

## **IMSE Senior Capstone Projects**

*Spring 2019*

**Project A:** Efficiency Realization and Capacity Increase of Fishing Wader Testing and Packaging Operations

**Sponsor:** Matt Dietrich, Production Manager  
Simms Fishing Products

**Description:** Simms Fishing Products is a fishing apparel company headquartered in Bozeman, MT. They specialize in GORE-TEX-lined fishing waders that are handmade in their Bozeman facilities and sold world-wide. Simms fabricates certain wader models from fabric cutting through pressing and sewing to sealing and finally to testing and packaging in their Bozeman facility. But they source other models from China. The current plan, however, is to bring the final assembly steps for these Chinese-made models into the Bozeman facility early in Q2 2019. To accomplish the plan, Simms has contracted new equipment for the boot attachment processes that will significantly increase production capacity in that step of production. Out of necessity, then, Simms must increase the capacity of all process steps downstream of that operation in order to accommodate the influx of China-made models.

The objective of the project, therefore, is to analyze the current testing and packaging operations to identify opportunities to increase efficiency (and thus capacity). Since the leak test involves full submersion of the waders in water, waders must be fully dried before packaging, so drying operations and technique are included. The team will explore alternative solutions and propose recommended changes. If efficiency gains cannot reach the 70% increase in capacity needed, Simms would like recommendations on where and how to add capacity. Management expects to start receiving the new influx of waders in mid-March to early April, which affords the opportunity implement changes and evaluate their effectiveness. Recommendations must be justified from a production standpoint and be supported by a strong business case.

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**Project B:** Inventory Tracking System for Timber Products

**Contact:** Mike Halverson  
Montana Reclaimed Lumber  
Gallatin Gateway, MT 59730

**Description:** Montana Reclaimed Lumber (MRL) provides reclaimed beams, antique boards, historic paneling and trim for architectural design. Their current inventory contains nearly 5M board feet of timber in all sizes and shapes, and consisting of numerous species, colors, textures and unique qualities. Owing to the large inventory, MRL desires a better way to track inventory in order to manage it more effectively and streamline operations.

This project will focus on sawn timber products ranging in size from 6” x 6” to 14” x 18” and larger. The team will first conduct a value stream assessment of these products from receiving the truck shipment of raw material to finished goods shipment. They will identify where in the process it would be most beneficial to the business to stock and track inventory. From there, the team will develop an inventory tracking system that MRL can use to better manage its inventory assets. The team will need to assess user needs as well as the necessary information requirements, research software platforms, and evaluate options. The recommended solution should include a design and system for labeling product in the yard (with capability for bar code identification either now or in the future) and a computer tracking system so that MRL can know what product they have on-hand, how much and its location. It would be helpful if the system could identify when MRL needs to order new product.

Deliverables will include: a labeling system for inventoried product, an electronic inventory tracking system populated with current inventory, and work instructions. Team members should have already taken EIND 458.

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**Project C:** Development of NUWC Keyport IMA Metric Dashboard(s)

**Sponsor:** Angie Meier and Liz Kovalchuk  
Naval Undersea Warfare Center Keyport  
610 Dowell Street, Keyport WA 98370

**Description:** The Naval Undersea Warfare Center Division Keyport Torpedo Intermediate Maintenance Activity (IMA) is guided by their commitment to meet the needs of many customers and their desire to be the enterprise leader in expertise associated with the preparation of Heavyweight and Lightweight torpedoes and systems. The IMA continues to strive to meet quality goals while producing torpedoes to meet customer goals and ensuring safe operations. Keyport strives to provide customer torpedoes with ‘zero defects’ attributable to IMA workmanship; provide the customer with torpedoes that are prepared as specified in accepted work requests; and continually focus on improving torpedo maintenance and support processes and to communicate those improvements across the torpedo enterprise. The need for torpedoes currently exceeds the projected production capacity. The IMA has a technical need to provide process improvements in order to increase capacity and meet the needs of the Fleet. The goal of this project is for a team of students to provide process improvement ideas and metrics for control to improve capacity and reduce/eliminate bottlenecks within focused work areas.

Throughout the next fiscal year, the IMA facility will be completely re-organized to improve process flow in order to meet necessary future production. As a part of move to real-time scheduling, the IMA is investing in automated visual displays to help indicate build status. Currently, each work center has unique metrics that are manually pulled and updated, and as such are generally not available outside of the work center. Using Microsoft Office tools and a government software program (NERDS), these existing metrics are being digitized and displayed. This provides the opportunity to create a roll-up of each workstation's metrics for a high-level overview showing torpedo progress to completion.

To improve its ability to meet quality goals and delivery expectations, the IMA leadership desires a high-level intuitive dashboard to indicate build status for Heavyweight torpedoes with the expectation of interfacing with the other displays. Using historical data for process times and assembly steps and processes, the display will compare scheduled to actual completion times and indicate which processes are completed or holding up production. The dashboard will reflect the full IMA production cycle, beginning at receipt of a Heavyweight torpedo on the IMA patio through delivery of that same torpedo back to the patio after reassembly to be shipped out.

This project will require the team to possess a knowledge of process simulation, statistical and data analysis, as well as good organizational and communication skills. Teams must work together to integrate various metrics or indicators into a functional and realistic implementation plan, and NUWC Keyport requires that they own any produced deliverables. Proposed solutions will require an economic analysis in order to justify the cost of any implementation(s). Students who elect this project will need to be able to travel to Keyport, WA, early in the year close to project initiation. This travel will be supported by NUWC, Keyport and will be of no cost to students.

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**Project D:** Value Stream Improvement of Plastic Injection Molded Product Line

**Contact:** Allie Haag  
West Paw Design  
Bozeman, MT 59715

**Description:** West Paw Design is a local manufacturer of pet toys and beds. One of their goals for 2019 is to focus on inventory reduction and becoming much more lean with their current equipment and assets (i.e., no purchase of machinery). This project requires the students to deliver a current and future value stream map of their injection molding process, from purchasing through large order volume shipping.

The injection molding department currently produces run sizes of 2-3 weeks of parts due to the long changeover time required for each mold change. Some of this product is packaged immediately while the rest sits in backstock as "raw"

inventory to be packaged later. The process operators use to pull from backstock does not require FIFO, which further increases the total time sitting in inventory. Once packaged in quantities of 1-2 pallets, the product is either put directly onto the shipping racks or palletized and put back into inventory. The packaged inventory is then pulled down on a per-order basis, accumulated with other product the customer has ordered, and boxed for shipping. Shipments then wait in the shipping bay for pickup by the freight company.

Through the value stream mapping process, the team will identify improvement opportunities, evaluate the costs and benefits to prioritize the opportunities with the highest potential impact, then deliver detailed design solutions with implementation plans that the client can implement at their discretion. The team will give detailed reporting on and provide recommendations for achieving a 50% reduction in Zogoflex order lead-time for large order volume shipping. Inherent in this objective is to reduce the amount of non-value-added time as a percentage of overall lead-time. The company is open to proposals on all aspects of their operations except moving the molding machines and large capital expenditures.

Team members will need knowledge from EIND 458 in order to succeed in this project.

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**Project E:** Value Stream and Facility Layout Assessment of Tarp and Tent Production

**Contact:** Donna Crask, Production Manager  
Montana Canvas  
110 Pipkin Way  
Belgrade, MT 59714

**Description:** Montana Canvas manufactures wall tents and tarps out of weather-treated canvas and other materials. Their production facility includes cutting, sewing, assembly and packaging operations for new tents and tarps, repair areas for tents and tarps, and frame-making in addition to shipping and receiving areas. Most production is build-to-order.

This project will have two thrusts. The first is an assessment of the tent and tarp value streams using value stream maps along with an assessment of the existing facility layout. It is expected that the assessment will result in recommendations for improved flow, space utilization, inventory management of tent components, and overall production efficiency.

The second thrust is a detailed analysis and redesign of the work area that creates tent frames from metal tubes and angle pieces. The new work cell design should result in more ergonomic workstations that accommodate a wider range of workers as well as improved flow and efficiency.

Team members will need knowledge from EIND 458 in order to succeed in this project.

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**Project F:** Specification for New Flexible Manufacturing Cell for Education

**Contact:** Durward Sobek, Professor  
Mechanical and Industrial Engineering Dept.  
Montana State University

**Description:** With the grand opening of Norm Asbornson Hall in Spring 2019, the M&IE Department's Computer Integrated Manufacturing (CIM) Lab will move to a space in the new building. The M&IE department would like to upgrade its CIM Lab equipment to a level commensurate with the quality of the new facility in support the educational mission of the programs within the department. The task of this team is to research automated conveyance alternatives with programmable logic control, design a flexible manufacturing cell layout for the new space, and develop equipment specifications that can be sent out for quotation. The goal is the purchase equipment over the summer and install it in time for Fall 2019 semester.

Some of the newer existing equipment will move to the new building, namely two FANUC robots, an EMCO CNC mill and an EMCO CNC lathe. It is expected that these items will be incorporated into the flexible manufacturing cell. The cell will include automated material conveyance between stations, automated machine loading and unloading, and machine vision. It is anticipated that another robot will need to be purchased, potentially a collaborative robot. All parts of the system must integrate seamlessly.

Team members who have taken EIND 371 will be in the best position to succeed in this project.

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**Project G:** Improvement of the New Student Registration Process

**Contact:** Anders Groseth  
Director of New Student Programs  
MSU Admissions

**Description:** The admissions office faces a significant challenge in getting approximately 1,200 new students registered for classes on the same day during fall orientation. The current process gets the job done, but is stressful, takes 8-9 hours and can be described as "managed chaos." Challenges that introduce significant variation into the process include: use of multiple registration locations, orientation leaders not able to hand-hold students through the orientation schedule, dealing with myriad AP, transfer and dual credits, handling math and science exceptions, and competing activities on campus associated with move-in, Catapalooza and orientation activities.

The goal of this project is to evaluate the current new student check-in and course registration processes for fall orientation and propose improvements. Project scope is expected to include an in-depth assessment of the myriad stakeholders' needs related to orientation registration; an evaluation of

communications, materials, signage and flow; an analysis of resources, processing times and queue times; and coordination with Move-In Day and possibly other orientation activities. A user-centered design approach should yield a creative and comprehensive set of solutions to better organize and streamline the registration process, reduce the stress levels for all involved and cut the time required by half.

The admissions office expects to implement approved proposed changes in the August 21-23, 2019 orientation. The sponsor would love to have one or more team members participate in the fall orientation.

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