Green Suppliers Network Lean/Clean Program

Lean and Clean Manufacturing Assessment

COMPANY XYZ

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Program Background

The *Green Suppliers Network* (GSN) is an innovative industry-government partnership that links the resources of aerospace original equipment manufacturers (OEMs) to the Environmental Protection Agency (EPA), the National Institute of Standards and Technology's Manufacturing Extension Partnership (MEP) and state-based MEP programs. The objective of the project is to identify a wide range of opportunities for improvements that reduce wastes, increase productivity and customer satisfaction, and reduce impacts on the environment. CONNSTEP, Inc., the Connecticut MEP, delivered the program.

The program is designed to help small and medium-sized manufacturers remain competitive across multiple supply chains. The program utilizes the tenets of Lean manufacturing to foster bottom-line improvements while optimizing material efficiency and process flow and reducing environmental impacts.

Project Objectives and Scope

The objective of the project is to identify a wide range of opportunities for improvements that reduce wastes, increase productivity and customer satisfaction, and reduce impacts on the environment. The project team will focus on:

- Eliminating wasted energy, raw materials, and non-value added activities;
- Simplifying processes to increase customer responsiveness; and
- Developing employees and cost effective processes to sustain improvement efforts.

The key phases are:

- Perform a top-level assessment of company;
- Develop a complete value stream (process flow) map of one product or process line with non-value added activities and wastes that can be reduced or eliminated; and
- Identify and present prioritized opportunities for improvement.

Company Profile

COMPANY XYZ is a nationally recognized source for cadmium, copper, electrolytic and electroless nickel, gold, silver, tin, and zinc plating on a variety of base materials, including zinc die cast and stainless steel. These processes qualify COMPANY XYZ to meet a host of specifications including, AMS, ASTM, Military, Chrysler, Ford, General Electric, General Motors, Pratt & Whitney, as well other as unique customer requirements. The company's founding in 1947 initially provided high quality finishing for the local spring manufacturers. Currently, COMPANY XYZ occupies a 70,000

square foot facility serving the needs of diversified markets, including aerospace, automotive, electronic, hardware, marine, medical, metal stamping and telecommunication.

Assessment Process

Phase One: Top-level assessment of company

COMPANY XYZ personnel completed a Competitiveness Review Questionnaire to provide information to calculate key operational measurements. The information gathered from the questionnaire was then benchmarked against a database of other "Coating, Plating and Anodizing" companies, maintained by MMTC, the Michigan Manufacturing Extension Partnership (MEP) program.

Opportunity Analysis

As a means of prioritizing the results of the Competitiveness Review, a Transformation Planner was created. This Planner includes an Opportunity Analysis chart, which showed where COMPANY XYZ stands in comparison with the other "Coating, Plating and Anodizing"companies. In addition, improvement targets are set.

The analysis identified an overall potential of $800,646 in annual savings through opportunities for improvement. The areas of greatest opportunity are seen below.

Opportunity	Current value	Target value	Annual benefit
Machine Run Hours % Available	50%	80%	$665,279
Schedule Bumping	6%	.22%	$64,089
Scrap and Rework	1.3%	.5%	$48,831
On-time deliveries	97%	99%	$15,284
			$$793,483.00

Phase Two: A team-based activity to assess opportunities for improving process and environmental performance

Judy Wlodarczyk and Bill Caplan facilitated three working sessions to identify opportunities for improvement on the Rack Plating Zinc process line that was selected for the project. This line represents seven percent of the company revenues, has a scrap and rework rate of 15% and has the highest employee turnover. This summary report documents the activities and outcomes of the process, including recommendations for improvement.

COMPANY XYZ Team (names withheld)

Environmental
Vice President of Operations
Estimating and Inside Sales
Plating Operator
Supervisor of the line
Chemical Maintenance and Wastewater Treatment

Training

A Lean/Clean overview training was conducted to provide a basic understanding of lean manufacturing methodologies and how to integrate clean opportunities into lean practices.

Understanding the Current State

Current state value stream map o f Rack Plating Zinc Process line

A current state value stream map (VSM) was created for the process. Lead time is currently quoted at 3-5 business days. The map was created by the project team to enable them to see and identify improvement opportunities.

The goals of the project were to:

- Increase capacity on the line
- Reduce scrap and rework
- Reduce water usage

The demand for the product is 270 racks per day. Based on the demand, the team calculated Takt Time to be 1.6 minutes/rack.

Lighting bursts for Lean opportunities are in light yellow and Environmental Health and Safety (EHS) are in light purple on the current state VSM below. ***Actual VSM has been removed***.

The relationship between value added and non-value added work represent areas of opportunity. The current state VSM has 4 major loops contributing to the critical path of parts: Order/Planning; Production (including manual off line); Quality; Unrack and Bake (25%) Opportunities for improvement in work flow, rework, work process and layout were identified by the team participants and are included below.

The current customer demand time or Takt Time is 1.6 minutes per rack (8 hour work basis). To achieve this level of output the line would need to be running at a rate of 1min10sec per rack. This assumes a production loss of 72 minutes for start up and a 15%

quality loss and doesn't assume other changeovers in the course of the shift. Since the line average capability is a "1minute 15 sec" cycle, additional capacity can be gained in a number of ways: decreasing rework from 15% to 5% and adding two missing hooks on the line will yield an additional 37 racks per day. An additional reduction of start up time by 25% will add an additional 14 racks. This would result in a total improvement opportunity of 63 min. of additional run time. This benefit could be used as additional capacity or a reduction from 9 hours to 8 hours of run time per day. Each of the number 1 and 2 priority opportunities listed below will contribute to this improvement. Additional opportunities in the shortening of overall lead time will result in the need for less storage space and less confusion on order priority and improved communications.

Recommendations on layout will improve ergonomic issues and reduce fatigue which could potentially slow the line. They will also facilitate the introduction of visual signals for improving planning and scheduling at the shop level.

Improvement Recommendations

The team identified issues and opportunities for meeting the goals of the project. These are listed in the pictures below.

The team then prioritized the issues and opportunities based on estimated timelines: #1 for within one week; #2 for two-three weeks; and #3 project evaluation since these will take more time and possible capital expenditures. The prioritized list is outlined below.

Ranking	Issue	Improvement/Opportunities
1	Pre-soak tank not being used	Eliminate tank to create space for layout improvements
1	Powder coated tooling – borrow one rack from another company to test	▪ Reduces repair costs ▪ Reduce chemistry contamination ▪ Eliminate reflash
1	Thickness testing on-line – Magna Gauge or Drop Test	▪ Gain production time ~ 5 min./stop
1	Increase line operator inspection	▪ Look for other problems ▪ Feedback to customer by using "orange sheet"
1	Maintenance on machine	▪ Install missing hooks on line ▪ Maintain full time
1	Excess oil on parts	Contact customer to determine why some parts come in dripping in oil and some are rather dry.
2	Ultra Seal (Stan Seal)	Relocate tank closer to previous operation
2	Move Trivalent Chromate in-line	▪ Improve manual labor ▪ Reduce chemical cost ▪ Reduce waste treatment cost ▪ Reduce energy

2	Ergonomic issue when treating off-line	Put hangers over tank to decrease drag-out
2	Increase tank size for Black Chromate	Needs to hold 3 racks to accommodate line
2	Install spray skimmer for oils	▪ Improves quality, minimizes staining ▪ Reduces waste and chemical use
2	Review process for amp & speed; Optimize process after first run	Three step process ▪ Preliminary ▪ Review ▪ Final
2	Layout changes	▪ Move inspection/packing station ▪ Modify dryer for access to work ▪ Move racking station (need to complete above 2 steps first) ▪ Mark floors for staging area
3	Fixed station for air dry	▪ Eliminate noise hazard ▪ Improve process ▪ Manual labor improved ▪ Reduce employee turnover ▪ Reduced impact on waste treatment ▪ Eliminate spin dryer
3	Replace all dip rinses with spray rinses	▪ Reduce rejects ▪ Reduce water and chemical usage
3	Install fog mist on tanks #14 and 16	▪ Eliminates staining ▪ Reduces rework
3	Evaluate strip and rework on line	Eliminates movement and time

Clean Opportunities

Scrap and Rework

Scrap and rework is a significant contributor to water, energy, hazardous chemical usage (both processing and stripping) and hazardous waste generation. Reducing the amount from the current amount of 15% to 7.5% will result in improvement in productivity (less rework) and potentially reduce energy costs, water usage and waste by that same amount. All rework must be stripped prior to putting the parts through the process again. The following table identifies estimated cost savings for this 50% reduction in scrap and rework.

	Current	Reduction	Reduction/yr	Yearly cost savings
Water/Sewer	7,300 g/d	547.5 g/d	123,188	$580.50
Waste treatment				$861.75
Chemicals				$3,476.00
Hazardous Waste				$37.50
Stripping (HCL)				$1054.00
Treat spent HCL				$18.16
Total				$6,027.91

Water Conservation

The process line has 16 dip rinse tanks, consuming 7,300 gallons/day of water. According to George Cushnie, a metal finishing expert working with NMFRC, replacing the current rinse dip tanks with spray rinses uses ¼-1/8 of the water. Another benefit is that spraying reduces dragout by 50%.

	Current per day	Reduction per day	Reduction/yr.	Yearly cost savings
Water/Sewer	7,300 g/d	5,475 g/d	1,231,875	$5802

Potential water/sewer savings from "reducing scrap and rework" and "replacing dip tanks":

1,361,063 gallons/year @ a cost savings of $6383.00

Oily Parts

The first tank in the automatic line is a soak cleaner to remove oil before electroplating. Some parts are extremely oily and must be first sent to line #31 or the IBM line for pre-cleaning to remove oil. This slows down the process and increases work on the other lines.

- Discuss the issue with the customer. Determine why some parts are so oily and therefore need additional cleaning and some do not.
- Add a skimmer to push oil to an overflow weir that will keep water cleaner longer and will increase quality, reduce water and chemistry use.

Pre-soak Cleaner

This tank contains 125 gallons of pre-soak cleaner that not being used. Eliminate the tank and save water and cleaner.

Energy

Utilities represent a significant bottom line expense for COMPANY XYZ. COMPANY XYZ has investigated various energy conservation opportunities, including more efficient motors. COMPANY XYZ has three electricity powered chillers that are used on a regular basis. Replacing these with a natural gas chiller is an option as gas chillers are more efficient and cost considerably less to operate. The initial cost is higher, but if the replacement makes sense, CONNSTEP will work with the vendor and the gas company to see what incentives exist. At this time, the State of Connecticut has "incentivized" this fuel switching due to the congestion in the southwest corner. Additionally, COMPANY XYZ may be a prime candidate for cogeneration, which will conserve energy by reuse and save money.

Worker Health and Safety Issues

The Rack Plating Zinc line has the highest turnover rate in the company. Addressing the following issues may improve working in the area and thus reduce the turnover rate.

- Fixed station for air dry. Currently the parts are blown dry with a compressed air hose before putting into oven to complete drying process. Eliminating this practice will bring the noise factor below OSHA requirements for PPE and eliminate the heavy lifting for putting parts into the spin dryer.
- Lifting heavy racks out of off-line tanks. Because the racks are heavy when lifted out of the off-line process tanks, a considerable amount of drag-out occurs due to diminished hang time. Adding hooks to hang the racks for a pre-determined time will reduce the fatigue of holding the heavy racks while maximizing hang time allowing chemicals to drip back into process tank.
- Move trivalent chrome process into automatic line. This will eliminate all the lifting that occurs during the current process.

Closing

The team has identified 17 actions to reach the project goals. Based on the team's timelines, 75% of these actions can be completed in four weeks or less. CONNSTEP will follow-up in one month to determine status and outcomes. If there are any questions or follow-up assistance required to reach these goals, CONNSTEP will be happy to help.