University of Connecticut

School of Engineering

School of Business

Department of Mechanical Engineering
Department of Chemical, Materials & Biomolecular Engineering
Department of Operations and Information Management

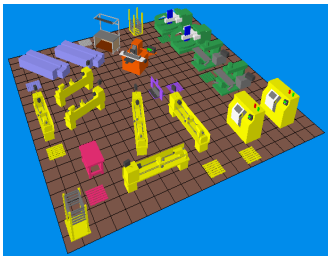
MEM SENIOR DESIGN PROJECTS

2006-2007







Friday, April 27, 2007, 12:30 – 4:00 PM

School of Business Building – Room 112

The MEM Program presents the MEM 215W class Senior Design Projects. This class is devoted to the investigation, analysis and solution of industrial problems, from detecting the source of the problem, to redesigning hardware, to proposing an improved machining and production process. The projects are sponsored by some of Connecticut's most prominent companies.

The MEM 215W Spring 2007 class on April 20, 2007.

From left to right;
First row: Joseph Lagosz, Mu Li, Glen Carnahan, Mia Pilchman, and Stephen Clark;
Second row: Brandon Pearce, John Leibfried, Sean Powers, Gregory Guroian,
Stephanie M. Vornle von Haagenfels, Ekta Gandhi and Professor Manuel Nunez;
Third row: Michael Allen, Richard Buskey III, Charles Thistle, Paul Millerd, Kevin Wilson,
Isaiah Sykes and Professor Zbigniew M. Bzymek;
Absent from the picture: Alvaro Rodriguez, William Dolce, and Daniel Arpaia.

(Photo by Tom Mealy)

Senior Design MEM 215W
Class of 2006-2007

Michael David Allen
Daniel Cameron Arpaia
Richard Allen Buskey III
Glen Edward Carnahan
Stephen Michael Clark
William Dolce
Ekta C. Gandhi
Gregory Garabed Guroian
Stephanie M. Vornle von Haagenfels
Joseph Andrew Lagosz
John Peter Leibfried
Mu Li
Paul R. Millerd
Meetul Dipak Patel
Brandon Albert Pearce
Mia Veronica Pilchman
Sean Edward Powers
Alvaro Enrique Rodriguez
Isaiah Sykes
Charles Harold Thistle
Kevin B. Wilson

MEM 215W Spring 2007 Final Presentations Agenda

Friday - April 20 — Center for Undergraduate Education, Room 318

TIME	TEAM	SPONSOR	
14:20	2	Sikorsky Aircraft	Sikorsky 76D Weight Reduction

Friday - April 27 — School of Business, Room 112

TIME	TEAM	SPONSOR	TITLE
13:00	8	Sikorsky Aircraft	Offshore Engineering Collaboration
13:20	1	TRUMPF	Laser Attachment and Assembly Operation Improvements
13:40	5	TRUMPF	Evaluation of Core Competencies
14:00	4	GE	Power Break II Production Analysis and Improvement
14:20	6	Pratt & Whitney	Jet Water Stripping
14:40	7	Pratt & Whitney	P&W Power Systems Process Automation
15:00	3	CCAT	Quest Modeling
15:20	All teams	MEM Senior Design	General Discussion
15:40	All teams	MEM Senior Design	Summary and Results

Sikorsky 76 D Weight Reduction

Team: Michael Allen, Richard Buskey, Glen Carnahan
Sponsoring Company: Sikorsky Aircraft
Faculty Advisors: Prof. Zbigniew M. Bzymek, Prof. Manuel Nunez
Company Consultant: Mr. Gene Frohman

The Sikorsky Logo and a general view of the new executive helicopter

(www.sikorsky.com)

The Sikorsky Aircraft Corporation is a worldwide leader in helicopter production. Their newest aircraft, the S-76D is set for sale in Mid-2008. In order to gain a competitive advantage, the S-76D needs to be able to fly long distances without the need for re-fueling. One of the easiest ways to make an aircraft fly farther is to make it lighter. By researching the automobile industry and how they make their cars lighter, the team was able to come up with ideas on how to lighten the aircraft. BTIPS principles were also used, more specifically the minimization and nanotechnology theories.
The research was broken down into three parts: there were materials, processes and products. The materials research focused on lighter stronger materials than the current material in the S-76D. The processes were parts of the manufacturing process which would help lighten the aircraft by removing items such as excess welds and rivets. The product research consisted of identifying older technology in the aircraft and finding new "off the shelf" technology that could replace it.

The S -76 D Sikorsky corporate helicopter (www.sikorsky.com)

Offshore Solutions

Team: Steve Clark, Charles Thistle, Kevin Wilson
Sponsoring Company: Sikorsky Aircraft Corporation
Faculty Advisors: Prof. Zbigniew M. Bzymek, Prof. Manuel Nunez
Company Consultant: Mr. Gene H. Frohman

The communication screen with WebEx software

The goal of this project is to analyze and provide recommendations for overcoming the barriers that Sikorsky Aircraft Corporation will face during the implementation of an offshore engineering collaboration program. The example offshore relationship used for this project is a partnership between locations in Connecticut and Hyderabad, India. The project consists of a cultural analysis based on the Geert Hofstede model, a time zone difference examination, a discussion of the emotional attachment and its role in "offshoring," and a web conferencing software comparison for the evaluation of communication technologies for offshore programs. Software testing was completed with five of the industry leading web conferencing programs available and WebEx™ was chosen based on a number of characteristics including security, audio and visual capabilities, and file and application sharing features.

Mounting a Coaxial Laser

Team: Gregory Guroian and John Leibfried
Sponsoring Company: TRUMPF INC
Faculty Advisors: Prof. Zbigniew M. Bzymek, Prof. Manuel Nunez
Company Consultants: Kai Moellendor, Sandro List, Matthias Wild

A coaxial laser mounting (Photo with permission of TRUMPF Inc.)

TRUMPF is a manufacturer of many types of machinery including punch press machines. The company currently has a process used to assemble these punch pressing machines. The process involves five steps during which a coaxial laser must be bolted to the larger, uncompleted punch press machine. It has been determined that the process for mounting the coaxial laser is inefficient. The current process utilizes an overhead crane, making it both time consuming and somewhat dangerous.

A new process must be developed to lift this near 500 kg laser onto the punch press machine without the use of the overhead crane or any external power sources. The process must be efficient, using only one worker, and is to be completed in less than five minutes. Safety, quality, cost, material and ergonomics must be taken into consideration in order to reach an optimal solution.

An assembly analysis of the current method must be performed and analyzed for problems. Recommendations of alternative methods for mounting the laser will then be made and evaluated for potential benefits and risks. The optimal alternative method will be taken and a preliminary design will be proposed. This new processes will enable TRUMPF Inc. to more efficiently assemble the punch press machine while saving the company's resources.

Core Competences Evaluation

Team: Isaiah Sykes, Ekta Gandhi, William Dolce
Sponsoring Company: TRUMPF INC
Faculty Advisors: Prof. Zbigniew M. Bzymek, Prof. Manuel Nunez
Company Consultants: Kai Moellendor, Sandro List, Matthias Wild

A laser printing TRUMPF machine whose production was included in team's analysis

(Photo from the TRUMPF USA website)

The project consists of the evaluation of Core Competences in the TRUMPF Inc. Assembly Department by the University of Connecticut MEM team. Core Competences enable the company to deliver unique value to their customers. They embody an organization's collective understanding of how to coordinate diverse production skills and integrate multiple technologies. Understanding Core Competences allows companies to invest in the strengths that differentiate them and set strategies that unify their entire organization. The team has studied three groups of production components and has collected information such as capacity requirements, purchasing volume of these components as well as their sources. In a discussion with representatives from different areas the items have been classified by strategic importance and profitability. With this analysis the team has provided recommendations for further steps, including in-house production or outsourcing alternatives. These alternatives should be further evaluated, with consideration of benefits and risks. This project will help TRUMPF Inc. develop its production strategy and re-focus limited resources on the most beneficial tasks.

Large Frame Power Break II LEAN Manufacturing

Team: Paul Millerd, Stephanie Vornle von Haagenfels
Sponsoring Company: General Electric
Faculty Advisors: Prof.. Zbigniew M. Bzymek, Prof. Manuel Nunez
Company Consultant: Mr. Doug Sutter, Mr. Reginald Mingot, Mr. Jeffrey Gordon

Large Frame Breakers production lines (Photo with permission of General Electric)

General Electric (GE) Consumer & Industrial manufactures and assembles the large frame Power Break II circuit breaker in their Plainville, Connecticut plant. They are currently operating at maximum capacity, producing, on average, 10-12 circuit breakers per day [6]. It is the goal of the team at General Electric to increase this capacity to meet unsatisfied demand. The ultimate target is to be able to produce 22-24 circuit breakers per day by using the existing infrastructure, with minimal capital investment. Our project team was composed of multiple GE representatives, University of Connecticut faculty, and ourselves (undergraduate Management & Engineering for Manufacturing (MEM) students). Trips to the plant exposed several inefficiencies with the process, namely, the poor placement of materials around the cell, the variation of process from worker to worker and breaker to breaker, and the redundancy of multiple workers doing the same process.

An initial four step process was analyzed and broken down into five stations. We improved the material preparation station by improving the layout and implementing part kitting of the large parts. The base station was divided into a two step process, and each station now involves a simpler, shorter process. The dress up station was kept the same, with the step involving the addition of stickers to the cover moved to another station. The testing station was kept the same, but when there is idle time, the operator will attach stickers and buttons to the cover. These steps were implemented into a new cell layout. With the changes implemented, and our further recommendations in this report, we feel that General Electric can reach their goal of a capacity of 22-24 circuit breakers produced per day. Just an increase of one additional circuit breaker produced per day will increase annual revenues by $2.21 million, and profits by $1.69 million.

Hybrid Water Stripping

Team: Joseph Lagosz, Brandon Pearce, Mia Pilchman
Sponsoring Company: Pratt and Whitney
Faculty Advisor: Prof. Zbigniew M. Bzymek, Prof. Manuel Nunez
Company Consultant: Mr. Scott Elliott

Pratt & Whitney strives for superiority in the production and repair of gas powered engines, both on the ground and the in air. The pursuit of quality must be accomplished safely, effectively and efficiently. Aligned with these ideologies, Pratt & Whitney's Power Systems division desires an alternative method to repair blade coating defects after their metallic plasma coating processes. The improvement in the repair process of these blades will increase quality, decrease hazards, decrease costs and ultimately be much more environmentally friendly. This project explores the possibility of utilizing a hybrid water jet stripping process by combining the abrasiveness of garnet with the flow of water in one heterogeneous jet. Ultimately, Pratt and Whitney's goal is to develop a robust new system of stripping these parts that will decrease scrap, increase quality, and promote environmental safety.

Hybrid Water Stripped machine parts (Photo with permission of Pratt & Whitney)

Manufacturing Process Automation

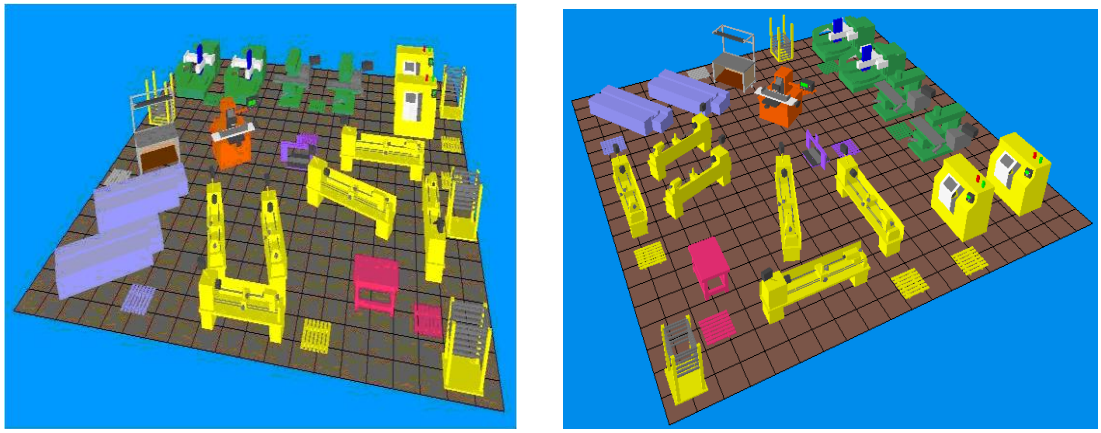
Team: Daniel Arpaia, Meetul Patel, Alvaro Rodriguez
Sponsoring Company: Pratt & Whitney Power Systems
Faculty Advisors: Prof. Zbigniew M. Bzymek, Prof. Manuel Nunez
Company Consultant: Mr. David Maher

Pratt & Whitney power systems (Photo with permission of Pratt & Whitney).

The process improvement will automate an existing business function that is currently being performed manually. The goal for the team is to create a process improvement that will improve efficiency, accuracy, and consistency. The ideal solution is an automated process where the documents are created simultaneously using a visual basic application. The documents are generated from a central source. The centralized data source eliminates independent document generation, maintaining consistent and accurate documents. There are several software applications that can create multiple forms from a central data base. The existing documents (Scope of Supply, Requirements Document, and Cost Sheet), are all generated in Microsoft Excel, so a convenient application is Visual Basic for Applications (VBA). The team's familiarity with this software application made it the logical choice as the platform to create the automated process.

Quest Modeling for Manufacturing

Team: Mu Li, Sean Powers
Sponsoring Company: CCAT
Faculty Advisors: Prof. Zbigniew M. Bzymek, Prof. Manuel Nunez
Special thanks for help and advice to: Prof. David Crow
Company Consultants: Mr. Tom Scotton, Mr. Jonathan Fournier



Machine arrangements of two example factories simulation (solutions proposed by the team)

This project analyzes the computer simulation program Quest and its ability to aid engineers in building computer models for manufacturing processes. The project is cosponsored by the University of Connecticut School of Engineering, the School of Business, and the Connecticut Center for Advanced Technology. The project will use data recorded from a company in the aerospace industry. This information will be input into a Quest simulation model and run to see where bottlenecks form and what the optimal batch size should be. The Quest software should prove to be a powerful tool in assessing what changes should be made to a factory before incurring actual capital investments. Quest's visually interactive simulations and also make it easy to show nonprofessionals the effects that changes in the factory setting will have on production.

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MEM 215 Spring 2007 Visit to Trumpf USA on February 2, 2007

Mr. Sandro List greets the class in the Company's Conference and Training Center

MEM Society Dinner on April 15, 2007

The MEM 215W Spring 2007 students, some MEM alumni, Ass. Dean Marty Wood and Prof. Z. M. Bzymek during the Annual MEM Dinner in the University of Connecticut Foundation

Mr. & Mrs. Gene Frohman's visit to UConn April 15, 2007

Mr. and Mrs. G. Frohman, the MEM 215W Spring 2007 students, and MEM alumni in the University of Connecticut Foundation

Sikorsky 76 Weight Reduction Final Presentation on April 20, 2007

Final Presentation of the Sikorsky 76 D Weight Reduction team on April 20, 2007 during the video conference (Richard, Mike and Glen standing, Mr. G. Frohman –on the monitor above - listening from the Sikorsky video conference room in Stratford, CT)

Guest Lecturer

Mr. Gene Frohman
Sikorsky Aircraft

"*Designing a New Civilian Helicopter*"

Sponsoring Companies

Connecticut Center for Advanced Technologies

General Electric

Pratt & Whitney

Pratt & Whitney – Power Systems

Sikorsky Aircraft

Trumpf USA

The MEM 215W Spring 2007 Senior Design Brochure was compiled from the student teams' Entries and the class material by Z. M. Bzymek, with technical help from Miss Alla Komissar. The publication was reviewed by Prof. Manuel Nunez.
Edited by: Ms. Emily Jerome. Copy made by FedEx Kinko's in Hartford Connecticut.

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