Bergey Improvements Overview

George Chao, Regional manager
Purpose

• Bergey faces continuing pressures to reduce costs, reduce lead times and continue to provide quality, high value products to its customer.

• The task is “how do we incorporate and implement a Continuous Improvement Methodology” throughout the company

• The answer is to get the leadership educated in the benefits of a Lean Enterprise approach to running the business. Lean is a “top down driven program”

• Once the leadership is behind this approach, we will educate the workforce and we teach and implement the concepts along with your team:
  • Focused 5S training
  • Focused Practical Problem Solving Kaizen Event
Manex
(The Corporation for Manufacturing Excellence)

• Since 1995, Manex has provided a broad array of proven solutions and resources exclusively to manufacturers, distributors, and their supply chains, enabling them to compete on a global scale

• Manex uses a holistic and proven approach, from strategy to implementation, to impact all facets of business performance

  • Services areas include **Strategy, People, Process and Performance**
  • Results: growth, profitability, and competitive advantage

• *Manex is one of 60 NIST/MEP Centers throughout the US. We are here to help manufacturers, distributors, and their supply chains grow profitably*
Manex *(cont'd)*

- Focused on results and delivering Rapid Return On Investment to position clients for long-term success: Typical result is 6:1. Spend a dollar get six back. Better than the bank

- Affiliate of the National Institute of Standards and Technology (NIST) Manufacturing Extension Partnership (MEP) program. NIST MEP frequently cited as among the country’s most effective and successful public-private partnerships

- Leading Consulting Firms *(such as Booz Allen Hamilton)* cited NIST MEP as a significant factor in mastering innovation and in company growth and success

- Value Manex provides to clients is measured by NIST to ensure we meet and exceed clients’ business objectives
**Manex Approach**

**Phase 1: Lean Manufacturing Training with Simulation**
- 1 Hands on Demonstration of One Piece Flow; Executive team and SKU workforce
- Creation of mock P and L for financial impact
- VSM Overview
- VSM Program for Tower Sections

**Phase 2: Value Stream Map**

**Phase 3: 6S Training and Kaizen events**
- 6S Training: 4 hours
  - 1 Hands on 6S event

**Phase 4: Practical Problem Solving - 5 day Kaizen Event**
- 1-5 day Kaizen Events with Teams
- Standard work
- In process inspection
- Shop area focused
Lean Manufacturing with Simulation Agenda

Introductions

Lean Manufacturing
History & Culture
Principles
Obstacles
Benefits & Results

Simulation Round 1
Leadership Role & Behaviors

Lean Services
Eliminating Waste
5S Principles
Standard Work

Simulation Round 2
Pull & Flow
Total Productive Maintenance
Set-up Reduction
Value Stream Mapping & Kaizen
Practical Problem Solving

Simulation Round 3

Lunch
Typical Simulation Pictures
# Simulation Profit & Loss

## AirLego P&L

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Round 1</th>
<th>Round 2</th>
<th>Round 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Labor:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct/Indirect ($20 Per Hour - $160 Per Day)</td>
<td>14</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>Total Labor Cost</td>
<td>$2,240.00</td>
<td>$2,240.00</td>
<td>$1,920.00</td>
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<tr>
<td><strong>Material:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airplanes Delivered (Material Cost = $60)</td>
<td>6</td>
<td>28</td>
<td>63</td>
</tr>
<tr>
<td>WIP (Incomplete Airplanes = $6.57 to $30)</td>
<td>98</td>
<td>40</td>
<td>22</td>
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<tr>
<td>Inventory (Parts = $3.33)</td>
<td>60</td>
<td>28</td>
<td>94</td>
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<tr>
<td>Defects</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>External (to the customer)</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Internal (within the facility)</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total Material Cost</td>
<td>$2,385.66</td>
<td>$2,634.91</td>
<td>$3,780.00</td>
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<tr>
<td><strong>Leased Space:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost Per Table ($150/Table)</td>
<td>5</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Warehouse ($450/warehouse)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total Leased Space Cost</td>
<td>$1,200.00</td>
<td>$1,200.00</td>
<td>$900.00</td>
</tr>
<tr>
<td><strong>Total Cost</strong></td>
<td>$5,825.68</td>
<td>$6,074.91</td>
<td>$7,240.52</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>6</td>
<td>28</td>
<td>63</td>
</tr>
<tr>
<td><strong>Profit (Dollars)</strong></td>
<td>-$4,385.68</td>
<td>$645.09</td>
<td>$7,879.48</td>
</tr>
</tbody>
</table>
Manex Approach

Phase 1: Lean Manufacturing Training with Simulation

- VSM Overview
- VSM Program for Tower Sections

Phase 2: Value Stream Map

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Phase 4: Practical Problem Solving - 5 day Kaizen Event

- 1-5 day Kaizen Events with Teams
- Standard work
- In process inspection
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- 1 Hands on Demonstration of One Piece Flow; Executive team and SKU workforce
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- 6S Training: 4 hours' 
  - 1 Hands on 6S event
Manex Proposal

• Create a current state Value Stream Map to identify areas for improvement.
• Need to have accurate cycle times for each operation so that the bottleneck operation can be identified.
• Current State VSM will show:
  • Information flow
  • Inventory between stations
  • Non value added costs in the total process
  • Customer demand
  • Creates the road map for improvement
• Future state map is the Ideal state that we want to move the company to.
• Need a team to do this.
Real life example: Original Layout
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5S Program and Focused Kaizen Event

• 4 hours of classroom training in 5S
  • Executive team
  • 1 SKU work teams
  • Learn about the importance of workplace organization

• 1 SKU focused Kaizen Events – reduce Waste!
  • Create Standard Work for affected part
    • Standard Work Combination Table
    • Standard Work Chart
    • Standard Work Process Capacity
  • Create dedicated work fixtures
  • Create correct material flow
  • Understand TAKT time and cycle time

• Goal: To reduce costs immediately on high running SKUS by reducing cycle times, reducing waste, implementing “build in quality” and improving moral.
Eliminating NVA (Waste) - DOWNTIME

- DEFECTS
- OVER PRODUCTION
- WAITING
- NVA PROCESSING
- TRANSPORTATION
- INVENTORY
- MOTION
- EMPLOYEE
5S System

*From Japanese words for five practices leading to a clean and manageable work area.*

- **Sort** (*Seiri*) – Eliminate unnecessary items/materials and ensure needed items are present.
- **Straighten** (*Seiton*) – A place for everything & everything in its place.
- **Shine** (*Seiso*) – Cleaning and eliminating the source of contamination.
- **Standardize** (*Seiketsu*) – A procedure to maintain/monitor the first 3 S’s.
- **Sustain** (*Shitsuke*) – Train, educate and change habits while following the first four S’s.
- **Safety** – Create and maintain a safe work environment!
Remove the clutter, organize the affected areas so operators do not waste time looking for items they need
## Sample Results after Kaizen

<table>
<thead>
<tr>
<th>Item</th>
<th>Before</th>
<th>After</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>5S Score</td>
<td>0</td>
<td>3.1</td>
<td>HUGE Improvement!</td>
</tr>
<tr>
<td>Sq. Ft. (Area)</td>
<td>1344</td>
<td>544</td>
<td>59% Reduction = $9,600 Annually</td>
</tr>
<tr>
<td>Linear Walk</td>
<td>128 ft. Avg.</td>
<td>63 ft. Avg.</td>
<td>51% Reduction</td>
</tr>
<tr>
<td>Number Of Workstations</td>
<td>21</td>
<td>10</td>
<td>52% Reduction</td>
</tr>
<tr>
<td>Cycle Time (observed cable)</td>
<td>93 seconds</td>
<td>48 seconds</td>
<td>48% Improvement = $54,000 Annually</td>
</tr>
<tr>
<td>Hardware assembly</td>
<td>Done In House</td>
<td>Shift to OEM (Eliminating Hardware Installation on ¼” Jacks)</td>
<td>$13,800 Annually</td>
</tr>
<tr>
<td>Cycle Time (Circuit Board Assembly)</td>
<td>124 seconds</td>
<td>62 seconds</td>
<td>$30,000 Savings Annually</td>
</tr>
</tbody>
</table>
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Kaizen Goals for Bergey

• Reduce Cycle Times
• Eliminate Clutter
• Improve Layout
• Eliminate Parts Waiting
• Fix Defects In BOM
• Eliminate Passing Bad Parts
• Create Information Flow
• Improve/Create Flow
• Eliminate Tribal Knowledge
• Reduce Linear Walk

• Eliminate Excessive Motion
• Move Toward Pull System
• Reduce Table Count
• Reduce Real Estate
• Reduce Interruptions
• Create Work Instructions
• Reduce WIP
• Eliminate Defects
• Introduce Kitting
Kaizen Process

• Use the VSM to define the current state opportunity
• Brainstorm with team areas for improvement
• Create action list!
• Implement revised flow / layout
• Implement “build in quality” or “quality at source”
• Implement material handling processes
• Understand the importance of “good quality”
Team Brainstorm

- Using the problem as the basis for your question, ask “What is causing this problem?”
- Post all suggestions

[Post it notes shown as a diagram with space for notes]

strategy > people > process > performance

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Name the Groups

• Once we name groups, it gives the team something to focus on
• Further brainstorming can now be performed to ensure we have exhausted all of our intellectual resources
• Grouping ideas will also give us a means to manage implementation actions later in the problem solving process
Kaizen Tools

- Why?
- Why?
- Why?
- Why?
- Why?

Strategic Planning
Maintenance Excellence
Product Development

Plan
Do
Check

1W
2W
3W
4W
5W

Maintenance Excellence
Built In Quality
Supply Chain Management
Lean Culture

Issues:
Issue A: 5.7
Issue B: 4.4
Issue C: 3.5
Issue D: 1.7

Strategic Planning
Maintenance Excellence
Product Development

Strategy > People > Process > Performance

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Eliminate Waste

<table>
<thead>
<tr>
<th>Situation</th>
<th>KPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials and waste</td>
<td>Over 45% waste</td>
</tr>
<tr>
<td>Running 3 shifts per day</td>
<td>8 pieces of equipment, 200+ lights and devices</td>
</tr>
<tr>
<td>Rework of finished goods</td>
<td>12% QA failure</td>
</tr>
<tr>
<td>Profitability</td>
<td>-3.2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Improvement</th>
<th>KPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials and waste</td>
<td>Under 15% waste</td>
</tr>
<tr>
<td>Running 2 shifts per day</td>
<td>50% energy consumption and waste streams</td>
</tr>
<tr>
<td>Rework of finished goods</td>
<td>1% QA failure</td>
</tr>
<tr>
<td>Profitability</td>
<td>+5.7%</td>
</tr>
</tbody>
</table>
Proof That “Lean Systems” Work

It does not matter what business you are in, going Lean will drive up the bottom line

1. Medical device manufacturer reduced their cost of production by over 50%.
2. Accessories manufacturer increased net income more than 20%
3. Contract manufacturer doubled their market share and increased prices by 8%
4. Food company achieved over $400k in sales per employee, best in class
5. Division of aerospace company increased sales by 700%.
6. Leading winery saw $300,000 in savings during the harvest by reducing waste in their processes.
Bergey’s Challenges

1. Demand can range from 200 – 1,500 sections annually
2. Reliant of skilled, certified welders in a regional with a cyclical demand for welders from higher wage industries (e.g., oil and gas)
3. Galvanizing logistics and delays can cause delivery problems and occasionally expedited shipping expenses
4. High CAPEX for robotic welding
5. Very high CAPEX, environmental permitting and safety risks for in-house galvanizing
3 things MFG strive for

1. **Cost**: fixed costs/ variable costs/ labor costs/ shipping costs

2. **Quality**: MFG process/ Supplier & Vendors

3. **Delivery performance**: Incoming / Outgoing
Cost

1. **Fixed costs:** Machines/Equipment maintainance cost and also rent/lease cost.
2. **Variable costs:** Material/vendor cost. Are they using one supplier for steel flanges, plates, legs and girts or? Maybe quote from more suppliers. Cost of bringing Galvanizing in house or compare with other finishing process.
3. **Labor costs:** Work with welder to identify if there are improvement can be made to the fixture to help min cycle time. If area more organized, then no wait around time. Look for waste.
4. **Shipping costs:** Find few carriers to compare quotes. Also see if you can find local galvanizing vendors to reduce shipping cost. Or see if you can get the galvanizing vendor to pay the shipping cost somehow.
Quality

1. Quality of each MFG process: what is the quality level for semi-auto welding, welding and final inspection. Often times quality levels are skewed to seem higher than reality since operator performs rework without telling anyone. Rework takes a long time, so best is to get it right the first time.

2. Quality of supplier and vendors: sometimes supplier and vendors have their own quality problems. Sometimes the operation will simply accept a certain level of quality from suppliers, therefore doing extra work in house. Ex, maybe the legs don’t come in straight enough, then welder need to straighten it before starting his work.

3. Galvanizing welded components, might have re-galvanizing/leaching issues. By working with the vendors on product design for manufacturability could eliminate these issues.
Delivery

1. Is the company lead times increasing? Maybe due to inefficient in the office or mfg floor? VSM can help in this area.

2. Capacity issue? To measure this is to capture takt time and compare that to cycle time of such mfg process
Questions?

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