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Development and Implementation of a Lean Assembly Line

Project Description

Formsprag Clutch / Marland Clutch, part of Altra Industrial Motion, Inc., (NASDAQ: AIMC) is a world-leading designer and manufacturer of power transmission products that are known for their precision and reliability. Our manufacturing facility in Warren, MI has an aggressive growth plan that consists of development of new products as well as updates/upgrades to our already successful product lines.

Formsprag is redesigning the assembly area of their large size clutch products and implementing a Lean production system. The Large Value Stream (LVS) consist of low volume, high mix production which includes customized clutch assemblies weighing up to 15,000 lbs. for use in mining applications. The assembly area consists of individual employee work benches where various hand tools and hand held power tools are used to assemble a clutch. Larger clutches that will not fit on a bench are assembled on heavy steel carts. Assembly operations such as painting and testing are completed in common areas. The current system is based on individual work stations. The Large Value Stream (LVS) consist of low volume, high mix production which includes customized clutch assemblies weighing up to 15,000 lbs. for use in mining applications.

The current facility is 20-25% converted to lean production. The Formsprag engineering team will be simultaneously working on converting other production lines within the facility. The MDP student team has been assigned a line that the engineering team would otherwise be unable to implement in the near future. They will develop a lean manufacturing solution for the production line, obtain approval for their solution from management and implement the plan.

Description of Project

The student team will deliver the design layout for a new moving line assembly process, participate in the implementation of new layout and new workbench formats, and validate the impact of the new system.

The student team will develop an assembly line concept that will support 80% of the Large Value Stream sales/product volume. The solution should have a paced line with 1x1 flow that will reorganize/reformat the current individual operator workstations and process stations. A successful team is expected to participate in the transition of the assembly area to the new system. Except for the paint room and overhead cranes, the equipment used in assembly can be reconfigured or new equipment can be installed during a weekend shutdown. There is no automated equipment nor a moving assembly line/conveyor involved.

Include a Deliverable (Phase I) and Details Here: BASELINE GOAL

Benchmark the current system through data collection, and deliver a redesigned Workflow. Support recommendations through results derived from simulation models.

Phase II: Intermediate Goals

Analyze the ergonomics of the assembly process and mechanisms for moving materials and components to, from and within the assembly area. Deliver a plan with the detailed process for transition.

Include a Deliverable Phase III Here: Stretch Goal HUGE SUCCESS

Participate in the implementation of the process changes and rearrangement of the assembly area in September-October 2017. Validate results on the manufacturing floor via actual process data and recommend changes for the next iteration. As time permits, participate in implementation of recommended changes.

Location

Work will take place on campus, with periodic visits to gather information and observe the assembly area at Formsprag in Warren, MI on Hoover Road near 9-1/2 Mile. **MDP will provide transportation for the students to/from Warren.**

Project Sponsor Mentor

Tim Mann – ABS Facilitator (Lean Implementation Manager)

Tim has over 25 years of experience in Lean Manufacturing and during that time has held positions ranging from Process Engineer and Manufacturing Engineering Manager to Director of Lean Systems with direct responsibility for continuous improvement in 4 assembly/manufacturing facilities. Tim joined Formsprag in 2014 to lead the transformation to Lean and continuous improvement efforts. Some of the U of M faculty members that have mentored Tim and contributed



directly to his professional development are John Shook, Mike Rother, Gene Goodson and Jeff Liker.

Project Faculty Mentor



Robert M. Ottolini is a former General Motors Executive who recently retired with over 42 years of management experience in Engineering and Quality Operations. He has worked in all facets of product engineering with a particular emphasis on systems development with a customer focus. He was instrumental in the journey from road to lab to math based testing and analysis within the company. The last dozen years he has provided leadership within the Quality organization, ensuring engineering design and manufacturing operations deliver a customer experience exceeding expectations and efficiently meeting all regulations. This includes execution of lean principles within production and a “lean factory” approach with our development process. Most recently he was Vice President of Quality for the European operations and then Vice President of Quality for the China based International Operations. He earned a Bachelor’s Degree from General Motors Institute in Mechanical/Electrical Engineering and a Master’s Degree from Stanford University in Mechanical Engineering.

Key Skills & Project Roles

MDP Sponsored Projects are both a professional and academic learning experience for students. By participating in this program, students are actively preparing for graduate school and a professional career. As part of the experience, MDP expects professional behavior. To best prepare you for future professional opportunities, your experiences on this MDP team will be very broad. In addition to key technical skills that you will bring to the team, you will engage deeply in the self-directed learning of new and important concepts, demonstrate flexibility, collaboration, and cooperation, and develop strong professional communication skills. This also means that you will need to be able to work outside of your traditional area of study in the true multidisciplinary nature of our projects. You won’t always be able to anticipate how your skills and expertise will be used, so the MDP Sponsored Project will challenge you to grow and develop as a professional.

Project Roles	Key Skills and/or Knowledge	Likely Majors
Lean Manufacturing (4 Students)	Lean Manufacturing,	IOE, Manufacturing
Ergonomics (1-2 students)	Ergonomic Design	IOE (ergonomics), Kinesiology
Mechanical Engineering Design (1-2 Students)	Basic mechanical design and fabrication, ME 250.	Mechanical Engineering, Manufacturing

Company Overview

With over 50 years of experience, Formsprag has applied catalog standard clutches as well as many special designs (typically driven by OEM requirements) into a wide variety of markets. This has resulted into expanding the product offering into the broadest range of overrunning clutches in the world. Over 2,000 different products are available with catalog designs ranging in torque capacity from 1 to 1,200,000 FT-LB, clutch bores from 0.1 inches to nearly 24 inches and overrunning applications operating up to 50,000 RPM in jet engines.

Formsprag overrunning clutches can be found in every corner of the world with applications in commercial, aircraft and military equipment. These applications include backstopping clutches in many gear reducers, snow ski lifts, amusement park rides, automotive final assembly lines, steel stamping presses, fan and pump drives, corrugated box making, material handling in foundries and steel making, forming and pickling, and marine applications such as submarines.

The LVS most often builds in a lot size of 1, with a takt time of nearly 3 hours. The variety includes 10 product families and as many as 17 sizes within a product family. The LVS comprises about 1/3 of the company's sales.

As Formsprag adds models to the product line up, newly developed larger clutches are exceeding the weight capacity of the equipment in the assembly area. Room has been created to accommodate building the larger clutches. An area of approximately 5,600 ft² is part of the scope of this project.

Legal Requirements

Citizenship and Right to Work Options (please select)

This location is an ITAR facility and therefore, **only** US Citizen, Lawful Permanent Resident, Permanent Resident Alien, Resident Alien Permit Holder or Green Card Holder are eligible to join this project team.

Intellectual Property Agreements / Non-Disclosure Agreements (please select)

- Students will sign the standard MDP IP/NDA agreement

Internship Information

On-site interview

All student team members are guaranteed an on-site interview for our summer internship positions. Interviews will take place in December 2016 at the Formsprag facilities in Warren, MI. Selection is expected in December.