studies were conducted to determine the actual cost of time spent on multiple wood core inspections. Using the solid modeling software CATIA, before and after designs were created. After researching alternative materials and potential new markets, recommendations were made to reduce the effects of warp while minimizing cost increases and without compromising product quality.

REDESIGN OF HOSPITAL FOOD SERVICE SYSTEM

by Kenneth Baldwin, Toby Moenke, Kyle Swanson, and Quentin Witkowski
Faculty Advisor: David Lyth
11:00 a.m. to 11:25 a.m., Room D-208

A local hospital has proven that great care goes beyond clinical performance and has committed to improving patient satisfaction via a redesign of their food service system. The hospital environment, nutritional needs, dietary restrictions, and food preparation requirements were all key factors when designing the new process. The redesign focused on defining past procedures and constraints in an effort to highlight areas for improvement. Service system blueprinting, flow process analysis, job shadowing, cost analysis, and time studies were used to develop recommendations based on providing the highest service quality while minimizing cost to the hospital.
DEVELOPING A SAFER MOLD TRANSPORTATION METHOD
by Daniel Evans, Gerald Harris, Jonathon Robins, and Scott Tindall
Sponsor: Alcoa - Engineered Plastic Components
Faculty Advisors: Betsy Aller and Joseph Petro Jr.
11:30 a.m. to 11:55 a.m., Room D-208

A local plastic injection molding facility expressed safety concerns with their mold handling process. Employee safety is the most important value in this company’s continued success. Using Single Minute Exchange of Dies (SMED), time and motion studies focusing on ergonomics, and CAD software such as Pro-E, a new process was designed to safely transfer various mold units from storage to the injection molding machine. Through this process, injury risk factors were reduced while maintaining standards for production downtime. Final recommendations for improved material handling procedures and equipment options were given.

DESIGN FOR MANUFACTURE AND ASSEMBLY (DFMA) FOR OFFICE FURNITURE COMPONENTS
by Josh Brien, Brian Cervin, Paul Marsman, and Chris Wylin
Sponsor: Bryan Albers, Phil Berridge, and Eric Sundburg, Herman Miller, Inc.
Faculty Advisor: Mitchel Keil
1:00 p.m. to 1:25 p.m., Room D-208

The competitiveness of the office furniture manufacturing industry demands companies simplify design and increase productivity. Using Design for Manufacturing and Assembly (DFMA) methodology, the redesigned structural interface for modular furniture focused on the reduction of parts to ease assembly for the operator and consumer. Prototype models were developed and tested in a virtual environment according to the manufacturer’s specifications using Pro/Engineer and Finite Element Analysis (FEA). Schematic process models were used to streamline the assembly toward lean manufacturing. The improved design of the system component will provide cost savings by reducing part count to ease operator assembly time.

REVERSE AND RE-ENGINEERING DESIGN PROCESS TO COMBINE A CHASSIS WITH POWERTRAIN
by Joshua Leyrer, Matthew Rutledge, Scott Seckel, Scott Spencer, and Michael Woods
Faculty Advisors: Fred Sitkins, Thomas Sutton, and Pavel Ikonomov
1:30 p.m. to 1:55 p.m., Room D-208

In order to remain both competitive and innovative, the automotive industry is continuously looking at ways to adapt already successful products into new designs. This strategy was incorporated in the re-adaptation of a donor chassis and powertrain from different manufacturers by using accepted reverse and re-engineering practices. Modifications to existing components and all new components were designed using Pro/Engineer and then analyzed using Finite Element Analysis (FEA). Analyzed designs were fabricated using standard manufacturing processes. The result was an operational chassis that takes into account all safety concerns.
STANDARDIZATION OF LABELING AND THE LABELING PROCESS IN HEALTH CARE

by Ryan Linenfelser, Josh Schilling, Manav Thusu, and Donny Wilson
 Faculty Advisor: Larry Mallak
 2:00 p.m. to 2:30 p.m., Room D-208

The health care industry is constantly being pressured to eliminate human error. By working with several departments at a regional healthcare system, an improved labeling protocol for medications and intravenous solutions was developed. Decisions for the improved labels were based on the needs of each department, durability, and a cost benefit analysis of alternative labeling designs. In addition, process flow mapping and benchmarking were used to determine the new labeling process. The results of this standardization will ultimately reduce human error and improve the labeling process within the hospital, promoting a safer environment for all patients.
PORTABLE VEHICLE LIFT SYSTEM
by Joel Boynton, Corey Case, and Mark VanHoutteghem
Sponsor: Hathaway Motorsports
Faculty Advisor: Judah Ari-Gur
9:00 a.m. to 9:25 a.m., Room D-109

A vehicle lift system was designed to bring a wide variety of automobiles to a height that allows basic service to be performed. The purpose was to develop a space saving lift system that is attractive to people who do their own vehicle maintenance. The designed system provides increased portability and is safe to operate. The design was verified through computer aided design, Finite Element Analysis (FEA), and prototype testing.

MOTORCYCLE QUICK MOUNT
by Randy Burkhardt and Casey Staniec
Faculty Advisor: Judah Ari-Gur
9:30 a.m. to 9:55 a.m., Room D-109

A safe, easy-to-use motorcycle transportation mount was designed. It improved on the existing method of transportation, using tie downs, which is unsafe and can damage the motorcycle handle bars and front suspension. The new design is composed of a bolt on mechanism to lock and secure the motorcycle and it allows for an easy operation of loading and unloading. It was verified through Finite Element Analysis (FEA) and prototype testing.

ENGINE REDESIGN FOR SUPERMILEAGE COMPETITION
by Gerard Mouatt and Ray Gillis
Faculty Advisor: Richard Hathaway
10:00 a.m. to 10:25 a.m., Room D-109

A single cylinder engine was redesigned for maximum fuel economy. The engine will be used to power a vehicle in a SuperMileage Competition. The combination of newly fabricated and modified base components along with an integrated electronic control system optimized the engines fuel efficiency. New components were designed using engine analyzing computer software along with a cylinder-head flow bench and a camshaft dial indicator. The rebuilt engine was tested and tuned using a water-brake dynamometer, allowing for the best possible fuel efficiency to be achieved.
AUTOMATIC SMART MIRROR SYSTEM
by Reid Arnott and Robert Brunetz
Faculty Advisor: Richard Hathaway
10:30 a.m. to 10:55 a.m., Room D-109

An automotive smart mirror system has been developed to aid in the reduction of blind spots caused from improperly adjusted vehicle side mirrors. The automotive smart mirror system that was engineered positions the mirrors for any person in the driver seat at a pre-determined angle that diminishes unnecessary blind spots caused by improper manual alignment. The smart mirror system uses a lens which locates the driver’s eyes and, through the use of computer programming, the side mirrors are coordinated to position at the exact location determined. The smart mirror system thus creates a higher degree of safety on the road by reducing blind spots commonly generated from manual alteration of vehicle side mirrors.

CONVEYOR SYSTEM REDESIGN
by Tabby Christie, Christopher Roeder, and Russ Willacker
Sponsor: Art Austin, Austin Sand & Gravel
Faculty Advisor: Dennis VandenBrink
11:00 a.m. to 11:25 a.m., Room D-109

A gravel conveyor system was analyzed, optimized, and redesigned utilizing modern simulation technology. The new design corrected various structural and safety concerns. With these issues addressed, a drawing model of the conveyor was produced for reproduction of the design in the gravel industry.

AUTOMATED PALLET INDEXING SYSTEM
by Sam Donaldson, Chris Kopcheck, and Ron Sucik
Sponsors: Denso Manufacturing Michigan, Inc.
Faculty Advisor: Ho Sung Lee
11:30 a.m. to 11:55 a.m., Room D-109

An automated pallet indexing system has been designed and implemented for a new radiator assembly line. Prior to the new system, a manual method of pallet retrieval was used. The manual pallet retrieval caused the operator to leave the machinery in order to retrieve pallets for assembly. The new automated pallet indexing system decreases downtime, improves ergonomic conditions, and reduces the workload of the associates by bringing the pallets directly to the workstation. The scope of the project includes the design, cost analysis, testing, simulation, modifications, and installation of the automated pallet indexing system.
NOISE REDUCTION OF PUMPS IN A HIGH EFFICIENCY WASHING MACHINE
by Matt McLean and Greg Stevens
Sponsor: Whirlpool Corporation
Faculty Advisor: Koorosh Naghshineh
1:00 p.m. to 1:25 p.m., Room D-109

A new washing machine was redesigned to reduce the noise levels of both the recirculation and the drain pumps. Many different situations were tested to represent normal household use. Sound level data was collected from the two pumps which were isolated from the rest of the cycle noises. Different mount locations, mounting methods, and materials were tested to help reduce the sound levels. From all of this information, recommendations were made on how to reduce both the overall amount of noise radiated from these pumps and to reduce the total cost of the washing machine.

REDESIGN OF FRONT LOADING WASHING MACHINE VENTILATION SYSTEM
by Jacob DeWind, Tamika Donaldson, and Morledge Dorris
Sponsor: Whirlpool Corporation
Faculty Advisor: Koorosh Naghshineh
1:30 p.m. to 1:55 p.m., Room D-109

To prevent suffocation of a child who may accidentally become trapped inside a washing machine that is not operational, manufacturers incorporated a ventilation system. One such ventilation system, currently housed in the laterally loading washing machine, was redesigned to reduce the cost of production. The redesigned ventilation system was modeled using computer aided design software and analyzed using the Fluent software before a prototype was built. Airflow characteristics were tested using this prototype to determine if suffocation would occur if a person is entrapped inside the machine while the machine is not in operation. The new design was found to be superior to existing design.
ALTERNATE MALE CONNECTION DESIGN FOR MATING WITH FEMALE PIPE THREAD PORT
by Chad Carpenter, Travis LaCombe, and Dan Symons
Sponsor: Parker Hannifin
Faculty Advisor: James Kamman
9:00 a.m. to 9:25 a.m., Room D-204/5

An alternate fitting for connecting to a female Dryseal American Standard Taper Pipe Thread (NPTF) fitting was developed to reduce overall assembly time of air brake systems for class A trucks. A cyclic design process of concept generation, solid modeling, and Finite Element Analysis (FEA) was used to develop a prototype for experimentation. Results from this experimentation led to a new design that assembles in less time than a standard NPTF male fitting. The cost, assembly effort, and disassembly time of the new design are comparable to that of the standard NPTF fitting.

DESIGN AND FABRICATION OF A PUMPKIN LAUNCHER
by Robert Abele, Kyle Davidson, and David Vogel
Faculty Advisor: James Kamman
9:30 a.m. to 9:55 a.m., Room D-204/5

A pumpkin launcher was designed and fabricated based on established constraints. The launcher was modeled after trebuchets used in the Middle Ages and built for the purpose of competition use. Pumpkin launchers designed for tournaments were studied and evaluated based on performance and efficiency. Concepts were then generated and dynamic and Finite Element Analysis (FEA) were used to determine the most effective design. As a result the final trebuchet design was constructed to specification and tested for overall proficiency. Modifications to the machine were then made to improve the performance behavior.

DESIGN OF A DYNAMIC ANKLE BRACE
by Aaron Gilbert and Christopher Vukonich
Faculty Advisor: James Kamman
10:00 a.m. to 10:25 a.m., Room D-204/5

An ankle brace was designed to allow for dynamic movement while incorporating gait impact and weight reduction. The purpose of this brace is to aid those who have a weakened or injury prone ankle, allowing them to resume normal physical activities without risk of further injury. This was done by allowing the afflicted joint to traverse through a limited innocuous range of motion similar to that of a healthy ankle, without permitting overextension of the joint. Impact reduction was also integrated into the design by means of bypassing a portion of the forces through the brace itself and by distributing the remaining forces over the entire base of the foot. The resultant brace design was found to aid in proper restriction of ankle rotation and impact reduction while concurrently allowing for a desirable range of ankle motion.
LVDT SENSOR SYSTEM DESIGN FOR THE MTS TENSION TESTING MACHINE
by Corey Flues and Travis Lipski
Faculty Advisor: Daniel Kujawski
10:30 a.m. to 10:55 a.m., Room D-204/5

The MTS tension testing machine was converted from an inoperable condition to a fully controlled, operable system. The inoperability was resolved using LabVIEW in connection with a Data Acquisition Card (DAQ) to control user inputs and display obtained results. The DAQ card monitors a Linear Variable Displacement Transducer and controls the displacement of the grips containing the specimen during testing. Within LabVIEW, a user-friendly interface was designed in addition to graphical data presentation. Numerous calibration tests were performed to collect data which was compared with published data to prove proper accuracy.

COOLANT SYSTEM MANAGEMENT REDESIGN FOR TRAMP OIL REMOVAL
by Marc Anderson and Brandon Buckhout
Sponsor: Thomas Peter Hudson, Parker Hannifin
Faculty Advisors: Ho Sung Lee and Iskender Sahin
11:00 a.m. to 11:25 a.m., Room D-204/5

A mobile oil/coolant separator was designed to efficiently separate coolant from tramp oil contaminants. The current techniques do not separate the tramp oil efficiently due to the quick moving fluid. The system was designed to remove tramp to prevent the formation of harmful bacteria that can form in the coolant. The system used pumps to move oil/coolant mixtures from the machines to be processed. A skimming head was designed to pump the coolant from the surface of the fluid in the trough to the separator. The reusable coolant is fed back into the central system and the tramp oil is disposed of appropriately. Evaluation of the design efficiency was determined by experimental and model testing for the amount of tramp oil removed.
K3 HEADBOX OPTIMIZATION
by Michael Flynn II and Christopher Lovell
Sponsor: Mark Cline and Norm Russ, Graphic Packaging International
Faculty Advisor: Margaret Joyce
10:30 a.m. to 10:55 a.m., Room D-202

The K3 cylinder paperboard machine currently utilizes seven headboxes. All the headboxes had different jet velocities which led to runability issues on the machine. Upon reviewing the current data available an optimal efflux ratio is 1.0. A design of experiment (DOE) was designed to adjust the efflux to 1.0 and determine its effectiveness. Adjustments to the varying headboxes and their individual jet velocities led to improvements in paper quality and machine runability. Improvements in these areas reduced offgrade and saved the company money. Controlling the efflux ratio and maintaining a uniform sheet was key to the success of this project.
THANK YOU

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