1st Annual College of Engineering Cooperative Education Symposium

Tuesday October 18th, 2005

Arkansas Alumni House

4 – 7:30 pm

Sponsored by Pratt & Whitney
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Foam: The Bubbles You Don’t Hate to Burst

Meredith Bruick, Chemical Engineering
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Domtar is an environmentally driven company that strives to produce quality paper products in the U.S. and Canada. Domtar-Ashdown is a bulk fine paper mill that produces about 2600 tons of paper per day. Since the beginning of this year the paper machines have experienced a surface foam issue, which creates many unnecessary problems with production efficiency and quality. While aiding in finding a solution, the opportunity has arisen to work with chemical suppliers, paper testing facilities, and many paper machine employees in an attempt to alleviate this problem. The finding of a temporary solution has been effective, and our work with Paprican has brought us to our conclusions about the foam’s origin.

Presenting author short bio: Meredith Bruick was born and raised in Fort Smith, Arkansas. Before attending the University of Arkansas, she was a student at Southside High School. When she is not on co-op, Meredith works for the University of Arkansas as an engineering recruiter.

Presenting author’s plans for the future: Meredith Bruick plans to complete her undergraduate degree in chemical engineering in May 2007. From there, she hopes to find an engineering position within the paper industry and someday earn her masters in business administration.
SAM’S CLUB Gas Impact Analysis

Gustavo Canton, Industrial Engineering
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SAM’S CLUB is a wholesale warehouse retail company with more than 560 clubs and 300 fuels stations around the country. It offers low cost and the convenience of the one stop shop. In order to satisfy its members, the company has invested and it is planning to invest a significant amount of money in new fuel stations. The objective of the project was to measure the effect of gas stations in membership revenue and in-box sales lift given that fuel represents a very important part of SAM’S CLUB business and image.

SAM’S CLUB’S objective is to use motor fuel retailing to find new profit centers. Their fuel division believes that motor fuel sales could bring more members into their clubs by offering low fuel prices, mainly upon opening stations.

This initiative aims at providing the company with a systematic and objective tool to help decide where to effectively locate new gas stations in the clubs.

Presenting author short bio: Gustavo grew up in Panama City, Panama. He attended to the Technological University of Panama in Panama City in which he obtains his bachelor’s degree in Mechanical-Industrial Engineering. Later on, he gained some work experience in his field by working for Multi Credit Group, a Panamanian financial institution.

Presenting author’s plans for the future: Gustavo came to Fayetteville in 2002 and he is currently working in his master’s degree in Industrial Engineering. After he finishes his master’s program, he is planning to stay in United States working in the field of data analysis, optimization and/or logistics.
Boeing Integrated Defense Systems (IDS) combines weapons and aircraft capabilities, intelligence and surveillance systems, communications architectures and extensive large-scale integration expertise across its seven customer-facing business units. The Air Force Systems business unit of IDS, along with the Defense Advanced Research Projects Agency (DARPA) is currently in an effort to demonstrate the technical feasibility, military utility and operational value of the Joint Unmanned Combat Air Vehicle (J-UCAS) X-45 for both the Air Force and the Navy. The X-45C is currently being designed as an improved demonstrator over the X-45A that will more closely represent the operational system as currently envisioned and conduct demonstrations for both the Navy and Air Force. The Subsystems Integration team is responsible for the release of Build-To-Packages for their specific responsibilities of the plane in order to have the X-45C join the demonstration program in 2006. For the team to reach this goal, they needed assistance in modeling supplier parts, creating and finalizing custom labels, release of identification markers, creating marker collector files, designing mounting brackets, and creating fasteners collector files.

Presenting author short bio: Chris grew up in Vilonia, Arkansas. He went to Vilonia High School and graduated in the top ten percent of his class. He was highly involved in the band program and was captain of the tennis team. He also continued his involvement with band at the University of Arkansas. He continues to pursue leadership opportunities as Treasurer of the Arkansas Society of Mechanical Engineers and as a member of 12:8 Leadership at University Baptist Church.

Presenting author’s plans for the future: From his Cooperative Education experience at Boeing, Chris confirmed his intention to graduate with a Mechanical Engineering degree. Although he has developed a high interest in the Aerospace/Defense Industry, he wants to explore more options within the field of mechanical engineering. He will go back to Boeing for his third co-op term in summer of 2006 and in the meantime will look for another opportunity for the summer of 2007.
Support for Our Troops

Sean Paul Dorey, Mechanical Engineering
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Lockheed Martin is the leading defense manufacturer in the United States, and it was a privilege to work in the HIMARS (High Mobility Artillery Rocket System) program. During the co-op, there were several opportunities for special projects that either directly or indirectly affected manufacturing. Some of those included designing a special transportation device for damaged hydraulic manifolds, designing a new process for electrical bond areas, designing a mobile hydraulic pin press, and designing a fluid-containing device for uncontrolled hydraulic fluid. Most of these projects started from a notion, but soon became reality after design and proof of concept.

Presenting author short bio: Sean Dorey originally grew up in Williamsport, PA and graduated from Prairie Grove High School in Prairie Grove AR, before continuing his education at the University of Arkansas. His love for engineering has stemmed from his love for modifying and restoring ex-cop cars.

Presenting author’s plans for the future: Upon the successful completion of his bachelor’s degree in mechanical engineering, Sean plans on working in a manufacturing industry. He would also like to run his own custom design shop, creating and manufacturing specialty automotive parts.
L’Oreal Powders

Erin Fritsche, Industrial Engineering
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L’Oreal is one of the world’s largest cosmetics manufacturers. The L’Oreal USA division is headquartered in New York City and manufactures several well known brands of cosmetics. The North Little Rock facility manufactures Maybelline and L’Oreal products.

This summer the powders department concentrated on improving quality, safety, and production rate on the packaging floor. There were several steps taken to initiate this project. A time study was performed on the most inefficient line, which allowed adjustments to be made to the equipment and processes. Productive maintenance manuals were also created and updated. These were effective steps for beginning this project.

Presenting author short bio: Erin Fritsche grew up in Fort Smith, AR. She graduated Greenwood High School in 2002.

Presenting author’s plans for the future: Erin Fritsche is currently pursuing a degree in Industrial Engineering. She will graduate in December of 2006 and is considering graduate school.
The world is slowly but surely moving towards an energy crisis of gargantuan proportions. While various alternatives have been suggested such as hydrogen and fuel cells, they are still not considered commercially viable for automobiles. Therefore, for the short and medium term (5-20 years) hybrid electric vehicles (HEV) are thought to be the answer for drastically reducing the consumption of fossil fuels in the USA.

The Oak Ridge National Laboratory (ORNL) spearheads an effort under the “FREEDOM CAR” project to develop efficient power electronic circuits that can be used in the next generation HEVs. Silicon carbide (SiC) devices have an order of magnitude better performance than their silicon counterparts. This enables voltage source inverters constructed with SiC devices to have higher efficiencies and therefore perform better in hybrid cars. To enable circuit designers to build and prototype systems, accurate models are necessary. Models were built for SiC diodes and JFETs and they were validated with characterized data from actual devices available at ORNL. These validated models were then used to build inverters such as those used in HEVs. It was conclusively shown from the testing and simulations that SiC devices are have superior performance for HEV applications.

Presenting author short bio: Avinash Kashyap was born in India. He completed his B. S. in Electrical and Electronics Engineering from Calicut University, India. He graduated with a Masters in Electrical Engineering in 2004 from Arkansas. Avinash is also a recipient of the Walton Doctoral Academy Fellowship and has authored numerous peer-reviewed publications in the area of silicon carbide devices.

Presenting author’s plans for the future: Avinash is currently a Ph. D student in the EE department. He would like to be involved in corporate R&D after the completion of his Doctorate degree.
Design and Installation of Cutter Water Filter Elements

Alice Keogh, Chemical Engineering
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Eastman Chemical Company is a global company that supplies billions of pounds of chemicals, fibers, and plastics to customers for use in thousands of consumer products. At Eastman's Texas Operations, over 60 major chemical and plastic products are manufactured and sold to customers worldwide. In the low density polyethylene process, there were problems with the cutter water filter being unable to collect all the fuzz and fines. The lack of collection of this material caused the exchanger to foul which resulted in frequent replacement of the exchanger. To resolve this problem, it was necessary to communicate with vendors and work with engineers that were familiar with this system to design filters that would be advantageous to the process. The filter baskets were replaced with alternative baskets along with other filtering elements to collect more fuzz and fines which will decrease the fouling and regular replacement of the exchanger.

Presenting author short bio: Alice Keogh was born in Baton Rouge, Louisiana, but moved to Little Rock, Arkansas at a young age. She graduated 10th in her class from Parkview Arts and Science Magnet High School in May of 2002. While attending the University of Arkansas, Alice also works as a recruiter for the College of Engineering.

Presenting author’s plans for the future: Alice is currently attending the University of Arkansas and pursuing her Bachelors of Science in Chemical Engineering. She plans to graduate in December of 2006 and start working in industry as a chemical engineer.
Tracking and Improving RFID Reads

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In order to improve its supply chain, Wal-Mart started using the RFID technology about one and a half years ago. As a member of the RFID strategy team, I was assigned two projects. The first one was to optimize the code of the RFID readers. I came up with an algorithm that has improved the speed of RFID reads by 40% and increased the capacity of the EPC number from 55 to 64 bits. My second project was to write a report generator that keeps track of the vendors that are tagging and the merchandize that is being tagged with the RFID tags.

Presenting author short bio: Nabil Lehlou was born and raised in Oujda, Morocco. In June 2001, he graduated from OMAR high school, where he was majoring in math, physics and chemistry. While attending the University of Arkansas, Nabil also works as a math/French tutor and is involved in many organizations on campus.

Presenting author’s plans for the future: Nabil intends to graduate with a Bachelor of Science in computer science with a minor in math in May 2006. Next, he plans to pursue a Masters in Computer Engineering and an MBA while working as a programmer.
WayLink Systems Corporation is a U.S. based technology company founded in Fayetteville Arkansas which specializes in automated highway data collection and analysis. Some of the recent projects conducted by Waylink include surveying the city of Fayetteville, Atlanta airport runways, and selling two Digital Highway Data Vehicles to China. One of the key technology features provided by Waylink is a laser based road roughness measurement system which samples at rates up to 64,000 measurements per second with an accuracy of one millimeter. Lasers for road inspection are typically mounted on the front of the vehicles. Vehicle chassis movement causes laser output be distorted by its own movement. To solve this problem, Waylink has developed a method to filter out laser movement in real time by adding an accelerometer sensor to sense the acceleration of the laser together with a modified disturbance observer algorithm to calculate laser movement. An accurate road profile is obtained by subtracting laser movement from laser sensor measurement.

Presenting author short bio: Son Nguyen was born in Ho Chi Minh City, Vietnam. After finishing two years in Ho Chi Minh Polytechnics University in Vietnam, he transferred to the University of Arkansas in 2002. He got his Bachelor degree in Electrical Engineering, Summa Cum Laude, in 2004. He is pursuing his master degree under funding from a joint project between Dr. Roy McCann (Electrical Engineering) and Dr. Kelvin Wang (Civil Engineering – President of Waylink Systems Corporation) to improve power system performance of Digital Highway Data Vehicles and especially real time signal processing for road roughness analysis.

Presenting author’s plans for the future: Son Nguyen plans to graduate in May of 2006 and start working in industry as an electrical engineering specialize in real time signal processing and control system.
APEI, Inc. performs research, product design, and product development in the broad technical areas of electric power systems, power electronics, and electric machines. This small R&D firm specializes in high temperature power electronics able to operate in extreme environments and reduced weight as a result of reduced heatsink size. Certain factors must be considered when designing printed circuit boards carrying such circuitry. Several substrates have been compared and contrasted, the choice of which is ultimately dependent upon application and cost. Control and power circuitry have drastically differing heat density and current carrying requirements. This allows for a combination of substrates to be used on the same system. These were a few of several factors considered during the project designs of this work tour.

Presenting author short bio: Bradley Reese was born in Hope, Arkansas and lived in Springhill, Arkansas most of his life. He moved to Texarkana, Texas to start high school and graduated from Texas High School with the class of 2002. He currently serves as the president of Eta Kappa Nu and vice-president of IEEE and still works part-time for APEI.

Presenting author’s plans for the future: Bradley Reese plans to graduate from the University of Arkansas in May 2006 with a Bachelor of Science in Electrical Engineering. Upon graduation, he intends to work for APEI full time while pursuing a Master of Science degree in Electrical Engineering at the University of Arkansas.
For nearly 100 years, The Boeing Company has been at the fore front of both commercial and military aviation. During the summer of 2005, I was granted an internship with the company’s Integrated Defense Systems unit (IDS) in Renton, Washington and assigned to work on the U.S. Navy’s newest project, the P-8A Multimission Maritime Aircraft (MMA.) While there I assisted the Flight deck and Avionics design team in the task of compiling avionics system requirements and design specifications necessary to meet the needs of the Navy in fulfilling the aircrafts assigned missions. In particular I worked on the Flight Management Computer system and the Air Traffic Control systems.

Presenting author short bio: Nathan Richard graduated from high school in Van Buren, Arkansas in 1992. In 1993 he enlisted in the U.S. Navy where he spent 6 years working as an avionics technician on the P-3 Orion aircraft, the predecessor to the P-8A. After that, he worked for another 4 years as an avionics technician at the Northwest Arkansas Regional airport. With the slowing of the aviation industry subsequent to September 11, 2001, Nathan decided to return to school. Nathan enrolled in classes for the Electrical Engineering course at the University of Arkansas in August 2003 and is currently in junior standing in that program.

Presenting author’s plans for the future: Nathan is currently pursuing a double major in both Electrical Engineering and Physics. He hopes to use his education in the areas of avionics systems improvement and new systems design to further safety and reliability in the aerospace industry.
Design and Production of PWM Motor Controller

Daniel Ruiz, Electrical Engineering
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Courtney Electronics, Inc. is an electronic design and manufacturing company that specializes in dc brushed motor controllers. CEI has developed a comprehensive line of completely solid-state motor controllers, which have proven to be very reliable and with a long useful life. However, in order to compete in today’s market, the complete line of controllers needs to be updated – a microcontroller will replace all the existing logic components. One of the new models, the MP4 12V dc PWM motor controller is scheduled for full production by the end of 2005. The design finalization stage included design of the firmware architecture, modifications to the hardware design provided by the system engineer, meetings with the costumer’s technical and management personnel, prototyping, design and supervision of production testing, and delivery of the first lot of MP4s to be tested in the field.

Presenting author short bio: Daniel Ruiz, from Tegucigalpa, Honduras, is an MSEE student research emphasis of DSP design. He completed undergraduate degrees in electrical engineering and digital media arts at John Brown University in Siloam Springs, AR. As an undergraduate, Daniel was actively involved in student government, the engineering club, and Students in Free Enterprise (SIFE).

Presenting author’s plans for the future: Daniel’s thesis research will contribute to the design of implantable microprocessor circuitry to treat paralyzed facial muscles. After completing the MSEE program, Daniel plans to continue working in the electrical engineering field, and still be heavily involved with design. He plans to concurrently pursue an MBA, which shall provide the training necessary to contribute to engineering both from and outside the lab workbench.
Change with Value

Erik R. Seabolt, Industrial Engineering
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Ayrshire Electronics is a printed circuit board assembler that currently manufactures high, mid, and low mix products utilizing surface mount, auto insertion, and hand placement methods. Ayrshire currently has 350-400 employees working first and second shift. During the summer of 2005, Erik Seabolt began a process improvement project for Ayrshire’s biggest customer on the continuous flow line.

The customer added 40,000 units on the order for September and increased the orders for future months to 30,000. Objective: 1. What is Ayrshire’s capacity with existing conditions? 2. How do we maximize capacity? After completing a time study, Erik Seabolt determined that Ayrshire did not have accurate production standards and correct staffing to satisfy the customer’s order. After completing a simulation, Erik further tested his assertions by modifying the production line and staffing for three randomly chosen days. With confirming results, Erik presented his findings to the President of Ayrshire along with an implementation guide and follow-up projects. Annual savings are projected to be $170,000, 14 operators are needed instead of 16 (the 2 extra operators used for cross training), and operator efficiency will be increased by 22%, product flow increased by 68%, and 84 production days were saved for additional production.

Presenting author short bio: Erik Seabolt grew up in Rudy, AR but attended Alma schools. He is the first member of his family to attend college. He played little league sports until the seventh grade when he developed tendonitis in his knees. Wanting to stay active, Erik joined the school band where he played the tuba and baritone for five years. While in high school, he took honors courses, joined the Naval Junior Reserve Officer Training Corps, and dated his future wife. Erik once again stepped onto the football field as a senior and starter. Erik became a high school graduate May 2002.

Presenting author’s plans for the future: Erik will ‘officially’ become an Industrial Engineer in August 2006. He desires to stay in the area but he will carefully evaluate his options when a decision must be made. His career focus is on quality, process, and production improvement, health and safety, and robotics.
Delphi Diesel Catalyzed Particulate Trap (DCPT)

Thet Naing Soe, Department Of Chemical Engineering
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Delphi Catalyst is a manufacturer of catalytic converters for automobiles, and various vehicles. Delphi has been actively involved in advancing diesel catalyst technologies to meet more stringent future diesel emission standards. Delphi Diesel Catalyzed Particulate Trap (DCPT) is used to prevent particulate matter (PM), also known as soot, generated from diesel-engine combustion, from exiting the tailpipe. Scale-up work was needed to insure a smooth transition from research through large-scale production. The purposes of this project were to perform scale-up work, to establish process procedures, and to coat a precise amount of catalysts on each filter substrate. Ten-gallon DCPT slurry batches were made using small scale processing equipment. The slurry was applied to wall-flow cordierite filters by using a coater. The coated filters were calcined at high temperatures to stabilize the catalysts on the filters. The procedures for manufacturing these parts were established as the first step of the scale up process. The amount of catalysts on each substrate using the coating method developed was within the specified range.

Presenting the author’s short bio: Thet Naing Soe was born in Mawl Myine, Myanmar, also known as Burma. After finishing the sixth grade, Thet moved to the capital of Burma, Yangon, with his family, and attended No. (2) Basic Education High School, Dagon. In 2002, Thet came to the United States and started his undergraduate degree in chemical engineering at the University of Arkansas, Fayetteville. Now, he is doing a co-op with Delphi Catalyst for one year and expecting to graduate in May, 2007.

Presenting the author’s plans for the future: Thet is planning to pursue a career in developing catalyst technologies as chemical engineer.
Detecting Plastic Shrinkage Distresses in Bridge Decks

Webb Winston, Civil Engineering
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Waylink Systems Co. is an innovative technology firm that specializes in highway data collection. This company has developed a Digital Highway Data Vehicle (DHDV) that has implemented a real-time system for pavement surface cracking survey. Waylink’s technology has always allowed the collection of 1 mm crack resolution, but with increased technology, Waylink was able to magnify this resolution to 0.125 mm, because the contraction and expansion cracking in bridge decks can be this small. The cracking was mapped using a vehicle equipped GPS. The survey was done at highway speeds, and the data was compared to manually collected data, which proved to be sufficient.

Presenting author short bio: Webb is a senior Civil Engineering student that grew up in Tuckerman AR, and attended high school at Newport High School in Northeast Arkansas.

Presenting author’s plans for the future: Webb plans to graduate in December 2006 with a BSCE. He then plans to enter a junior engineering position in pavement materials or pavement management for four years. After four years, he plans to sit for the professional engineering exam and become a P.E. After two or three years in a management or supervisors position, he plans to open his own firm with possible partnership and begin his life-long career.
Acknowledgements:

We are grateful for the support provided by Pratt & Whitney in helping us host this event.

We appreciate the employers who have made the Cooperative Education experiences possible and to the supervisors who have mentored our students.

We are very grateful to June Brosius and the staff at the ERC for printing the posters, and Anthony McAdoo at the Arkansas Alumni Association for providing such a wonderful location for the event.

Thanks to Rick Boozey with Microsoft Corporation for sharing with us the need for balance in education and the workplace.

And a special thanks to all of the judges, many of whom traveled great distances to come and evaluate the posters and to share their experiences with our Professional Development Institute students.

Many of the details of this event were adapted from the Undergraduate Research Symposium at the University of South Florida.