Automotive – 90% Lead Time Reduction

Facing potential closure, an automotive manufacturing business is returned to profitability in just eight months

Improvement Initiative

After a small automotive division of a fortune 50 company lost $10M in 2006, the leadership team was given the ultimatum to make the division profitable or close the business. The operations team was then given the task to consolidate two of the three manufacturing plants that made up the division.

Improvement Opportunities:

- Two plants one hundred miles apart
  - Plant 1 produces rolled insulation and ships it to plant 2
  - Plant 2 die cuts the rolled insulation and ships it to the customer
- Three days of raw material inventory at plant 1
- Seven days of WIP inventory at plant 1
- Seven days of WIP inventory at plant 2
- Fourteen days of finished goods inventory at plant 2
- 6,000 ppm defects shipped to the customer
- Total lead time from raw material to finished goods shipped is 31 days

Improvements

- A milk run was implemented for all of the raw material shipments
- SMED kaizens conducted on insulation and die cut lines
- Productivity and quality kaizens were completed on the die cut line
- Pull systems were implemented for raw materials, WIP, and finished goods
- Plant 2 operations moved to plant 1

Breakthrough Results

- Raw material inventory reduced by 67%, WIP reduced by 93%, and finished goods inventory reduced by 86%
- Total lead time reduced from 31 days to three
- Warehouse space reduced by 58 percent – plant 2 equipment relocated to freed up floor space
- Direct labor reduced by 30 percent
- Changeover time reduced by 65 percent
- Shipping costs reduced by $400,000 annually
- Customer reject rate reduced from 6,000 ppm to zero
- Eight months after the consolidation of the plants, the division regained profitability

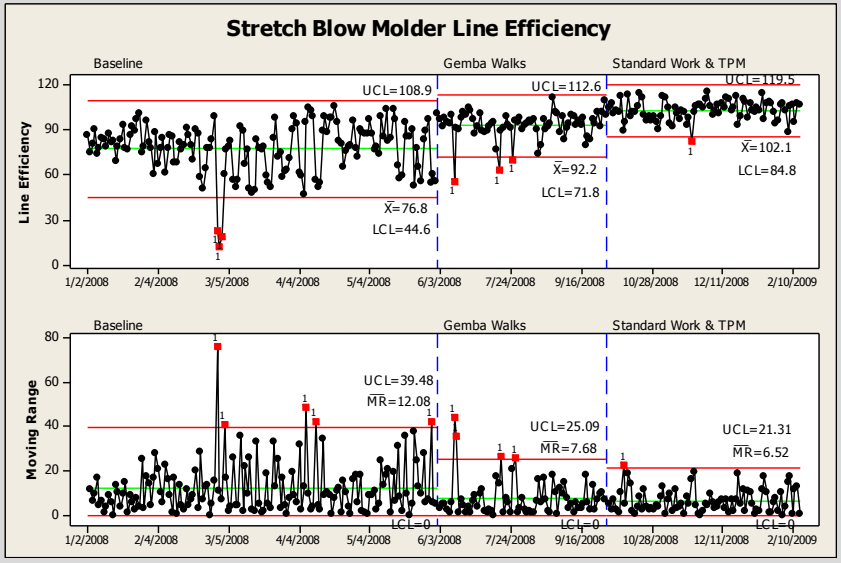
Packaging – Plant Turnaround

A plastic bottle manufacturer for the beverage and food industries was running nearly 25 percent below the expected rate and waste was forcing them to carry excess finished goods inventory

Improvement Initiative

The baseline efficiency data from January 2008 through May 2008 was 76.8 percent. Additionally, the plant had a customer defect rate of 1,300 ppm and was using a combination of internal and external warehousing to store 14 days of finished goods inventory.

Lean six sigma and TPM projects were chartered to raise the efficiency, eliminate the customer defects, eliminate the outside warehouse need, and instill operational discipline.



Improvements

- Gemba walks, equipment restoration, and 5S were used to increase the efficiency from 76.8% to 92.2%
- SMED kaizens were conducted to reduce the changeover time from 4 hours to 1.5 hours
- Standard work, standard work for leaders, and visual controls were used to drive day-to-day consistency
- TPM tools were used to reduce speed losses and minor stops increasing the efficiency to 102.2 percent

Breakthrough Results

- The stretch blow molder line efficiency improved by 33 percent
- The day-to-day efficiency variation was reduced by 46 percent
- Defective units shipped to the customer was reduced from 1,300 ppm to 0 ppm
- Customer complaints were reduced by 80 percent
- Internal scrap was reduced by 18 percent
- Zero lost time injury rate was maintained
- The finished goods inventory was reduced from 14 days to 3 days

Packaging – Scrap & Downtime Reduction

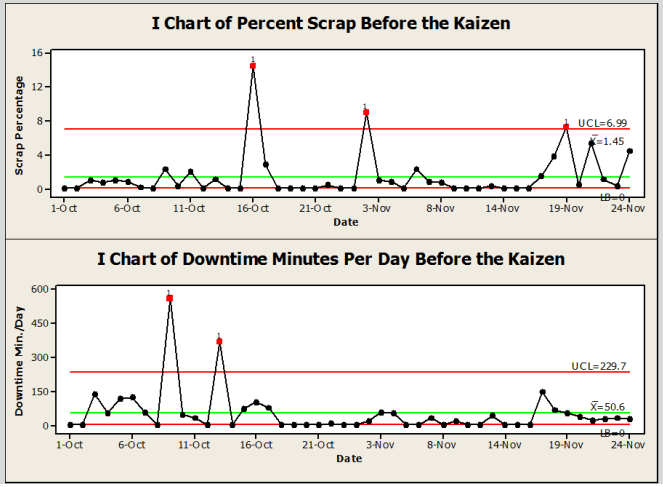
An Autonomous Maintenance Kaizen restores an injection molding machine to condition and results in an annual savings of $128k

Improvement Initiative

A single injection molding machine producing 1.45 % scrap and 50.6 minutes of downtime each day was costing a plastic packaging manufacturer $159k annually.

During a week long kaizen, Autonomous Maintenance tools were utilized to restore the machine to condition.

After receiving training on AM and TPM, the team conducted an initial cleaning and inspection. Red tagged broken components and sources of contamination were then repaired and modifications made to improve accessibility and ease of cleaning.

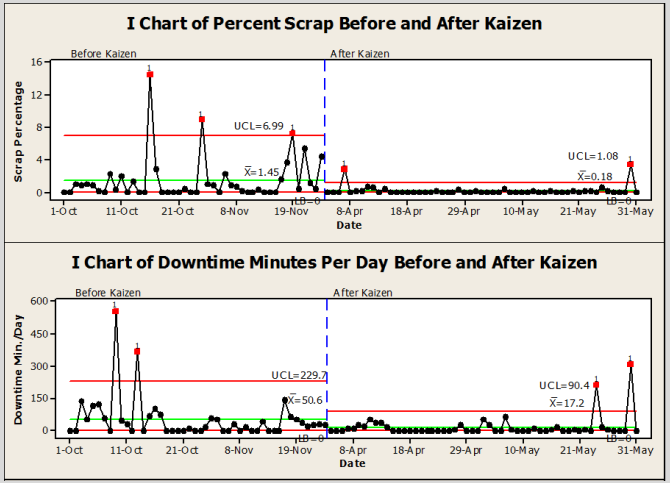


Improvements

- Cleaning & Inspection Standards – SOPs and visual controls were developed to sustain the improvement
- Restore to Condition – Primary restoration activities:
  1. Leaking hydraulic pump and accumulators repaired
  2. Robot cam followers replaced (forced deterioration)
  3. Eliminate the source of temposonic rod damage
  4. Replaced leaking clamp stroke hydraulic cylinder (forced deterioration)

Breakthrough Results

- Scrap reduced from 1.5% to 0.2%
- Downtime minutes per day reduced from 50.6 to 17.2



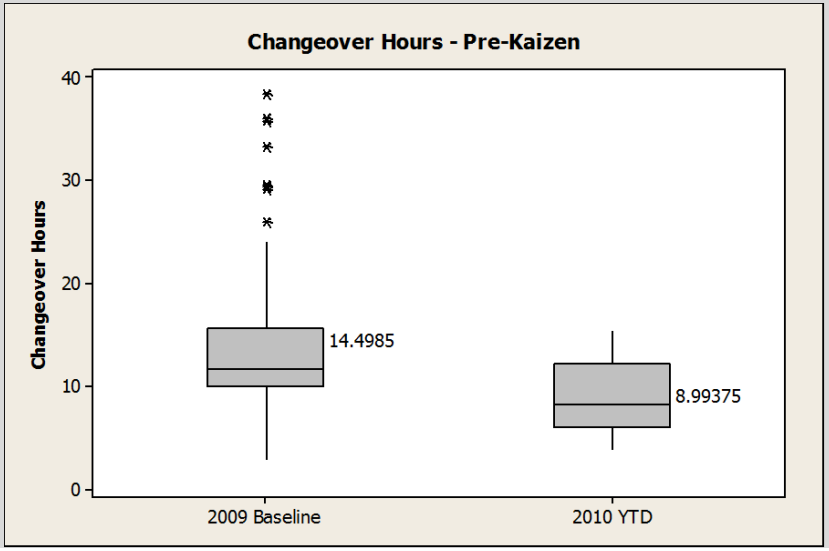
Packaging – Changeover Time & Scrap Reduction

Single minute exchange of die tools are used to drastically reduce the changeover time and scrap rate resulting in an annual cost savings of $342k

Improvement Initiative

Poorly planned, executed, and staffed changeovers were costing a plastic packaging manufacturer $491k annually on two blow molding lines.

During 2009, the average changeover time on two blow molding lines was 14.5 hours and the scrap rate was 9.1%. Improvement efforts during the first quarter of 2010 improved the performance to 9 hours and 7.9% scrap. To hit the changeover targets of 6 hours and 3% scrap, a one-week SMED kaizen was conducted.



Improvements

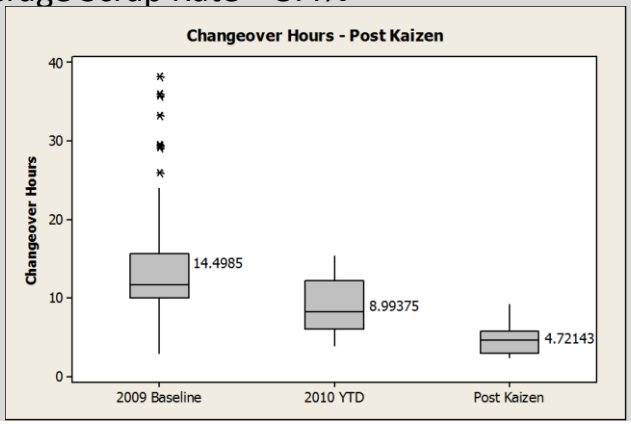
Major kaizen improvements:

1. SOPs were written for simple maintenance activities and these tasks were shifted to production operators
2. Leak test equipment and conveyor rails were modified to allow tool-less changeover
3. Point of use tool stations were setup for the blow molders and palletizes
4. The mold cart was modified to improve access to the blow molder and reduce the travel distance

Breakthrough Results

Kaizen results:

- Average Changeover Time = 4.7 hrs
- Average Scrap Rate = 3.4%



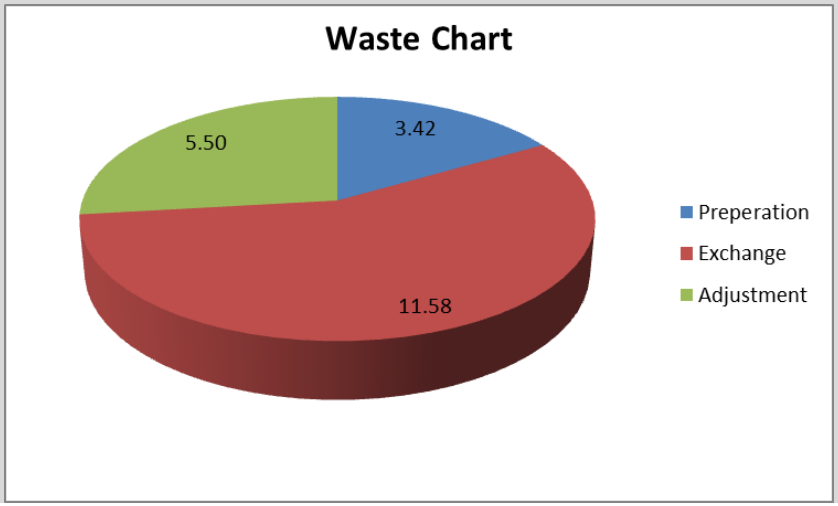
Packaging – Label Changeover Time Reduction

A one-day SMED kaizen reduces a plastic packaging manufacture's label changeover time by 68 percent resulting in an annual cost savings of $263k

Improvement Initiative

A plastic packaging manufacturer was struggling to meet their customer's order requirements. After reviewing the plant's performance, the label changeover process was identified as having the greatest quick gain potential. Analysis of the current state process revealed that the label changeover time was twenty two minutes.

The current state process was then video recorded and a cross-functional team was formed to conduct a SMED kaizen. The goal of the kaizen was to reduce the changeover time from twenty two minutes to less than ten minutes.



Improvements

- Implemented a pre-changeover standup meeting to insure personnel are ready, the correct paperwork is available, and to start the line clearance activities
- Shifted 75 percent of the label loading time from internal to external
- Eliminated the need to reheat the hot runner tips, resulting in a startup time reduction of 3 minutes 48 seconds
- Created a point-of-use staging area for the label being changed to and the label being changed from

Breakthrough Results

- Two internal elements, totaling 46 seconds, were eliminated
- Nine internal elements were shifted from internal to external equaling a total time savings of 7 minutes 35 seconds
- Twelve internal elements were improved for a total time savings of 6 minutes 38 seconds
- The total changeover time was reduced from 21 minutes 58 seconds to 6 minutes 59 seconds, a 68 percent reduction

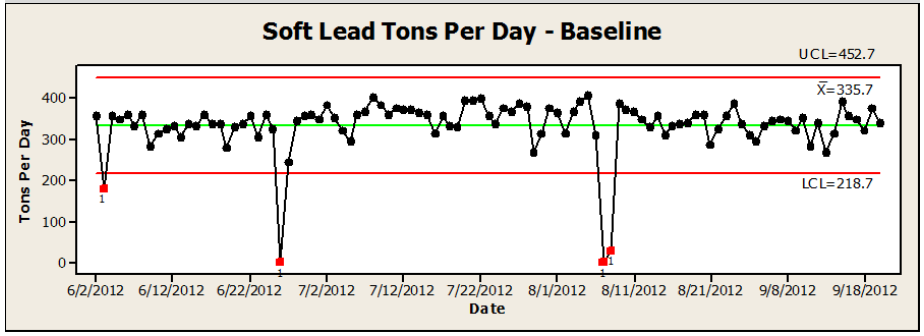
Output Improvement Increases Profits By $8M

The primary plant of a lead acid battery recycling company with annual revenues of $180 million was only producing at 88 percent of the targeted capacity

Improvement Initiative

The baseline data analysis showed that the primary plant was producing an average of 335 tons of soft lead per day. The engagement goal was to increase the soft lead output to the entitlement capacity of 380 tons per day. Increasing the lead production would be accomplished by:

- Applied Science: Understand lead production in context of thermodynamics and phase kinetics
- Material Mixture: Evaluate impact of raw material inputs on production output
- Standard Work: Assess standardization, work instructions, workforce engagement, standard work for leaders
- Process Discipline: Identify critical process inputs and implement run rules to meet process entitlement

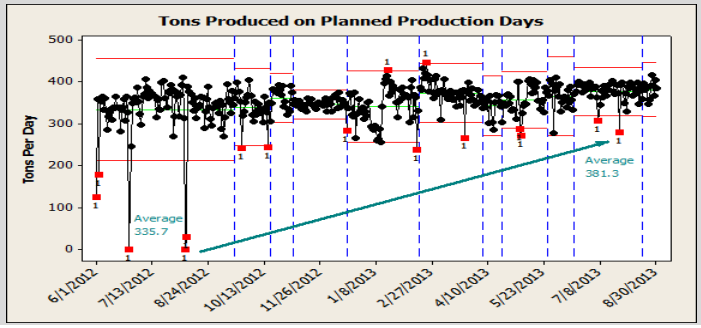


Improvements

- Science: Established recipes for the furnace operation across the full range of run rates
- Material Mixture: Defined combinations to efficiently consume all materials in the process and implemented run rules to improve the mix consistency
- Standard Work: Implemented standard work to ensure application of findings
- Material Storage: Implemented storage run rules to insure FIFO and proper material conditioning

Breakthrough Results

- Reduced variation in average daily output from 13.85% to 4.11%
- Shifted average output to 381 TPD for annual increase in revenue of $35.8 million and profit of $8 million



Five-Week Standard Work Project Yields $7.2M

A poorly defined and haphazard mixing process at a lead acid battery recycling plant, resulted in inconsistent furnace feed material and reduced furnace output

Improvement Initiative

There are several component materials that make up the reverbatory furnace feed material:

- Flue dust from the pollution control system
- Battery paste material from processed batteries
- Grid material from processed batteries
- Dross from downstream refining processes
- Wood chips from ground contaminated pallets

The lead content and the energy required to convert these component materials back to soft lead varies considerably. Consequently, variation in the component quantity and homogeneity greatly impacts the furnace output.

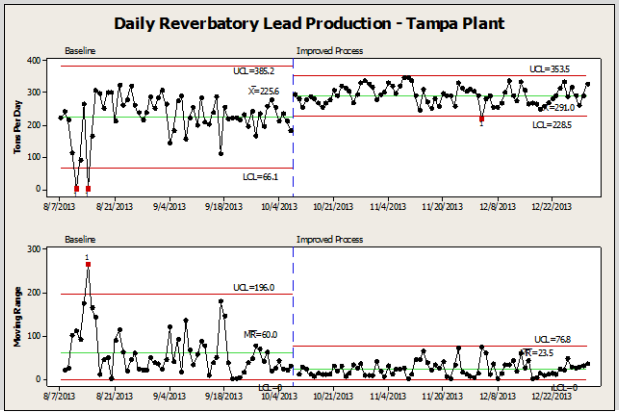
Gemba walks and process observation revealed that there were inconsistent concentrations of all the component materials throughout the feed material. Furthermore, a review of process documentation and job aids exposed a poorly defined and documented processes regarding the mixing and storage of the feed material.

Improvements

- Mix ratios for each of the component materials were developed and documented
- The feed material warehouse was organized and storage locations for component and feed materials were identified and clearly marked
- Job aids were developed and all area Operators, Technicians, and Supervisors were trained
- A material tracking and audit function was developed

Breakthrough Results

After completion of the five week project, the new mixing process and training resulted in a 30 percent increase in lead output and an annual increase in profit of $7.2M



Safety Kaizen Minimizes Hazards and Risks

Safety Health and Environmental hazard analysis tools were utilized to identify, categorize and address 41 hazards

Improvement Initiative

Poorly designed equipment, work cell layout, and processes for an extrusion blow molding line were putting production operators in high risk situations.

The most serious of the situations was the requirement for production operators to enter a guarded area of the blow molder while it was running; exposing them to unguarded moving parts. Other concerns were slip and trip hazards due to poor housekeeping and excessive packaging materials.

Kaizen Objectives:

- Eliminate the need to go inside the blow molder guards while it is running
- Train the team on hazard recognition, risk reduction, and lockout/tagout
- Identify hazards and the associated risks
- Review and update the current risk assessment
- Identify and eliminate/reduce as many hazards as possible
- Reduce the congestion around the packing area

Improvements

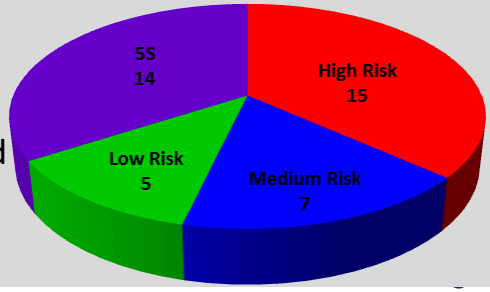
Kaizen improvements:

1. Added interlocks to the blow molder guard doors
2. Modify guard doors to prevent circumvention of guard
3. Moved air and conveyor adjustments outside of guarded area
4. Installed guard for the detabber infeed area
5. Installed electrical interlock on the autopacker guards doors
6. Installed barrier guards on all rotating shafts
7. Packaging material kanban developed and implemented to reduce congestion issues
8. Sort, Straighten, and Shine 5S activities implemented with plans to complete Standardize & Sustain

Breakthrough Results

Risks Levels:

- 15 high risk hazards identified and corrected
- 7 medium risk hazards identified and corrected
- 5 low risk hazards identified and corrected
- 14 5S items identified and corrected that combined to produce a medium risk slip and trip hazard



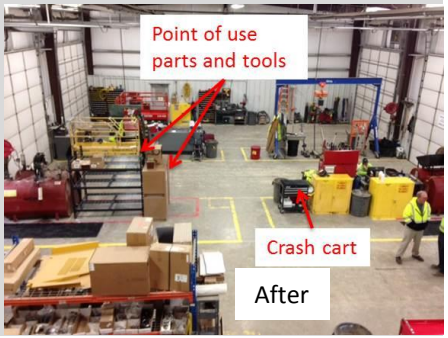
Maintenance Shop Output increased by 50%

A four-day kaizen to address an inefficient shop layout, excessive clutter and poorly defined processes increases a rental equipment repair shop output by 50 percent

Improvement Initiative

Initial observations by the kaizen team exposed the following issues:

- Too many steps were required to get parts, tools and information
- The gemba walks detected gaps in the visual control signage and compliance
- Processes were poorly defined or not defined at all
- Replacement part needs were discovered too late in the repair process
- Manually operated garage doors were pulling the technicians away from value adding activities
- There was too much confusion regarding priority for next piece in shop



Improvements

- Unneeded and seldom used parts and tools relocated
- Common parts and tools moved closer to the point-of-use
- Crash carts put in place and work stations reorganized
- A triage process was developed to facilitate early detection of part and labor needs
- Guidelines for prioritizing shop activities were developed

Breakthrough Results

The walking distance per Mechanic per day is reduced by 0.72 miles and the shop output is increased by 50 percent