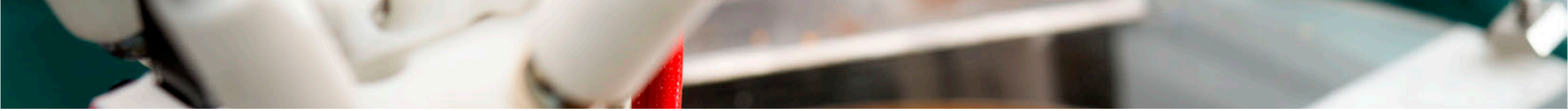
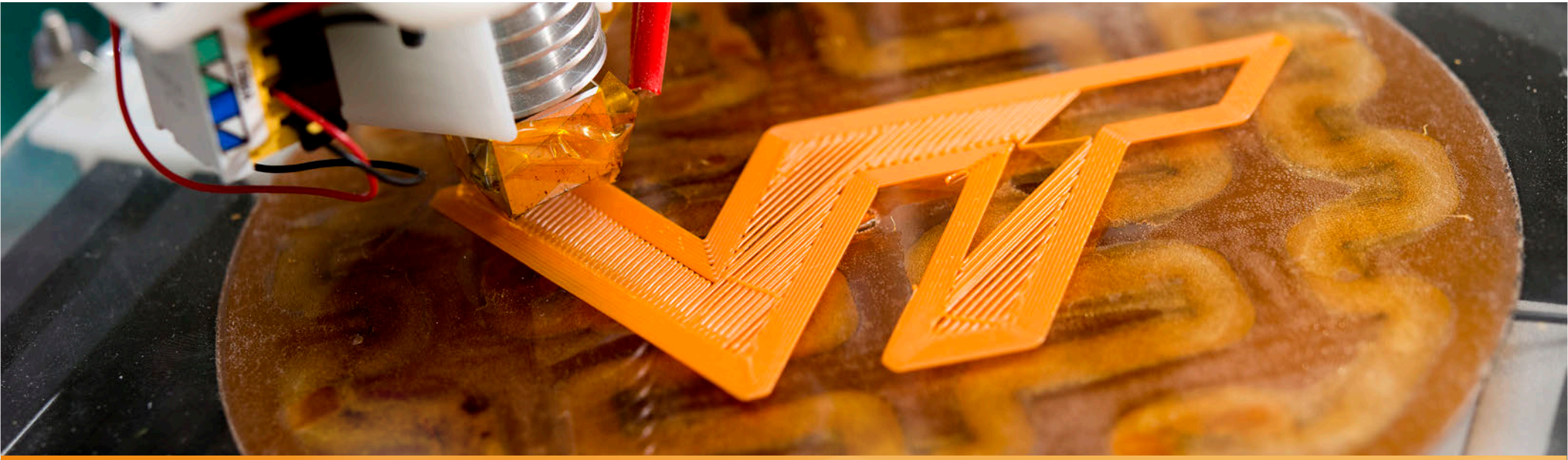


Grado Department of Industrial and Systems Engineering

SENIOR SYMPOSIUM & UNDERGRADUATE RESEARCH POSTER SESSION



Thursday, April 27, 2017

The Inn at Virginia Tech & Skelton Conference Center • 901 Price's Fork Road, Blacksburg, VA

Time Line

Registration	12:00 - 5:30 p.m.	1st Floor Foyer
Capstone Poster Session*	12:00 - 3:00 p.m.	1st Floor - Latham A & B
UG Research Poster Session*	12:00 - 3:00 p.m.	1st Floor Foyer
Capstone Project Presentations	1:00 - 5:15 p.m.	2nd Floor (See Itinerary)
Reception and Awards	5:30 - 6:30 p.m.	1st Floor - Latham A & B

**Students will be present at poster presentations from 12 p.m. – 1 p.m.*

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ITINERARY

Concurrent Presentation Sessions

	Drillfield	Duck Pond	Smithfield	Cascades A	Cascades B
	Moderator: Dr. Natalie Cherbaka	Moderator: Dr. Barbara Fraticelli	Moderator: Dr. Manish Bansal	Moderator: Dr. Alejandro Salado	Moderator: Dr. James Kong
Times:	**Impact Awards**	**Innovation and Creativity Awards**	**ISE Methods and Tools Awards**	**Dashboard Design**	**Process Improvement**
1:00 - 1:30 p.m.	**Corning** *Team #9*	**Roanoke City Public Schools** *Team #26*	**Northrop Grumman** *Team #23*	**CCAM** *Team #8*	**Blacksburg Transit** *Team #6*
1:30 - 2:00 p.m.	**AmeriCare Plus** *Team #5*	**Morgan Rhea** *Team #22*	**RADVA** *Team #25*	**Radford Army Ammunition Plant (RFAAP)** *Team #33*	**Across The Way Productions** *Team #2*
2:00 - 2:30 p.m.	**VT Athletics** *Team #38*	**VT Athletics** *Team #37*	**Formula SAE Team** *Team #35*	**VFP** *Team #17*	**Pulaski Grow** *Team #24*
2:30 - 3:00 p.m.	**Carilion Clinic** *Team #7*	**VA Dept. of Mines** *Team #34*	**HunterLab** *Team # 18*	**Applied Felts** *Team #36*	**English Meadows Senior Living** *Team #11*

3:00 - 3:15 Session Break

Please join us after a 15 minute break for our session two.

ITINERARY

Concurrent Presentation Sessions

	Drillfield	Duck Pond	Smithfield	Cascades A	Cascades B
	Moderator: Dr. Natalie Cherbaka	Moderator: Dr. Carolyn Duncan	Moderator: Dr. Blake Johnson	Moderator: Dr. Alejandro Salado	Moderator: Dr. Divya Srinivasan
Times:	**Location Based Decisions**	**Process Improvement**	**Scheduling/ Inventory Management**	**Warehouse Management**	**Facility Design**
3:15 - 3:45 p.m.	**Roanoke Police Department** *Team #28*	**Metalsa** *Team #21*	**Spectrum Brands** *Team #30*	**General Electric** *Team #13*	**Lewis Gale Hospital** *Team #20*
3:45 - 4:15 p.m.	**UPS** *Team #31*	**InMotion** *Team #19*	**Aeroprobe** *Team #3*	**Amcor Rigid Plastics** *Team #4*	**General Electric** *Team #14*
4:15 - 4:45 p.m.	**UPS** *Team #32*	**Spectrum Brands** *Team #10*	**Seven Springs Farms** *Team #29*	**Eastman Chemical** *Team #12*	**General Electric** *Team #15*
4:45 - 5:15 p.m.	*OPEN*	**ABB** *Team #1*	**Roanoke Police Department** *Team #27*	*OPEN*	**High Liner Foods** *Team #16*

PROJECT ABSTRACTS

Team 1: Connecting Our World

Members: Jared Gloss
Fernando Gutierrez
Eric Lands
Manuel Saavedra

Faculty Advisor: Dr. Robert Sturges

ASEA Brown Boveri (ABB) is a Swedish-Swiss multinational company with a facility located in Bland, Virginia that specializes in dry-type transformers. The team was tasked with designing an alternative fastening technique of sheet metal panel walls on indoor transformer enclosures. The new design on this project culminated in decreasing the number of hardware pieces (nuts, bolts, washers, etc.) used to fasten the panels to the posts in order to reduce labor time on the assembly floor. The new design also resulted in a new assembling method of the panel walls that is made for ease of removability and assembly, along with a reduction of connection points. If this project solution is implemented fully it will result in a large decrease in labor time, labor difficulty, and cost of assembly.

Team 2: FloydFest Parking Lot Functions and Transportation Logistics

Members: John Bean
Yunseo Lee
Alvaro Morales
Elizabeth Roberson

Faculty Advisor: Dr. Laurel Travis

Across the Way Production is a live music event planning company that is responsible for Floydfest, a 5-day long world music festival. Floydfest offers off-site parking and transportation to all attendees; however, long wait times for shuttle buses to and from the festival grounds has led to overall customer dissatisfaction with recent festivals. Due to the popularity of the festival and an anticipated growth of 2000 customers in the coming years, the transportation and parking logistics must be restructured to accommodate this growth. The senior design team evaluated the current ticket structure and parking logistics currently in place to find the optimal assignments of ticket types to parking lots. From this information, a discrete event simulation was made to find the amount of buses and scheduling of the system needed in order to ensure short wait times and customer satisfaction with the ticket increase. With customer satisfaction maximized, retention rates and growth to the festival will allow Across the Way Productions to remain viable and profitable.

PROJECT ABSTRACTS

Team 3: Dynamic Probe Calibration Scheduling Tool

Members: Konnor Houff
Samantha Leong
Marleigh Olson
Aleco Reynolds

Faculty Advisor: Dr. Nathan Lau

Aeroprobe Corporation is a company headquartered in Christiansburg, Virginia that manufactures and calibrates custom-designed, micro-machined air probes. One operator is responsible for scheduling and performing all calibrations; understanding this schedule is critical in determining whether or not additional customer orders can be accepted and integrated within the calibration schedule. Multiple iterations of a new tool were introduced and tested with the operator until a fully customized solution was reached. This electronic tool provides a visual representation of the calibration schedule which increases ease of use and accessibility within different departments of the company.

Team 4: Amcor Material Handling Improvements

Members: Iman Adam
Max Guzinski
Ashleigh Schaar
Aaron Schulz

Faculty Advisor: Dr. Xi Chen

Amcor Rigid Plastics, located in Wytheville, Virginia, opened their doors ten years ago and since then, the volume and product mix have drastically increased raising the need for a change in their material handling processes. The current operations have created a system that does not allow the forklift operators to do all of their job tasks efficiently and leads to feedback another operator being required. On the blow-molding side of the facility, the team is implementing new visual and audio alert systems for the forklift drivers for when processes have stalled, as well as redistribution of responsibilities. With injection put away, the team is designing a staging area for each injection machine to decrease the time it takes the forklift driver to do each put away movement. The goal of the project is to reduce the number of forklift drivers in the blow-mold and injection put away areas from three to two and a half. For injection put away, the team's solution will elimate the need to add more operators; while for the blow-mold put away, the total amount of forklift drivers will be decreased by half a personnel; this operator is now partially freed up to assist in other areas of the facility.

PROJECT ABSTRACTS

Team 5: Customized Patient Solution

Members: Abby Armstrong
Somer Hand
Niki Khandelwal
Sam Meaux

Faculty Advisor: Dr. Joseph Gabbard

The team worked with Devin who has a genetic disease called Muscular Dystrophy. After meeting with Devin, the team recognized the need to build an ergonomic keyboard, desk, and footrest to address his significant daily challenges. The joint team, consisting of both Mechanical Engineering and Industrial and Systems Engineering students, has worked to define the problem, generate concepts, perform research, create prototypes, evaluate the design, build the products, and conduct testing. By designing and building these products, the team hoped to increase Devin's mobility by providing him a portable workspace, increase his productivity by integrating an ergonomic keyboard that will increase his typing speed, and decrease the swelling in his feet through the addition of a footrest to his existing wheelchair. Ultimately, the goal of this project was to make Devin more independent from his caretakers while improving his quality of life.

Team 6: Bus Parking Technology Assessment

Members: Alexandre Fanet
Yifan He
Corey Hering
Alexandra Oggero

Faculty Advisor: Dr. Joseph Gabbard

Our team worked with Tim Witten at Blacksburg Transit to assess, select and test a technology to automatically locate buses within the Blacksburg Transit housing facility. The housing facility does not have any restrictions on parking and no automatic way to map buses once they are parked. This was causing a problem with labor hours and preventative maintenance. After an assessment was completed to determine the best technology, barcode scanners were selected as the best option. The solution included using barcode scanners programmed with raspberry pi's converted into a map format in order to automatically locate and visualize buses in the facility. This solution dramatically decreases labor hours necessary for location, helps with preventative maintenance issues, and aids facility logistics.

PROJECT ABSTRACTS

Team 7: Automated Pharmacy Inventory Control Tool

Members: Stephanie Brininstool
Andrew Emery
Danielle Knust
Rae Wallace

Faculty Advisor: Dr. Niyousha Hosseinichimeh

Carilion Clinic for-profit pharmacies are located at five different locations throughout the Southwestern Virginia area. Their inventory control process takes hours of manual work to update and maintain. With the new tool, we will be able to reduce time spent setting Periodic Automatic Replacement (PAR) levels and increase accuracy for future drug orders. The tool is an automated Excel sheet that forecasts new PAR levels based on historical data, suggests new PAR levels to client, and is then uploaded into their drug ordering system, QS/1. The tool is dynamic and will be used at all five retail pharmacies. This automated tool will streamline all PAR level setting tasks into one single location to save the client time and increase PAR forecasting accuracy.

Team 8: Visual Operations Dashboard

Members: Anna Frazer
Kristen Pastor
Annabel St Louis
Stefani Via

Faculty Advisor: Dr. Alejandro Salado

The Commonwealth Center for Advanced Manufacturing (CCAM) is a collaborative organization that conducts innovative manufacturing research. CCAM is a small but quickly expanding organization and the team is developing a virtual dashboard to provide a centralized view of company operations to increase oversight. The senior design team used an iterative design process to develop the dashboard to ensure continuous feedback. CCAM will use the final dashboard to keep a pulse on key operational metrics. The team will also propose a war room design where the dashboard could be displayed. The use of the dashboard is expected to enable more efficient communication and decision making. This efficiency should support CCAM's efforts to drive necessary behaviors and stabilize operations.

PROJECT ABSTRACTS

Team 9: Corning Finishing Area "Playbook" Development

Members: Jerry Chen, Alex Lowe, Tim Slade, Ben Sowell

Faculty Advisor: Dr. Divya Srinivasan

Corning Inc. is a multinational Fortune 500 Company; the plant in Blacksburg produces ceramic substrates used in catalytic converters by car manufacturers. The plant has recently seen a decline in labor productivity in the finishing end of their manufacturing process and requested a "playbook" or set guidelines for how to best staff the lines. In order to create a playbook, the team performed time and motion studies,analyzed line flow, and worked with historical data. The solution took two forms: a physical playbook detailing the staffing procedures for standard product situations and an Excel tool that is able to make up-to-date live projections for a given shift. The finishing area project will save Corning Inc. money by raising labor productivity and will help to lessen the learning curve of new shift managers.

Team 10: Bio-Bag Process Improvement and Future State Analysis

Members: Joseph Gebicke, Sean Jones, Kaitlin Roelofs, Guillem Secanell Riu

Faculty Advisor: Dr. Eileen Van Aken

The Blacksburg facility of Spectrum Brands manufactures a disposable aquarium filter cartridge called the Bio-Bag as part of the Pet, Home & Garden division. Because of the low reliability of the machines and high dependency on manual labor, Spectrum Brands is looking to justify the purchase of a new machine that will streamline the current process and eliminate the need for three separate machines. The team proposes a tiered approach to this problem, which includes suggestions for short-term improvements to the current system and a tool that calculates potential cost savings for different performance levels of a future machine. The initial short-term suggestions will help increase worker productivity, reduce machine downtime, and decrease labor hours until a new machine can be purchased. The cost analysis of the current process suggests that designing a new machine to replace the current process will save Spectrum Brands enough money to meet the required three-year payback period.

PROJECT ABSTRACTS

Team 11: Facility Maintenance Plan: English Meadows Senior Living Home

Members: Caroline Abbott
Yus Johnson
Claire Petrie
Mohannad Shaheen

Faculty Advisor: Dr. Blake Johnson

The client, Twenty/20 Management, hired Team 11 to analyze and remedy their on-site maintenance plan for the Bedford location. They were experiencing the negative effects of reactive maintenance and desired a more proactive system to reduce costs and increase work efficiency to lead to higher resident satisfaction. The company already had a management platform in place, Direct Supply TELS, which was not fully utilized. The team designed an implementation plan that spanned three main categories in TELS: asset data collection, preventative maintenance work scheduling, and personnel training. As a result, TELS more effectively facilitates communication and maintains deadlines within the maintenance crew, consequently operating a leaner facility.

Team 12: Performance Films Warehouse Improvement

Members: Antonio Fazio
Andre Mallqui
Johnny Rebman
Kyndal Stakes

Faculty Advisor: Dr. Kimberly Ellis

Eastman Chemical Company, recognized as a Fortune 500 company, is a global manufacturer of chemicals, fibers, and plastics materials. This project deals with the advanced materials segment of Eastman, specifically the do-it-yourself (DIY) product warehouse in Fieldale, Virginia. The warehouse is experiencing problems with congestion, worker safety, and space utilization. Past sales data, product data, and existing warehouse practices were analyzed to establish the current state of the warehouse. In addition, two alternative future state configurations involving a new machine location were proposed by the team. A discrete event simulation model was developed to compare the current state configuration to the future state configurations of the warehouse to provide a recommendation to facility managers. The future state configurations offer the opportunity to improve space utilization, decrease congestion, and reduce safety issues.

PROJECT ABSTRACTS

Team 13: Communication and Display Design

Members: Jon Gordon
Muneeb Hameed
Rachel Landers
Kendall Urie

Faculty Advisor: Dr. Nathan Lau

GE Controls and Power Electronics in Salem, Virginia manufactures and tests equipment needed for electric power infrastructure. The facility is one of GE's oldest facilities and is in need of a modernized communication system to effectively and efficiently communicate safety alerts and plant information across the facility. The team will develop a plan for GE to integrate a communication system utilizing display monitors which will be placed throughout the facility based on ergonomic principles. Along with the implementation plan for the displays, the team will provide a human factors tool to output mount height based on the viewer's distance from the monitor, a cost/benefit tool to help assess the value of additional display monitors, and presentation templates to quickly deploy content based on user interface strategies. The implementation of the detailed communication system integration will improve safety communication and, as a result, reduce injury rate throughout the facility. In addition, valuable time will be saved from communicating alerts via display monitors rather than daily safety meetings. Management will eventually have the ability to update the facility through an effective and efficient modern communication system which will keep the employees well informed.

Team 14: Ecomagination: Lighting Evaluation and Implementation Plan

Members: Eddie Gerow
Ashley Ryan
Nikki Slaughter
Brandi Wells

Faculty Advisor: Dr. John Casali

The Virginia Tech senior design team met with an environmental health and safety (EHS) team from the General Electric facility in Salem. The EHS team indicated that the main focus for this project would be developing an implementation plan for a new system of lighting that would decrease utility costs by increasing the efficiency of the system throughout the facility. The Virginia Tech team took an inventory of the existing lighting system, conducted research to conclude which replacement bulb would be the most efficient for the facility, and consulted GE's primary vendor to develop a realistic estimate for the implementation of the new lighting system. The final solution was to replace the existing fluorescent lights with LED tube lights that can fit into the lighting fixtures GE is already planning to implement throughout their plant. Once these bulbs are in place in the facility, based on previous similar case studies that have already been completed, the team is confident that GE Salem will see a decrease in costs associated with energy consumption as well as labor.

PROJECT ABSTRACTS

Team 15: General Electric Salem Facility Remodeling Plan

Members: Alex Branham
Devin Fitts
Mathew Woodmancy
Juan Zuluaga

Faculty Advisor: Dr. Maury Nussbaum

The General Electric Plant in Salem, VA, a plant that has provided electrification and automation solutions since 1955, was in need of a plan to complete remodels to their facility. The majority of the facility has not been remodeled since it first opened its doors, and today it is riddled with uneven flooring and dimly-lit production areas which have combined to create a possibility of danger to the workers, an outdated place for them to work, and problems when it comes to moving material throughout the facility. In order to complete this remodel, a plan must be constructed to break down the facility into manageable, smaller zones that could be remodeled one at a time without halting production in any way. Our team considered many variables in order to create a tool that would output accurate cost and time estimates, as well as a schedule for the zone remodels that can be implemented by General Electric when funding becomes available. We feel our project will help General Electric add value to their property, increase worker safety and satisfaction, and ultimately will put General Electric in a position to continue providing excellent service to their customers.

Team 16: High Liner Foods Pack-Out Area Layout Redesign

Members: Mariano De Socarraz-Novoa
Taylor Jenkins
Rachael Qualley

Faculty Advisor: Dr. Divya Srinivasan

In 2016, High Liner Foods closed one of its three seafood manufacturing facilities and moved those products to their Newport News, Virginia facility. This increase in product caused the facility to become too crowded with equipment and created ineffective and redundant processes in its pack-out area, leading to a less than optimal throughput rate. The goal of Senior Design Team 16 is to improve the layout of the facility in order to increase throughput and make processes within the pack-out area more effective using a three year implementation plan that will be delivered to the client. The team has applied tools such as facility design, simulation, and lean principles to redesign the facility to increase space utilization, safety, and throughput in the pack-out area. Once the three year plan is implemented, the Newport News facility will be able to increase their throughput while decreasing the cost of production, making the pack-out area more efficient.

PROJECT ABSTRACTS

Team 17: Business Process Improvement Through System Advancement

Members: Jenna Craig
Theo Jolley
Nicholas Mattingly
Moriah Viviano

Faculty Advisor: Dr. Christian Wernz

Our client Is VFP, a medium size prefabricated building manufacturer headquartered in Salem, VA. The problem we addressed was the wide array of legacy systems and redundancies in their business processes. We have implemented a short-term project management tool to streamline day to day operations. We are currently creating a road map to build a permanent custom solution built specifically for VFP. This solution will consolidate legacy information systems, reduce redundancies and rework, and create a short-term solution that will enhance project management and provide automated project updates.

Team 18: Lean Redesign of a Manufacturing Process

Members: Taha Ashayer-Soltani
Amerigo Contini
Mark Crowley
Colin Ferrigno

Faculty Advisor: Dr. John Shewchuk

Our team is working with HunterLab, a low-volume manufacturing company, which currently produces spectrophotometers based on a sales forecast that leads to excess inventories. We are helping HunterLab go lean by implementing a build-to-order methodology and new procedures for U-line production. A DMAIC implementation plan was used to analyze and improve the current process based on observation and previously recorded data. We are presenting a final solution that includes new standard operating procedures and practices to help HunterLab transition from a traditional to a lean manufacturing processes. This project decreased required inventory, customer lead times, and worker utilization for HunterLab's highest volume products.

Team 19: Motor Wire Insertion Optimization

Members: Ryan Atwood
Brett Caine
Zhongting Han
Alex Meholic

Faculty Advisor: Dr. Robert Sturges

InMotion's difficulties lie in the wire winding process for its 2" power steering motors, while the very similar 3" motors have no issues at all. The team was tasked with observing, identifying, and improving the yield of the 2" motors to match that of the 3". In order to accomplish this, the team employed single-variable analysis by adjusting machine parameters and observing for changes in output quality. This allowed for identification of the problem variable and for relevant adjustments to be made to improve the process. This project allowed InMotion to gain a better understanding of their own system, as the equipment was inherited and much of the machine knowledge was buried away in binders. This also allows for decreased production costs, as a lower defect rate decreases the amount of time spent performing rework on bad motors.

PROJECT ABSTRACTS

Team 20: Facility Planning and Redesign of Food Services

Members: Brian Kelleher, Sherry Kim, Leah Roberts

Faculty Advisor: Dr. Joe Meredith

LewisGale Hospital Montgomery is a for-profit hospital located in Blacksburg, VA, who was looking for a new layout for their cafeteria. The team was tasked to design new service and seating areas in the cafeteria to address issues related to floor space, station organization and seating capacity. The team delivered a Google SketchUp model of the cafeteria with solutions that focused on improving flow and the issues mentioned above. The team shortened 79% of all possible routes between stations, increased seating capacity by 15%, and increased available floor space. The team also incorporated a made to order grill station, restructured the tray return and trash systems and changed the fountain drink refill policy.

Team 21: Product Mix Impact on Throughput Variation

Members: Carla Downs, Nabil Shakib, Ben Stickley, Qiuyi Wang

Faculty Advisor: Dr. Zhenyu Kong

Metalsa is a commercial truck frame rail manufacturer that runs a highly automated facility where each rail is custom made. The high degree of customization leads to a large amount of throughput variation decreasing the production stability plantwide. Simulation software modeled part of Metalsa's automated line to test various improved rail sequencing methods. The results of the simulation testing, found a method of rail sequencing that creates the greatest stability. By resequencing the order of rails, production variability decreased and Metalsa's throughput is expected to increase along with the operating availability. By implementing this critical process, the plant production is expected to run much closer to its full capacity.

Team 22: Process Improvement and App Development for Morgan Rhea

Members: Andrew McGroarty, Patrick Moody, Neel Ronvelia, Julie Wright

Faculty Advisor: Dr. Ran Jin

Morgan Rhea is a luxury leather manufacturing company based out of Charleston, West Virginia. The team worked to improve the facility production efficiency, process documentation, and implement a tracking system. Our final solution includes analysis of the current facility with production capacity and utilization, cost justification of the laser cutting and sewing machine, and process improvement comparisons of the facility before and after the purchases of these machines. Our main deliverable is a real-time iOS application that includes QR code scanning for order tracking, documentation of materials required for each product, and To-Do list features. The simulation model allows Morgan Rhea to visualize the process and focus on areas for improvement, while the cost/benefit analysis and process efficiency comparisons show the improvement of the facility throughout the year. The iOS application centralizes product information and current orders to improve communication, order tracking, and inventory tracking.

PROJECT ABSTRACTS

Team 23: Air Traffic Management Analysis and Modeling

Members: Mark Gibson, Stephanie Milazzo, Sophia Nguyen, Roman Tejada

Faculty Advisor: Dr. Xi Chen

Although no hard data regarding the issue of runway performance exists, it is currently suspected that airplanes are spending an excessive amount of time taxiing on runways after landing. This reduces the number of airplanes that can land in a given time period, which in turn limits the amount of profit airlines and airports can generate. As a contractor for the Federal Aviation Administration, it is the job of Northrop Grumman to address this issue. For this reason, the team is developing a machine learning system which can be used to gather data surrounding the problem of excessive runway occupancy time. In addition to this, the team is also creating a second program which can identify the optimal runway exit airplanes ought to use which would limit the costs associated with runway occupancy time and taxi time. As a result of this study, current runway performance is now quantitatively understood, and the factors which affect runway performance are now visible.

Team 24: Aquaponics Temperature Regulation System Redesign

Members: Michael Asselanis, Kyle Gentle, Hannah Good, Andrew Greenwood

Faculty Advisor: Dr. Brian Kleiner

Pulaski Grow is a local, community-supported organic aquaponics nonprofit solely operated by our client Lee Spiegel. In aquaponics systems, fish waste provides nutrients to fertilize crops for soil-less greenhouse agriculture. Fish are sensitive to temperature, so Lee enlisted our team to help make sure her fish stock could survive and continue to produce waste when outdoor temperatures drop low in the winter--something she'd had problems with in the past. Our team collected data and consulted with experts to identify the primary mechanisms of heat loss in the system, and to quantify the amount of heat required to keep the system within ideal temperatures even on very cold days. With this information, we researched heating solutions and presented several proposals within Lee's budget of $1000-2000, each with projected business impact to further inform her decisions and with consideration for the sustainability goals of her business. If Pulaski Grow chooses to adopt one of our proposals, the business is projected to significantly reduce costs and labor hours associated with heat-related fish deaths.

PROJECT ABSTRACTS

Team 25: Press Mold Changeover Time Reduction

Members: Zihao Li
A.J Pittas
Neil Robles

Faculty Advisor: Dr. Manish Bansal

RADVA is a packaging supplies company operating out of Radford, Virginia. The senior design team helped them to reduce changeover times on their molding presses, which are responsible for a majority of their operation. This was accomplished through organizational improvements, process changes, and new equipment. After these improvements were implemented, RADVA saw a significant reduction in the amount of time it took them to change out a mold. This will correspond to substantial financial savings both this year and into the future.

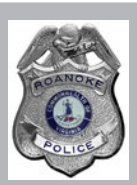
Team 26: Energy Conservation and Management Plan: Phase II

Members: Madeline Anderson
Kate Branna
Joe Holman
Anna Ross

Faculty Advisor: Dr. Manish Bansal

Roanoke City Public Schools (RCPS) serves the Roanoke community and its students ages kindergarten through 12th grade with its quality schools and facilities. Currently, operations at RCPS do not have a centralized electronic and paper utility billing system; therefore, RCPS needs a way to manage utility consumption in their schools to combat rising energy costs and to minimize environmental impact. In accordance with RCPS' goal to become a better steward of energy, the team has developed an electronic dashboard system that displays and tracks current and historical utility bill data for RCPS. The team collected and analyzed historical bill data, designed proper visuals to communicate this analysis, and created training materials for dashboard implementation at RCPS. The dashboard and tracking system provide visibility to RCPS on their current utility usage in comparison to the historical baseline. RCPS will use this system to track future consumption and implement a district-wide incentive program to further motivate schools to reduce utility consumption.

PROJECT ABSTRACTS



Team 27: Police Inventory Control and Management

Members: Lijie Ge
Adam Hedrick
Suhyun Oh

Faculty Advisor: Dr. Patrick Koelling

To fulfill their duties, and provide the highest level of service to their community, as a nationally accredited agency, the Roanoke Police Department utilizes many types of equipment and supplies. In order to make RPD's use of these items more efficient and effective, the team concentrated on existing problems with inventory control and management of fixed asset equipment and consumable supplies. These problems were addressed through the implementation and incorporation of technology in the form of a Grainger Keepstock Secure dispensing machine and RFID chip technology. The main impacts of this project are increased accessibility to personal protective equipment items and reduced supervisor time spent each day on inventory-related tasks. This was accomplished by decreasing the time required to obtain an item from storage and simplifying the overall process. Additionally, this project focused on improving the quality and accuracy of the RPD's inventory tracking systems for both fixed assets and consumable supplies.

Team 28: Police Staffing and Deployment

Members: Katie Brower
Andrew Lohmann
Chris Macaulay
Dylan Sharpy

Faculty Advisor: Dr. Patrick Koelling

In the last 15 years, the city of Roanoke has seen substantial population growth within the city. This has led to an increase in the number of calls officers receive, making it harder to respond to all calls and leading to an increase in call response time. In an attempt to reduce crime and alleviate the officers' workload, the senior design team created a linear program to reallocate districts based on call densities and neighborhoods. A shift relief factor was also created as a measure to determine the number of officers needed for each position. After completion, the team will propose the final solution to the City of Roanoke to elicit approval to redistrict and hire new officers.

PROJECT ABSTRACTS

Team 29: Customer Satisfaction and Inventory Management Improvements

Members: Aladdin Abed
Hannah Jesensky
Alex Morgan
Peter Ott

Faculty Advisor: Dr. Ebru Bish

Seven Springs Farm, a Community Supported Agriculture (CSA) farm located in Floyd, Virginia, is owned and operated by our client, Polly Hieser. Seven Springs is a partnership between the farmer and produce customer, where customers commit to purchasing a share of the produce that the farm yields while sharing in the risk of running the farm. The previous process at the farm distributed identical bags of produce to members of the same share size, regardless of their produce preferences. Membership had declined in recent seasons and weekly operations (record keeping and produce bagging) presented opportunities for improvement. The proposed Excel-based solution gives the client a suggested quantity of produce to allocate to every member each week based on their personal preferences and the available produce. This will ensure that the produce available for distribution on any given week will not run out before every customer receives their share and will provide a more efficient bag filling process every week. Customers will know that the client has taken their preferences into account, and it will be reflected by what they receive each week.

Team 30: Liquid Filling Operation Recapitalization Project Process Analysis

Members: Robson De Souza
Insup Lim
William Scherr
Alexis White

Faculty Advisor: Dr. Subhash Sarin

Spectrum Brands is a global and diversified consumer products company and a leading supplier of specialty pet supplies. Spectrum Brands is expecting an 85% increase in demand for a certain number of their products; therefore, our team was assigned to assess the liquid compounding area of the liquid filling operation. Our solution consisted of a feasibility test to determine if the existing equipment is able to withstand the increase in demand. Our team also developed a methodology that utilizes Microsoft Excel along with a Traveling Salesman optimization for the sequence of products to run on the lines, which then dictates the schedule in the liquid compounding room. After implementing our solution and comparing it to the current operational standards, we decreased the amount of scheduled downtime, minimized indirect labor costs to training costs, and increased the maximum production capacity of the facility.

PROJECT ABSTRACTS

Team 31: UPS New Facility Location: Hampton Roads

Members: Brian Hsiung
Brandon Mrvan
Jack Nachazel
Brian Umberger

Faculty Advisor: Dr. Doug Bish

The United Parcel Service (UPS) is the world's largest package delivery and global logistics company. The goal of the project was to find the most cost-efficient location for a new distribution center located in the Hampton Roads region. To accomplish this, the team used a heuristic approach to minimize the distance travelled on all package delivery routes to and from the new facility. After analyzing the geography of the region and eliminating infeasible zip codes, the team began the heuristic. Starting with the zip codes farthest from the current facilities, assignments were made until maximum cost savings was achieved. The implementation of this new distribution center will lead to savings in a number of categories including miles driven, hours driven, and maintenance cost per vehicle. Most importantly, however, it will help solve current capacity issues in the existing facilities.

Team 32: UPS New Facility Location Richmond, VA

Members: Brendan Craig
Max Garcia
Melanie Peck
Chris Raible

Faculty Advisor: Dr. Doug Bish

Any company that undergoes a substantial amount of growth faces the issue of increasing capacity to meet demand, especially when you are the world's largest package delivery company. The UPS Richmond Division has witnessed 94% growth within the past few years and is now concerned about their existing distribution network's capacity and ability to meet this demand. In order to alleviate stress on the existing distribution network and reduce costs, our focus has been on finding a suitable location for a new distribution facility. We solved this problem by setting up a linear programming model that assigns zip codes in the delivery area to the new facility and simultaneously identifies a location for the facility. This new facility will ensure UPS can continue to meet demand they encounter through the months of November and February, their peak season. The new facility will increase the distribution network's capacity and reduce labor costs for the company with a relatively short payback period.

PROJECT ABSTRACTS

Team 33: Key Performance Indicator System

Members: Sam Gest
Drew Witter
Brian Wolf

Faculty Advisor: Dr. Niyousha Hosseinichimeh

We were tasked by the Radford Army Ammunition Plant (RFAAP) to create a Key Performance Indicator (KPI) System for the Maintenance Department of the operating contractor, BAE Systems. We handed over a working database to our client at the beginning of April and continue to make adjustments as requested. Our database is able to import work order information, perform KPI calculations, and generate meaningful graphs in Microsoft Excel that displays the desired KPIs as well as additional information not initially expected. Our project does not implement automatic improvements to RFAAP's system; instead it helps in the identification of improvement areas. The possible impact our team has generated is in the millions of dollars range if RFAAP decides to address specific areas our program identifies as cost saving opportunities.

Team 34: Mine Reclamation Analysis

Members: Mary Pat Colandro
Justin Halper
Andrew Schoka
Abigail Smith

Faculty Advisor: Dr. Zhenyu Kong

The Virginia Department of Mines, Minerals, and Energy (DMME) identified a unique opportunity to transform abandoned coal mines into large scale power storage assets by implementing Pumped Storage Hydropower technology. The Virginia Tech Senior Design team partnered with DMME in the first phase of this program to create a site selection methodology using the ESRI ArcGIS platform to select optimal mines to implement this innovative technology. The project solution provides DMME with a scalable site selection methodology that provides an attribute-based, client-customizable method for reducing thousands of potential sites to a list of optimal mines for detailed engineering studies. Applied within the geospatial analytics platform of ArcGIS, the solution provides the foundation for an unprecedented technology implementation to transform abandoned coal mines in the Appalachian region into assets for large-scale electric power storage for renewable energy sources. The site selection methodology implementation for the VA DMME produces a 99.99% reduction in potential sites, identifying locations deemed qualified for follow-on engineering studies. This methodology will enable the first-ever implementation of a pumped storage hydropower system in an abandoned mine, with the potential to enable a multitude of similar implementations across the country.

PROJECT ABSTRACTS

Team 35: VT Motorsports Ergonomics Team

Members: Morgan Jones
Daniel Lozano
Amy Luxemberg

Faculty Advisor: Dr. Carolyn Duncan

Virginia Tech Motorsports designs and builds a superior ergonomics package for a small formula one racecar. The ergonomics package includes building comfortable and adjustable parts that the driver interacts with, as well as a cost report and facility layout. The team followed a process of designing, manufacturing and testing the seat and steering wheel. Additionally, the team performed substantial research and used data collection methods to create a baseline for the facility layout. In order to see the success of future VT Motorsports efforts, the team has worked to continuously improve the ergonomics package of the vehicle.

Team 36: Order Handling Improvement Project

Members: Andrew Pheneger
Robert Poindexter
Hannah Zauner

Faculty Advisor: Dr. Navid Ghaffarzadegan

Applied Felts is the leading manufacturer of Cured in Place Pipe liners. Due to increasing demand and a pending plant expansion, they fear their paper-based order handling process will not be able to meet future demand. To help track the performance of their ordering system, we have developed a digital order tracking system. The system was implemented gradually beginning with training sessions provided by our team. Applied Felts will now be able to monitor metrics for their ordering system, allowing them to address changes in their system as their company continues to grow. The digital system also reduces the number of non-value added activities, such as order travel time and time spent tracking orders.

Team 37: VT Athletics - Traffic System Improvements

Members: Prince Adu-Jamfi
Rachael Hensen
Carlos Rivera
Adam Scherbenske

Faculty Advisor: Dr. Barbara Fraticelli

Virginia Tech Athletics manages and operates sporting events at the university and recently has been receiving a higher-than-usual volume of complaints regarding the traffic congestion following games. The department is seeking improvements to their football and basketball pre-game and post-game traffic procedures. Potential solutions include changes to signage, most importantly within the parking lots, and providing maps via a smartphone application for game attendants to plan their routes before arriving on campus. Additionally, simulation runs for post-game traffic resulted in changes to the routing system that is currently in place. These recommendations will reduce the time it takes for drivers to a) find their parking lot and space before the game, and b) leave campus after the game, thus improving customer satisfaction.

PROJECT ABSTRACTS

Team 38: VT Athletics Gate Entry Systems Improvements

Members: Michael Mason
Christie Nguyen
Christine Schiffer

Faculty Advisor: Dr. Barbara Fraticelli

The Virginia Tech Athletics Department oversees 22 varsity sports and coordinates all the events and functions for the teams, with the largest functions being football games. Fans have complained that they have waited in extremely long lines, causing them to miss Enter Sandman and kickoff. Thus, the senior design team measured the gate congestion and late entries into Lane Stadium through video recordings and fan surveys to analyze the arrival and service rates. Using a simulation model to validate the results, our recommendation is to add more ticket scanners and implement a shading policy that will make scanning tickets easier. These recommendations would increase the service rate of ticket scanners in our model of a worst-case scenario, which in turn shortens the average simulated wait time. These reductions will allow more of the fans in our model to enter the stadium before the start of Enter Sandman.

Thank you

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