OpEx Leadership, LLC
Lean Transformation
Consulting • Coaching • Training
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Lean Manufacturing Case Study Highlights – Central Machining: Improving Hours Per Unit in Automated Component Machining Lines

Business Case / Situation

A major automotive manufacturer's powertrain division (engine and transmission) was not competitive in Hours per Unit and labor cost in its component machining operations. The manufacturer typically required 2-3 times the number of employees to operate a machining line when compared world-class lean operations such as Toyota. Further, the average operational availability of the manufacturer's lines was significantly lower than the benchmark (55% vs. 90%).

The manufacturer had announced a new greenfield powetrain plant and had defined 'world class in hours per unit' as one of the project's strategic initiatives, with a specific focus on component machining lines. Mark Tussey, president of OpEx Leadership, and his team were called in to investigate the situation, develop a plan to achieve the targets, and support the implementation of the plan during start-up and launch, all based on world-class lean principles.

The major goals of the greenfield project were:

- Reduce direct labor requirements in the new machining lines by 50%
- Improve the operational availability of the lines from the average of 55% to 85%
- Eliminate uncontrolled work-in-process within the production lines

Key discoveries during the investigation were:

- Employees were assigned to specific machine or machines and spent much of their time watching the machines and waiting. They were required to perform a quality check once per hour, utilizing 5-10 minutes.
- Employees were not cross-trained, i.e., the employee assigned to a machine or machines was not trained to perform a tool change or minor maintenance and troubleshooting. This led to significant downtime waiting for the certified tool change operator or other specialist to be available.
- If an employee had more than one issue to address in his/her responsible area at one time, he/she had to address the issues one at a time – no one else was trained or expected to help. This led to significant downtime due to machines waiting for someone to service them.
- Employees spent much of their time unloading and reloading work-in-process from the automation between nearly all of the machines, creating very high inventory levels.
- When a tool change was deemed necessary, tools were not normally available at the machine point-of-use. There was significant downtime looking for tools and/or waiting for tool set-up.
- Many tool changes were only made in reaction to poor product quality or tool failure, leading to more downtime, high scrap, and rework.
- Machine status was displayed on the machine's control panel or a hard-to-see stack light system. As employees weren't stationed at every control panel, the machines were frequently down for a long time before anyone noticed.

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Strategy

- •Eliminate the employees' 'Waste of Waiting' through cross-training and expanding their roles; develop all employees to be able to perform all activities on every machine.
- •Implement 5S and SMED principles to assure tools and gauges are always available for tool change.
- •Investigate and standardize tool lives to avoid poor quality and scrap due to tool failure.
- •Eliminate waste and develop standardized work for all standard activities in the machining line: Tool change, quality checks, tool setting, PM / 5S requirements, etc.
- •Utilize the Standardized Work results to measure and understand the full work content of the line; adjust the manpower requirements accordingly.
- •Eliminate the need for assigning employees to watch machines by designing and implementing an andon system.
- •Develop a simplified machine controls system that would significantly reduce tool change time, both for the machine and the employee.
- •During plant design, optimize the line layouts to save space and significantly reduce walking time
- •Bolster the application of *jidoka* in the machinery – the application of error-proofing and error-prevention to the extent that the machines always stop when abnormalities are detected.

Approach

In cases involving large automated machining lines such as the ones described, the approach used to improve uptime and manpower utilization is known as *Central Machining*. Some highlights of the Central Machining approach are:

- •All employees work in the line work as a team, and are each able to perform all standardized work tasks (tool changes, quality checks, tool setting, PM / 5S requirements, etc.) on all machines; this significantly reduces machine idle time while waiting for someone to perform an activity.
- •Using the Andon system and improved machine controls, standardized work and other machine service activities can be performed on demand; there is no need for anyone to 'watch the machine', which frees the employees to perform standardized work.
- •All activities are optimized by the teams through applying standardized work, 5S, SMED, and other applicable lean tools, significantly reducing the time required to perform each activity.
- •No work-in-process is allowed to be stored within the line; lines are launched with finished goods safety stock only, which is strictly controlled and reduced as the lines are proven stable; this eliminates the labor requirements for material handling as well as significantly reducing inventories on-hand.

Results

Through the collaborative efforts of the employees, management, engineers, Lean/TPS coaches, and many others, all targets were met or exceeded (see fig. 1, next page). In addition, the plant was awarded North American best in class in Hours per Unit for its first two years of operation.

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Results (cont'd)

Lean Transformation Value Proposition
Case Study Highlights – Cost

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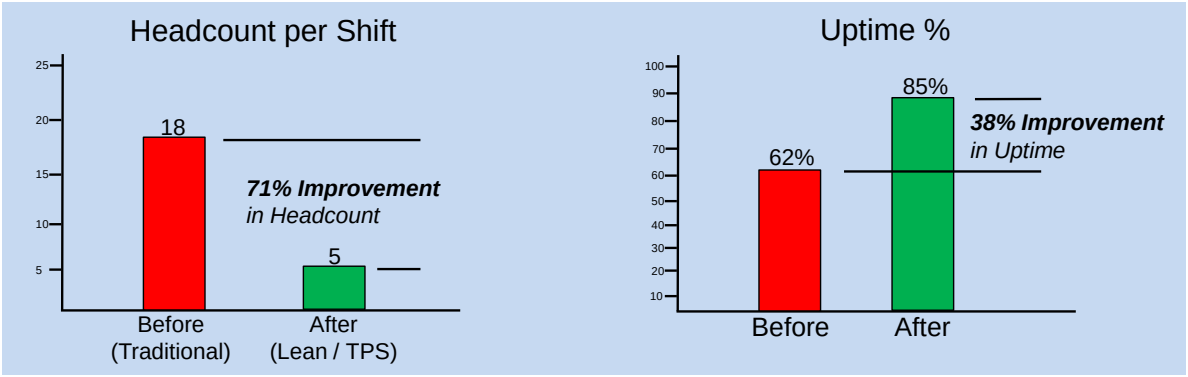
Initial Condition: Automotive manufacturer experiencing high costs in traditionally designed and staffed large automated component machining lines due to poor uptime and high labor costs.
Target Condition: Staffing (headcount) in a comparable greenfield project in line with world-class performers; uptime improvement to >= 85%.



Lean Transformation Action Item Highlights

-Standardized Work for All Activities
-Tool Change Optimization (5S / SMED)
-'Central Machining' Implementation
-Autonomous Maintenance-based TPM Program
-Andon (Work Instruction Device) Application
-Employee Engagement
-Multi-Skilled Worker Development
-Collaborative, Gemba-based Organization Design
-Transparent Visual Management and Problem Solving

M. Tussey, 26 April 2011

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Fig. 1 – Highlights and results from the Central Machining Application in a major automotive manufacturer's Powertrain Component Machining Line