Creating a Lean Culture in a Traditional Manufacturing Company

Vince Carbone
V.P. of Operations
Savage Arms

Jack Anderson
C.I. Leader
Savage Arms

Savage Arms
The Definition of Accuracy

Agenda

- Savage Arms History
- Products, Customers, & Innovations
- Burning Platform (a call to action)
- Our Lean Journey (changing course)
- Continuous Improvement in Action
- Lessons Learned
- Next Steps

Our History . . .

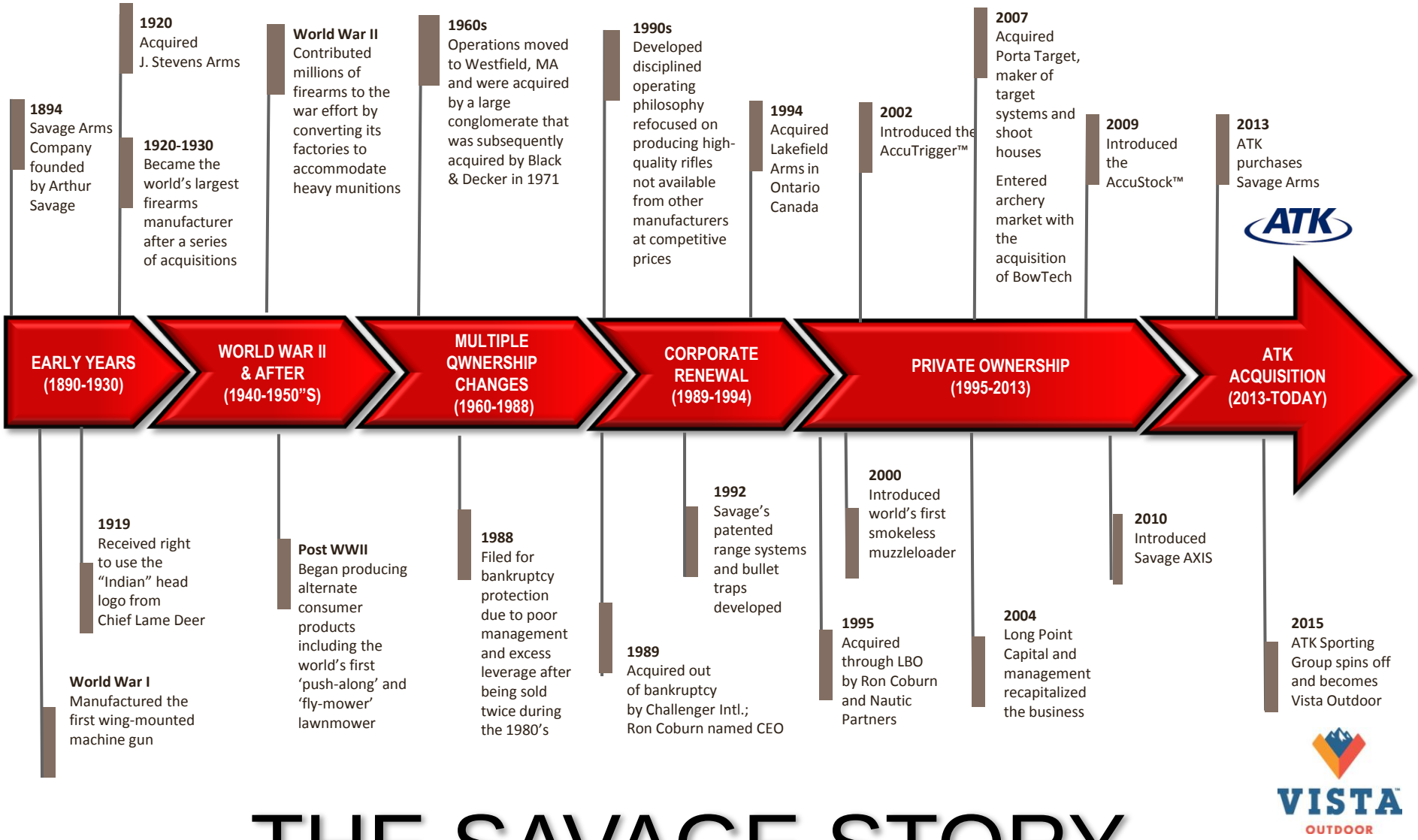
Savage Arms
The Definition of Accuracy

Arthur Savage

The Savage Arms Company was organized in 1894 by Arthur Savage in Utica, New York.

He developed the Savage Halpine torpedo, became the Superintendent of the Utica Belt Line Railroad, and invented the first "hammerless" lever action rifle .

THE SAVAGE STORY



Today . . .

Savage Arms

Westfield, MA

Total Area: 23.3 acres
350,000 sq. ft.
326 employees

BRINGING THE WORLD OUTSIDE.™

RCBS · Millett · WEAVER · Bushnell GOLF · Bushnell · NIGHT OPTICS

HOPPE'S 9 THE GUNCARE PEOPLE SINCE 1903 · PRIMOS HUNTING · BLACKHAWK! · tasco

VISTA™ OUTDOOR

bollé · BOG-STINGER · CÉBÉ · SERENGETI PHOTOCHROMIC LENSES

GUNSLICK PRO · EAGLE · Outers · UNCLE MIKE'S · CHAMPION · BUTLER CREEK · speer

ALLIANT POWDER Technically Superior by Design · Blazer AMMUNITION · FEDERAL PREMIUM AMMUNITION · Savage Arms The Definition of Accuracy · Speer bullets · CCI · ESTATE CARTRIDGE

Our Products . . . Model 10/110

Introduced in 1958

Over 1 Million Model 110's produced

- Action design has become the blueprint & standard for accuracy in firearms design throughout the industry
- Very strong & robust action: Able to handle high performance cartridges such as: .300 WM & .338 Lapua
- Very versatile design with 100's of configurations

Savage

#1 Centerfire rifle manufacturer

#1 Bolt action rimfire rifle manufacturer

Innovative Design

THE NEW INDUSTRY STANDARD: Savage ACCUTRIGGER

- User Adjustable trigger: (6oz – 6 lbs depending on model)
- No paying gunsmith to get a “trigger job” or purchasing an aftermarket trigger $$$
- Very crisp with no creep
- Extremely Safe

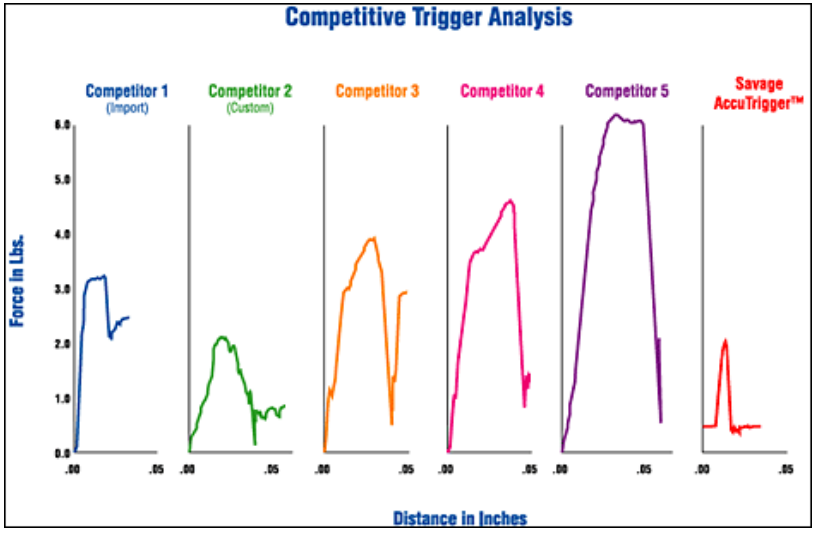


FIGURE 3

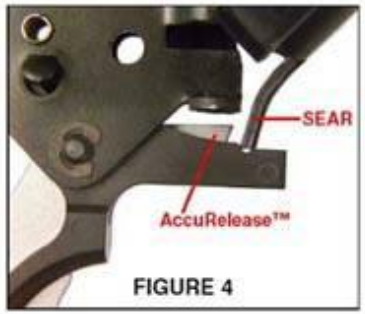


FIGURE 4

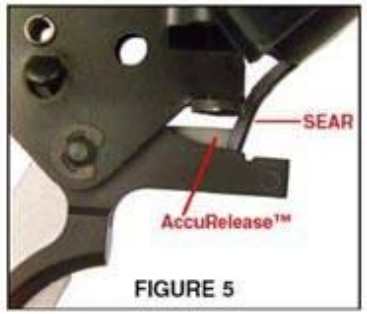


FIGURE 5

Innovative Design

New for 2015

A17 Autoloader – 17 HMR

Our Customers . . .

“Out of the box accuracy”

Team Savage

Darrell Buell
Damascus, OR

John Weil
Welches, OR

Monte Milanuk
Wenatchee, WA

Stan Pate
Milwaukie, OR

Before Lean:
Batch & Queue Culture

Our Burning Platform

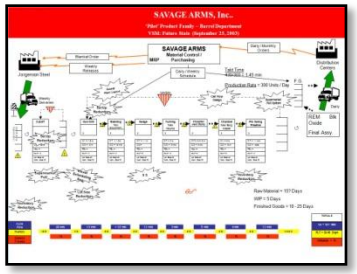
- Double digit defect rate **23%**
- Long lead time to the customer **Months**
- Large batch sizes **120**
- Multiple non-connected processes **16 Days WIP**
- Unreliable equipment/breakdowns **No TPM**
- Command and control management style
- Could not keep up with Sales at **550 Guns/Day**
- **Dirty and Cluttered Production Environment**
- **BUT VERY SUCCESSFUL !!!**

2003

Journey Begins
MassMEP Partnership
Lean 101 Training
Continuous Flow Layout

2004

Value Stream Mapping
Receiver Department
Barrel Department
Assembly Department



2005

Kaizen Events
Receiver Department 5S
TPM, POUS, Pull Systems
Setup Reduction

2006

Pull Systems
2 Bin System
Balanced Flowline
Lot Size Reduction
Supplier Pull System

2007

Leadership Changes
New V.P. of Operations
Lean Culture Traction
Lean 101 Training

2008

5S Initiative
Employee Teams
VSM Events
Lead Time
Reductions

Our Lean Journey Begins . . .

Our 3 Main Value Streams

Barrels Receivers Assembly

Creating a Lean Culture

- TOTAL SUPPORT from Top Management
- A Full Time Lean Expert at the top management level
- Formal Top Level G&O's / Use the Lean Platform to drive the G&O's
- Managers with Lean knowledge to manage the process
- Formal process of conducting Kaizen
- An adequate training room
- A need or crisis to change the culture

Lean tools available to Change the Culture

- **Use the tools in your Lean Toolbox where needed**
- Value Stream Mapping
- Start with quick wins like 6S
- Utilize TPM where the need to maintain equipment is crucial
- Use standard work as a compliment to 6S
- Train the Trainers

Lean tools available to Change the Culture

- Train everyone and keep the training going
- Celebrate all events
- Do not use excuses not to improve (month end, too busy, etc.)
- Try not to remove an employee from a Kaizen due to a production need
- Make the Kaizen no more than 5 days

Westfield Operations

Al Kasper
President/COO

Jack Anderson
C.I. Leader

Mike Greene
Director of Machining Ops.

Chris Bezzina
Director of Operations

Vince Carbone
V. P. of Operations

Bob Browning
Director of Supply Chain

Roy Provost
Director of Assembly Ops.

Rick Bonci
Director of Quality

FY2015 Operations Goals and Objectives

- 2400 Guns/Day (in a 5 day work week)
- Cost Reduction – $1MM through Continuous Improvement
- New Product Introduction - Meet all project milestones, cost targets and product introduction dates
- Quality / Rework Improvement
- Inventory Reductions
- Equipment and Process Enhancements (TPM, Standard Work)
- Factory Layout
- Training Programs

FY 2015 Goals and Objectives

- **Execute the Quality Management System (QA, ENG, MFG) – Barrel, Receiver, Assembly and Finishing Cells**
- **Execute the Quality Management System SPP (QA, SCM, ENG) - Top Ten Vendors**
- **Reduce range rejects to less than 3% for Axis and less than 5% for all other (QA, MFG, ENG)**
- **Negotiate a new 3 year labor contract (HR Director, VP Operations, CFO Accounting)**
- **Improve communications within Salaried ranks (HR and Staff)**
- **Ensure complete compliance with OSHA regulations (HR, ENG, MFG)**
- **Lean – Engineering to lead one Kaizen per month, Manufacturing to lead one Kaizen per month, Maintenance to lead one TPM per month (will depend on resources available). Service and Accounting/MIS one per quarter**
- **Cost reduction $1.0 M (MFG, SCM, QA, ENG)**
- **New Products – Hit production date, cost target and improve overall process (MFG, SCM, QA, ENG)**
- **Production run rate at 1800 guns per day to 2400 guns per year by year end in a five day work schedule (MFG, SCM, QA, ENG)**
- **Standard Work ("Best Way") (MFG, SCM, QA, ENG)** Implement simultaneously in the Assembly, Finishing Department Processes and in Machining
- **Training** Create Job Breakdown Sheets and Training Timetables for Swing, Proof, Finishing, Ejector, Roll Stamp, Scope Mount, Build & Stock, Function, and Oil/Tag/Serialization Processes
- **Employee Engagement (MFG, SCM, QA, ENG)** Increase Employee Kaizen Participation (involve 2nd, and 3rd shift personnel)
  Employees involved in improving their processes, employ daily team huddles
  Enhance communication, awareness, and teamwork between employees
- **Maintenance Excellence (MFG, SCM, QA, ENG)** TPM Events (identify critical equipment and schedule events accordingly)
  Improve machine safety, uptime, and create a renewed focus on energy conservation
- **Problem Solving (MFG, SCM, QA, ENG)** Utilize PDCA, and A3 Reports (data driven tool used as a plant wide problem solving tool)

Continuous Flow (Assembly Department) **(MFG, SCM, QA, ENG)** Implement A Mag Rimfire Continuous Flowline (based on Axis Flowline)
Create an Ejector/Roll Stamp/Scope Mount Cell

Value Stream Mapping (MFG, SCM, QA, ENG) Involve and train horizontal value stream process owners in VSM techniques
Utilize department VSM's(Current & Future) to identify continuous improvements opportunities

Visual Management/KPI's (MFG, SCM, QA, ENG) Identify and track critical KPI's to monitor in all departments (ex. Safety, Quality, Cost, Delivery, Training, 6S, Scrap)

Plant Layout (MFG, SCM, QA, ENG) Implement 2013/2014 plant layout relocations in support of the approved 2015 Master Plan

LEAN TOOLBOX

- Pull Systems
- Standard Work
- SMED
- TPM
- 8 Wastes
- Gemba Walks
- Visual Controls
- Takt Time
- OEE
- LSW
- KAIZEN
- Value Stream Mapping
- 6S
- Heijunka (level loading)
- PDCA
- 5 Whys
- Poka Yoke (mistake proofing)
- Cellular Flow (one-piece flow)
- Process Improvement
- FIFO (first in first out)
- VA / NVA Work
- Problem Solving

2015 Lean/Continuous Improvement Focus

Maintenance TPM / PM
- TPM Events – Machining Departments
- Maintenance Excellence Initiative

Employee Training / Employee Engagement
- Standard Work
- Job Instruction
- Problem Solving
- Kaizen / Blitzes

Quality / QMS
- Defect Reduction
- Process Audits
- Gaging / Calibration

Process Improvements / Continuous Improvement
- Assembly Department
- Machining Departments
- Value Stream Mapping

Visual Factory
- KPI's / 6S Initiative
- Visual Standards / Communication Displays

Engineering
- New Product Introductions

Lean Drivers

Jack Anderson
C. I. Leader

Chris Bezzina
Director of Operations

Vince Carbone
V. P. of Operations

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Roy Provost
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Director of Quality

David Kronengold
Director of Engineering

Wayne Kratochvil
Components Planner

Paul Smarrelli
Director of Customer Service

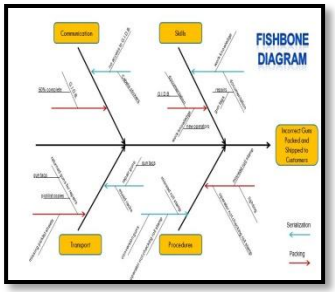
Don Skelly
Materials Manager

Train The Trainer
Westfield & Lakefield
5S Training with
MassMEP Facilitator
Lean 101 Training
Fluting SMED Kaizen

2009

Value Stream Mapping
Barrel Department
Receiver Department
Assembly Department
Order Entry Process
Plant Layout Changes

2010



2011

Kaizen Events
Proof & Function
Barrel Bore Finish
Customer Service
RTV Process
Swing Rework

Process Improvement
Packing Process
Shot Blast Process
Finance Processes
Incoming Receiving

2012

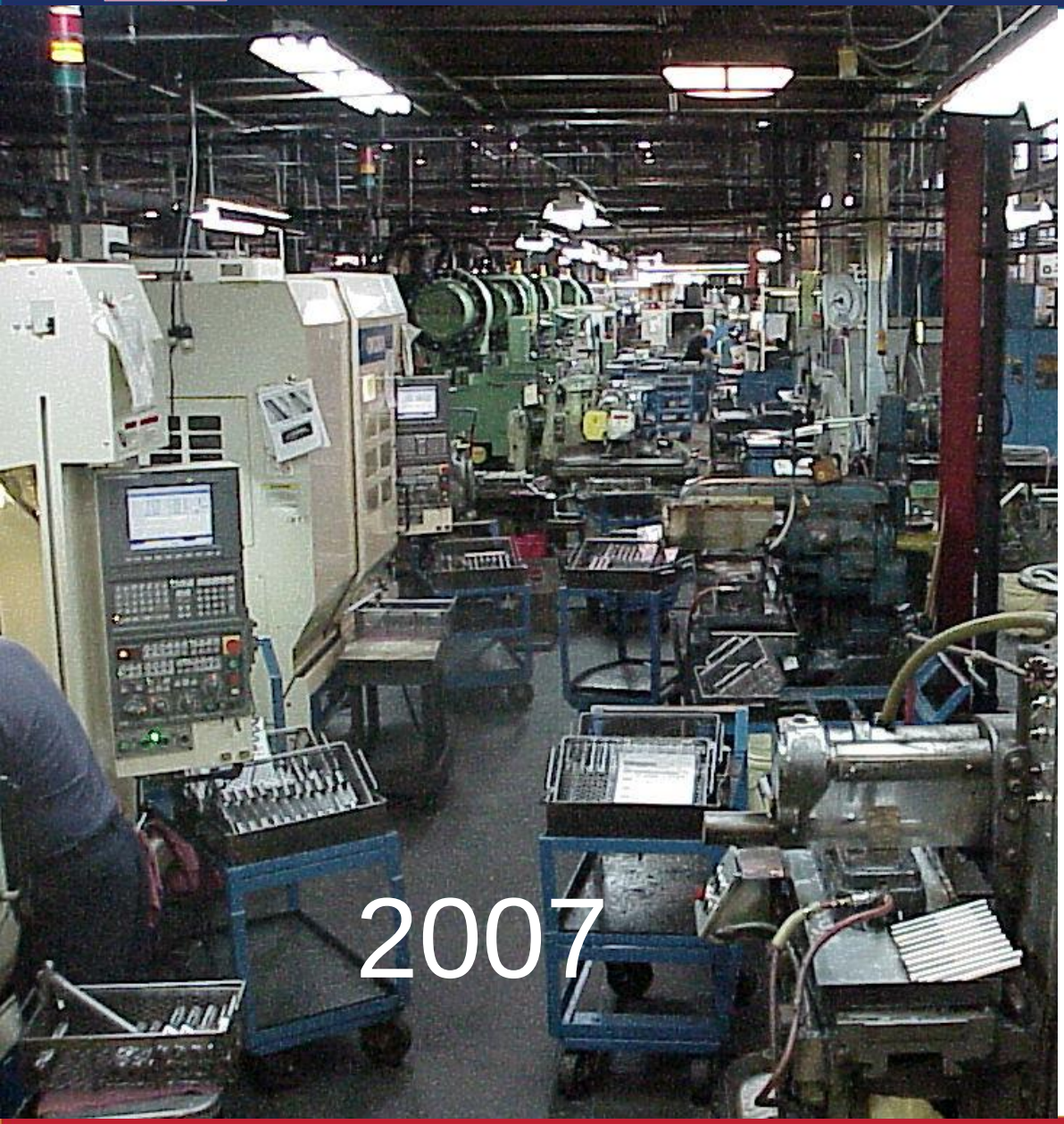
TPM /Kaizen Events
TPM Training
Range Improvements
Office Kaizen
Standard Work

2013

6S/Standard Work
Standard Work Videos
Employee Engagement
Continuous Flow Focus
Lean Training Grant

2014

Our Lean Journey Restart . . .



Batching

The Old Receiver Manufacturing processes that consisted of:

Ten Cells

Mill Line 1

Mill Line 2

Trigger slot

Auto Drill

Mill Line 3

Safety Slot

Mill Line 4

Hand File

Wash

Threading

Twenty four Machines


2015

LEAN TOOLBOX

- Pull Systems
- Standard Work
- SMED
- TPM
- 8 Wastes
- Gemba Walks
- Visual Controls
- Takt Time
- OEE
- LSW
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- Value Stream Mapping
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- Heijunka (level loading)
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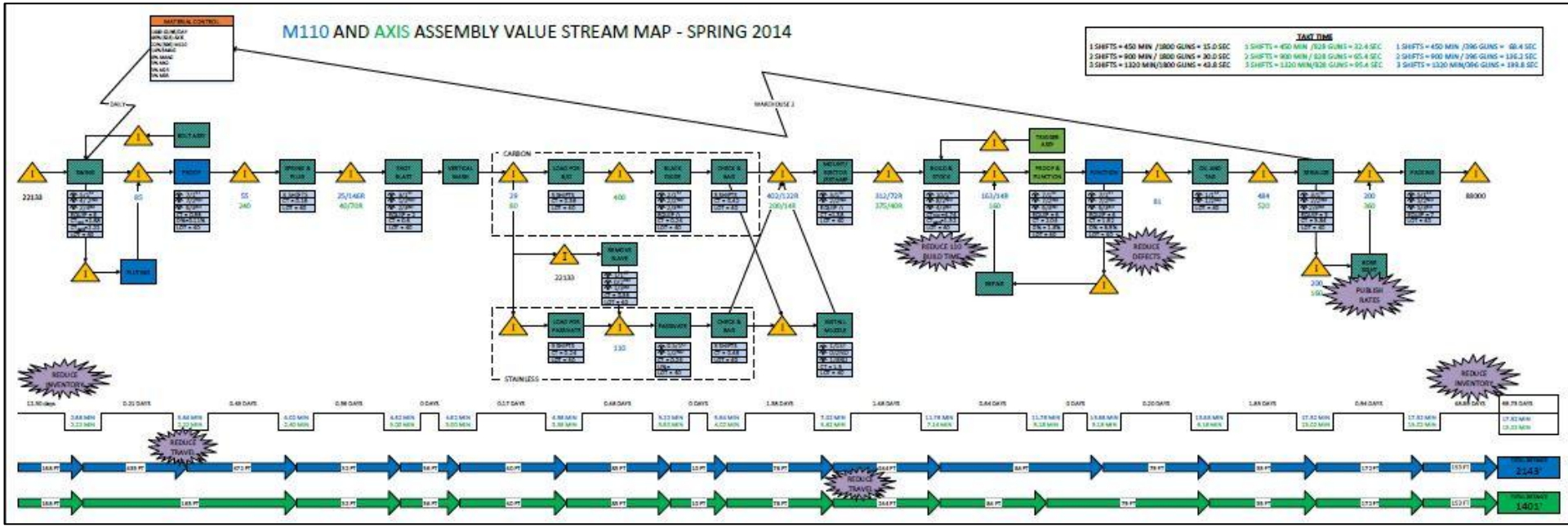
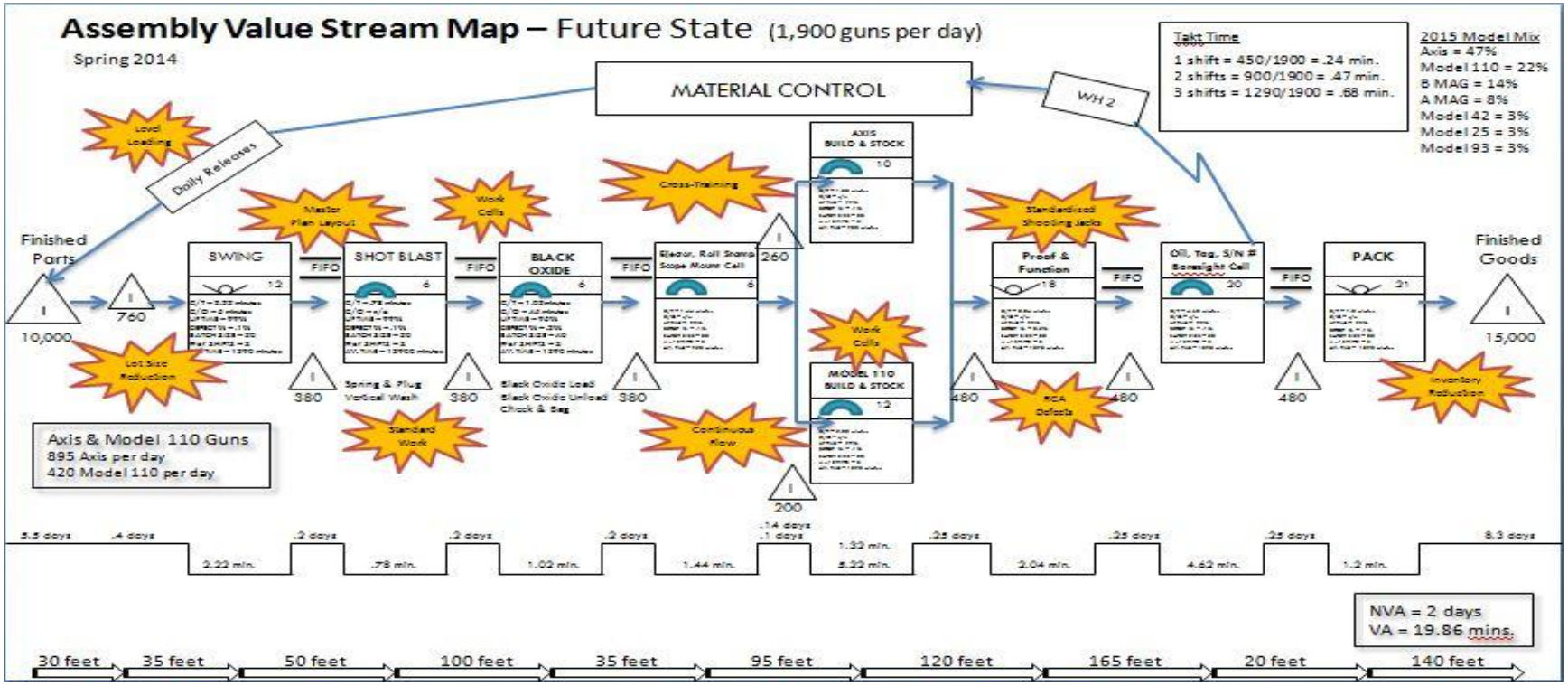
- Cellular Flow (one-piece flow)
- Process Improvement
- FIFO (first in first out)
- VA / NVA Work
- Problem Solving

Value Stream Mapping



Value Stream Mapping – Current State

Value Stream Mapping



Value Stream Mapping – Future State

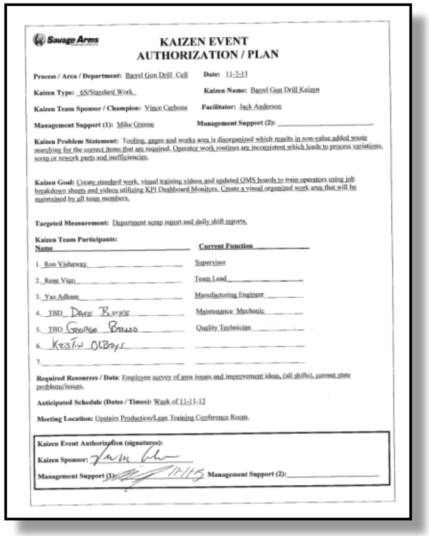
Value Stream Mapping

Suggested Kaizen	Benefit	Sponsor	Team Leader	Start Date
Gun Drill TPM	Improve Uptime, Avoid Delays, Increase Capacity	Mike Greene	Keith Albee / Jack Anderson	April
Gun Drill SMED Set Up Reduction	Improve Uptime, Avoid Delays, Increase Capacity	Mike Greene	Ron Vishaway	April
Scrap / Rework Reporting System	Performance Metric, Process Control, Improvement Opportunities	Nick Ponci	Mike Greene	April
Wash / Polish / Oil & Bag Cell	Reduce Distance Traveled, Avoid Parts Transportation / Travel, Waste	Mike Gibbs	Dean Peatman	June
Gun Drill Tooling	Improve Uptime, Avoid Delays, Increase Capacity	Mike Greene	Frank Darcy	May
TWI Job Instruction Training/ Cross Training	Employee Development, Workforce Flexibility, Job Satisfaction	Vince Carbone	Jack Anderson	July
Cut Off Supermarket	Improve Synchronization, Avoid Overproduction, Reduce WIP	Mike Greene	Wayne Kratochvil / Mike Greene	March
Turning & Chambering 6S Kaizen Events	Organize work areas for greater flow and less wastes	Mike Greene	Patrick Kenney	May

VSM Improvement Plan

Our Improvement Process

Kaizen Authorization Form



KAIZEN EVENT AUTHORIZATION / PLAN

Savage Arms

Process / Area / Department: Barrel Gun Drill Cell **Date:** 11-7-13

Kaizen Type: 6S/Standard Work **Kaizen Name:** Barrel Gun Drill Kaizen

Kaizen Team Sponsor / Champion: Vince Carbone **Facilitator:** Jack Anderson

Management Support (1): Mike Greene **Management Support (2):** ____

Kaizen Problem Statement: Tooling, gages and works area is disorganized which results in non-value added waste searching for the correct items that are required. Operator work routines are inconsistent which leads to process variations, scrap or rework parts and inefficiencies.

Kaizen Goal: Create standard work, visual training videos and updated QMS boards to train operators using job breakdown sheets and videos utilizing KPI Dashboard Monitors. Create a visual organized work area that will be maintained by all team members.

Targeted Measurement: Department scrap report and daily shift reports.

Kaizen Team Participants:

Name	Current Function
1. Ron Vishaway	Supervisor
2. Rene Vigo	Team Lead
3. Yaz Adham	Manufacturing Engineer
4. TBD Dave Burke	Maintenance Mechanic
5. TBD George Bruso	Quality Technician
6. Kristin OlBrys	
7.	

Required Resources / Data: Employee survey of area issues and improvement ideas, (all shifts), current state problems/issues.

Anticipated Schedule (Dates / Times): Week of 11-11-13

Meeting Location: Upstairs Production/Lean Training Conference Room.

Kaizen Event Authorization (signatures):

Kaizen Sponsor: [signature]

Management Support (1): [signature] 11-1-13 **Management Support (2):** ____

Continuous Improvement Schedule

Kaizen Event

C. I. Improvement Flowmap

Kaizen Events

Continuous Improvement – Employee Driven

Kaizen Events

Continuous Improvement – Employee Driven











Kaizen Agenda

Day One

Kaizen Lean Training
Observe & Document Current Process

Day Two

Identify Problems & Barriers
Brainstorm Improvement Ideas

Day Three

Develop Action Plans
Implement Action Plans

Day Four

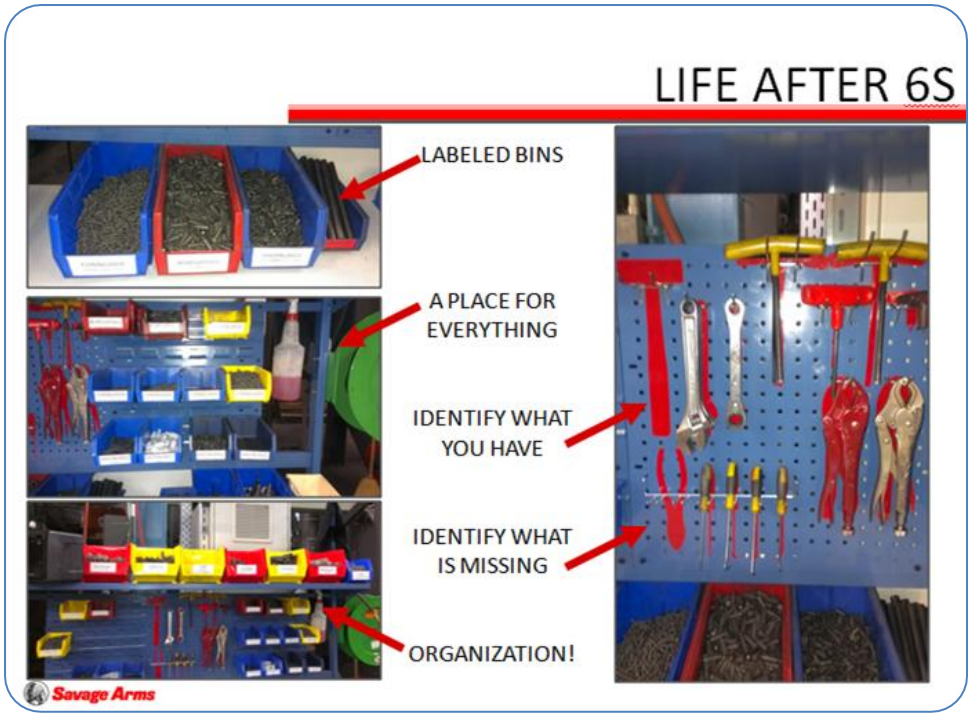
Continue Improvements
Document & Train to New Standard Work

Day Five

Kaizen Presentation

6S

LIFE BEFORE 6S



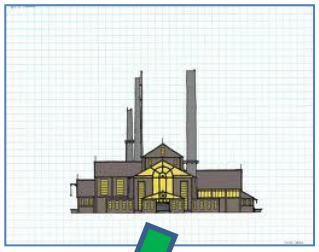
Workplace Organization

Pull Systems

Kanban Card

Purchasing

Supplier



A basic pull replenishment system starts with the demand for parts or material. With the need for replenishment, a SIGNAL is sent back to Purchasing to supply more parts or material.

TPM (Total Productive Maintenance)

TPM requires the involvement of all people in the organization.

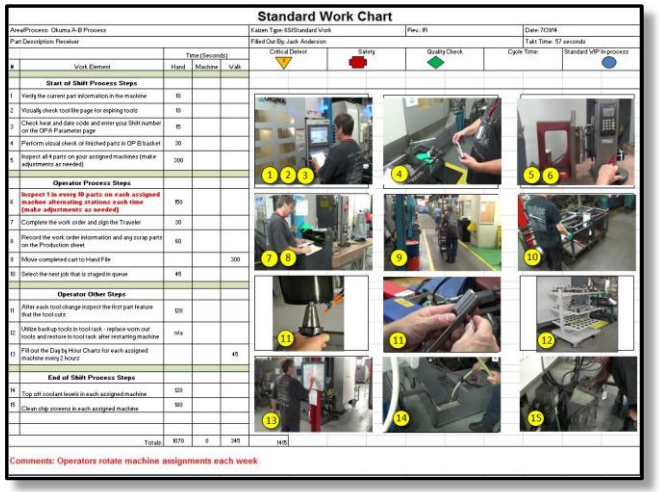
Maintenance

Operators

Management

Standard Work

Involve the people that do the work and help develop the **"Best Way"** to do the process as you know it today, then keep improving it.


Standard Work Chart

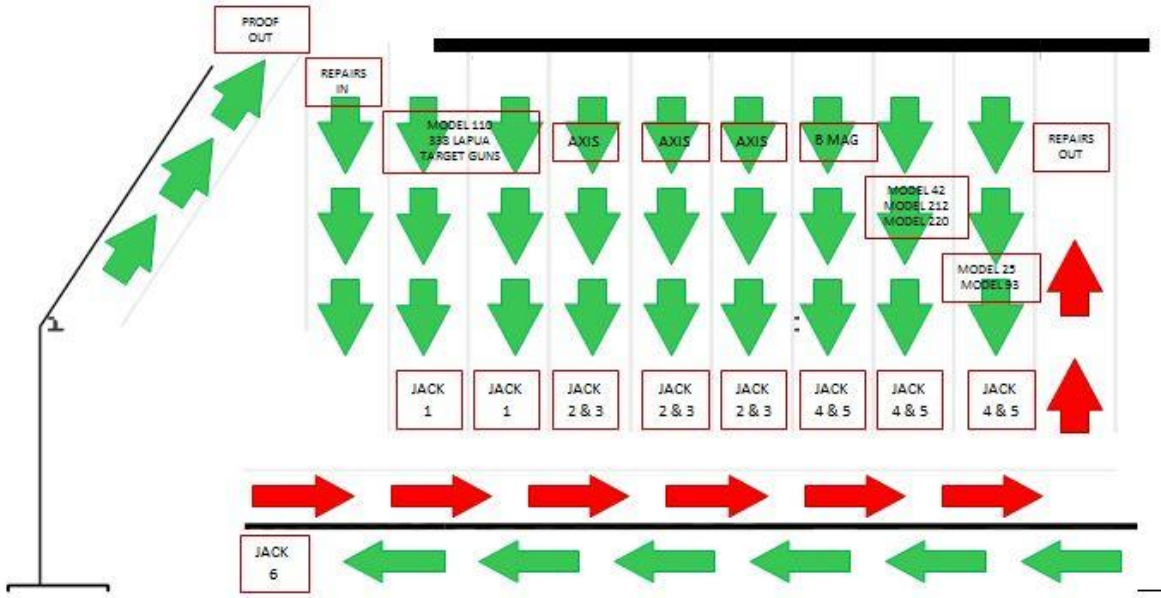
Standard Work Chart

Standard Work Video

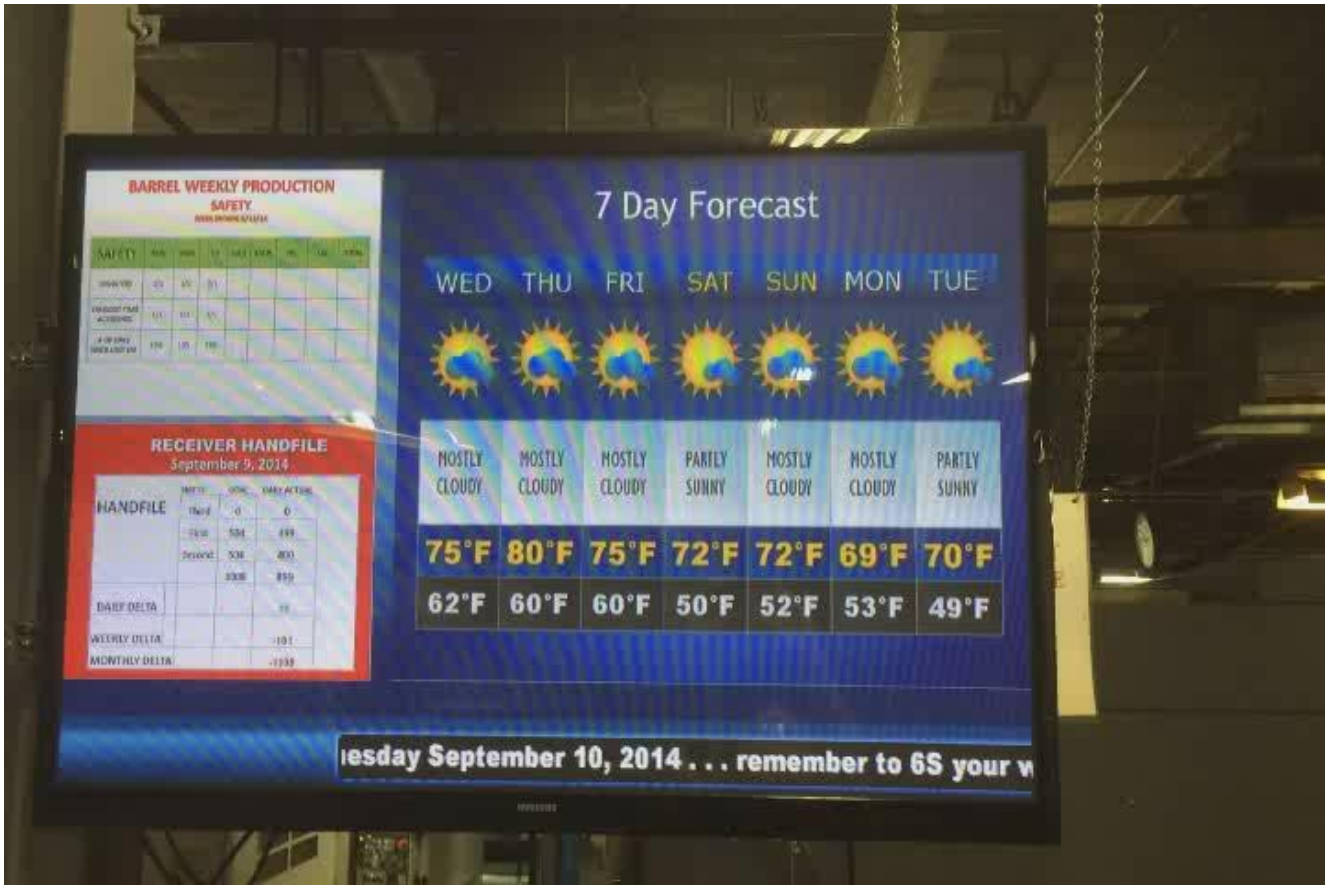
Continuous Flow

ALWAYS LOOKING FOR A "BEST WAY"

First in First Out Lanes



Visual Factory



VISUAL FACTORY

(13) digital signage stations

KPI's
Company Information
Safety Alerts
Kaizen Events
New Product Releases
Employee Profiles
Health & Wellness

2-Year Training Grant

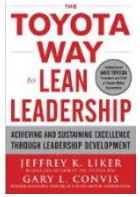
2013/2015 - 8 modules

Lean 101	–	400 employees
Value Stream Mapping	–	33 employees
Standardized Work	–	33 employees
Lean Expert Certification	–	30 employees
Champion Training	–	16 employees
Inspector Technician Certification	–	24 employees
Supervisory Skills	–	25 employees
Lean Supply Chain Certification	–	13 employees

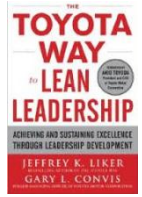

Lean 101 Training


Lean 101 Training
04:37

Employee Training



Lean Champions



Jack Anderson
C. I. Leader

Chris Bezzina
Director of Operations

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Rick Bonci
Director of Quality

David Kronengold
Director of Engineering

Wayne Kratochvil
Components Planner

Paul Smarrelli
Director of Customer Service

Don Skelly
Materials Manager

Lean Experts


Jack Anderson
C.I. Leader


Frank Darcy
Manufacturing Supervisor


Jessica Henry
Staff Accountant


Israel Maldonado
Group Leader - Barrels


James Vassallo
Builder/Shooter


Ron Vishaway
Manufacturing Supervisor


Wayne Kratochvil
Components Planner


Ben Lewis
Quality Engineer


Sandy Molloy
Group Leader – Sub-Assembly


Don Skelly
Materials Manager


Kristin Olbrys
MRO Buyer


Craig Priest
CNC Operator


Kate Gihon
C.I. Specialist


Christian Savaria
Quality Inspector


Hector Torres
Material Coordinator

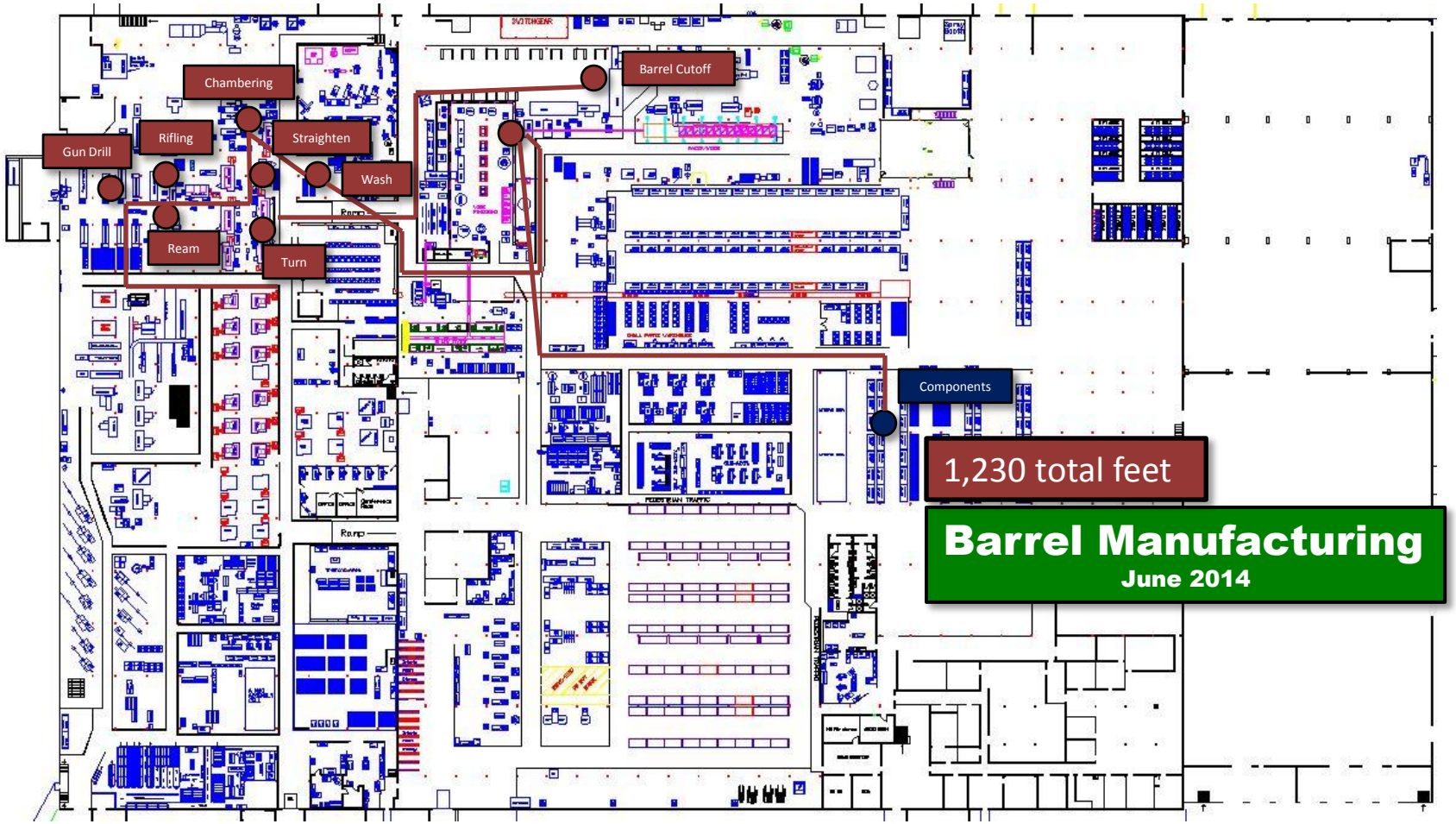

Maryanne Gignac
Customer Service

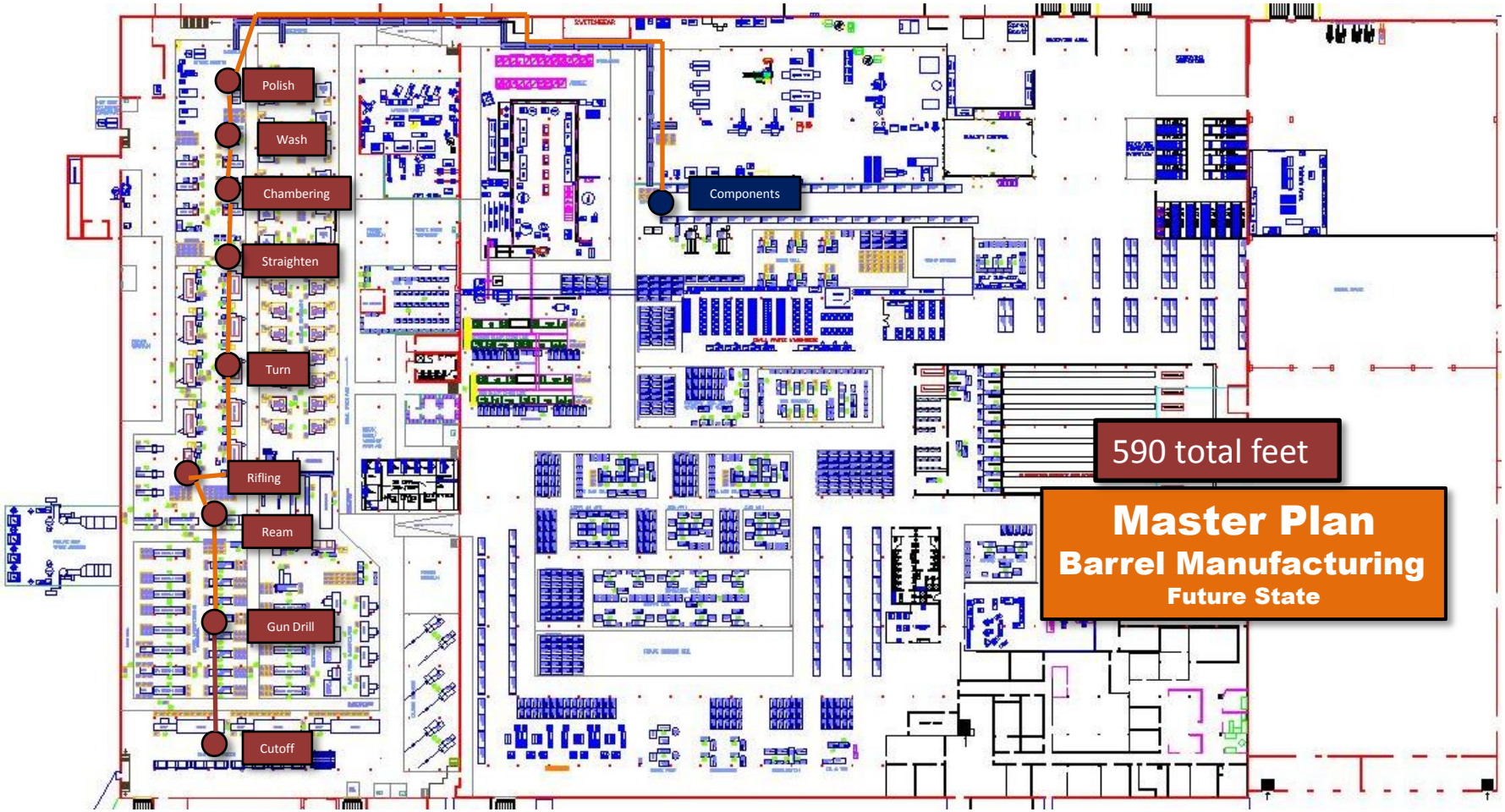

Vitaliy Blishchik
Group Leader - Receivers

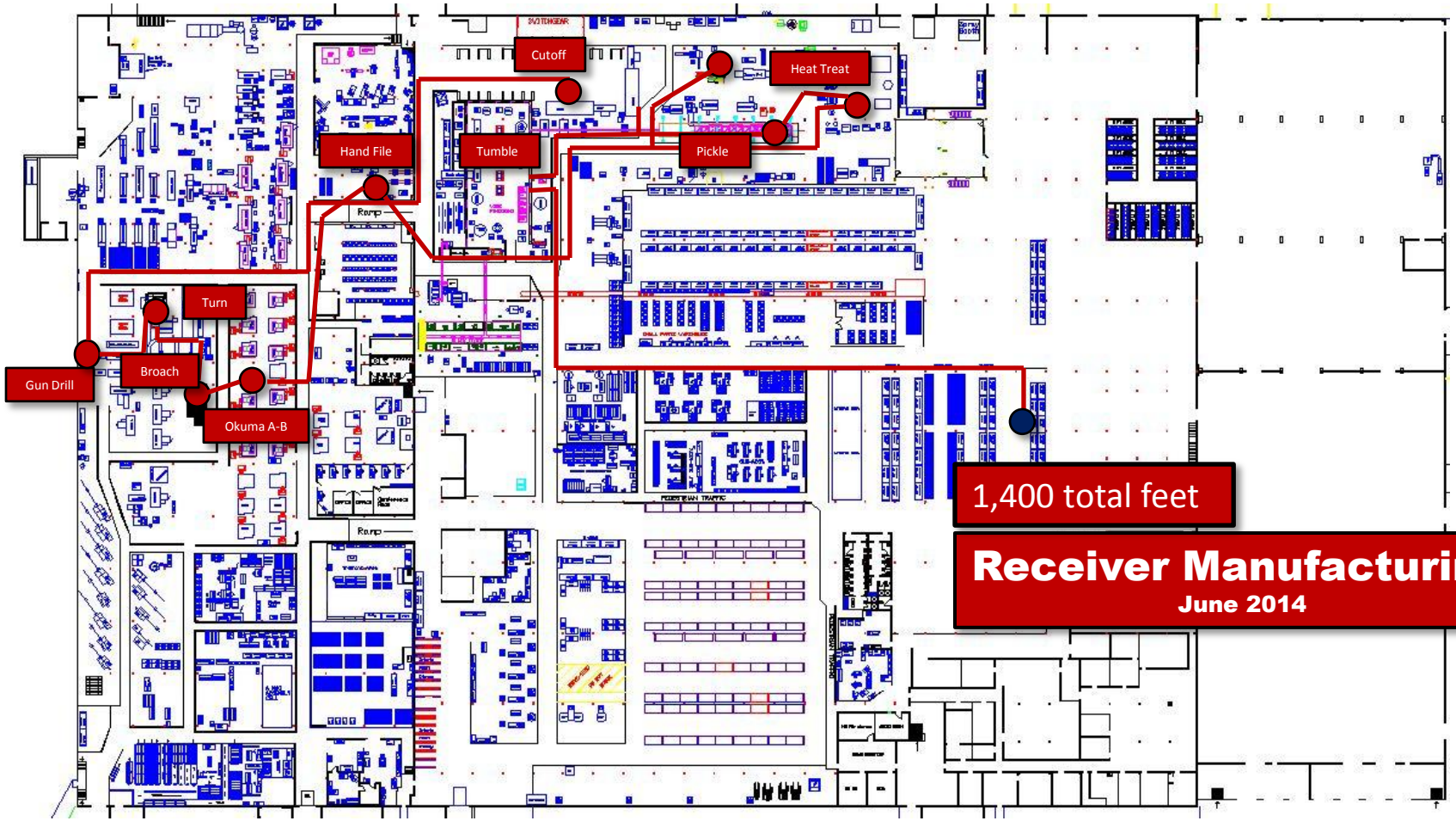

Joslin Hawley
Group Leader - Receivers


Reid Lavallee
Manufacturing Supervisor


Eric Berrios
Group Leader - Barrels

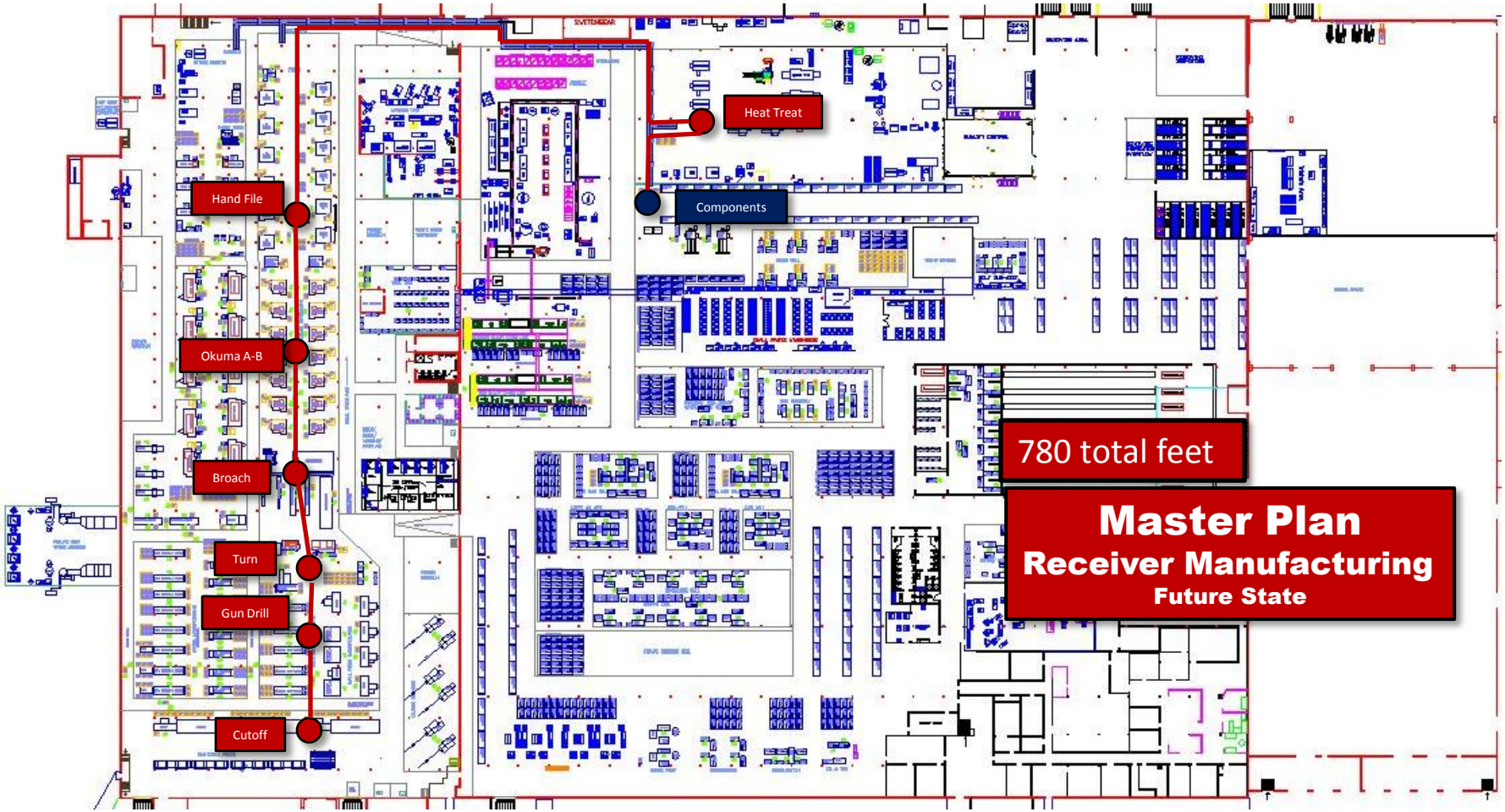

Chambering
Barrel Cutoff
Gun Drill
Rifling
Straighten
Wash
Ream
Turn
Components
1,230 total feet
Barrel Manufacturing
June 2014

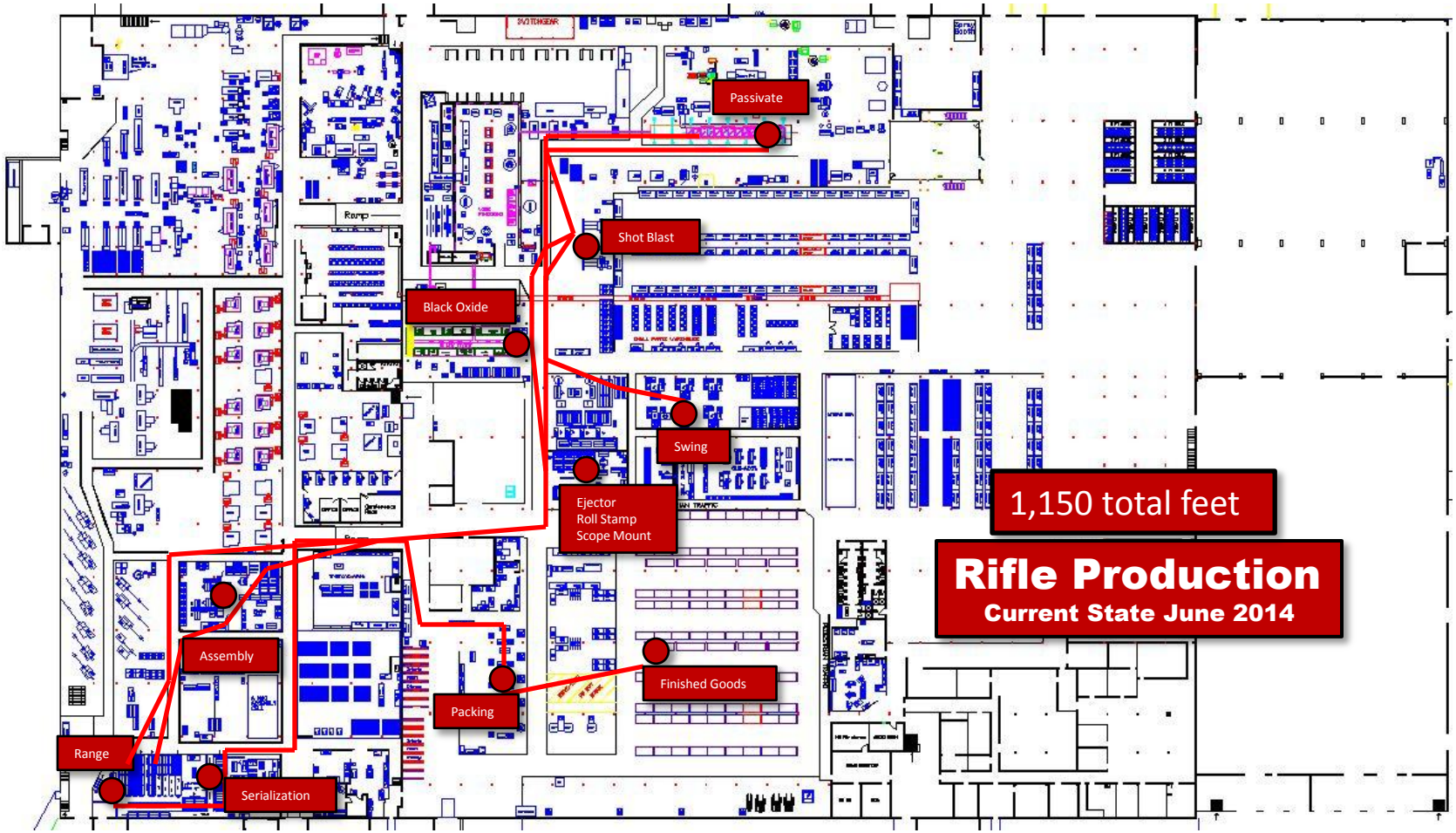

Polish
Wash
Chambering
Straighten
Turn
Rifling
Ream
Gun Drill
Cutoff
Components
590 total feet
Master Plan
Barrel Manufacturing
Future State

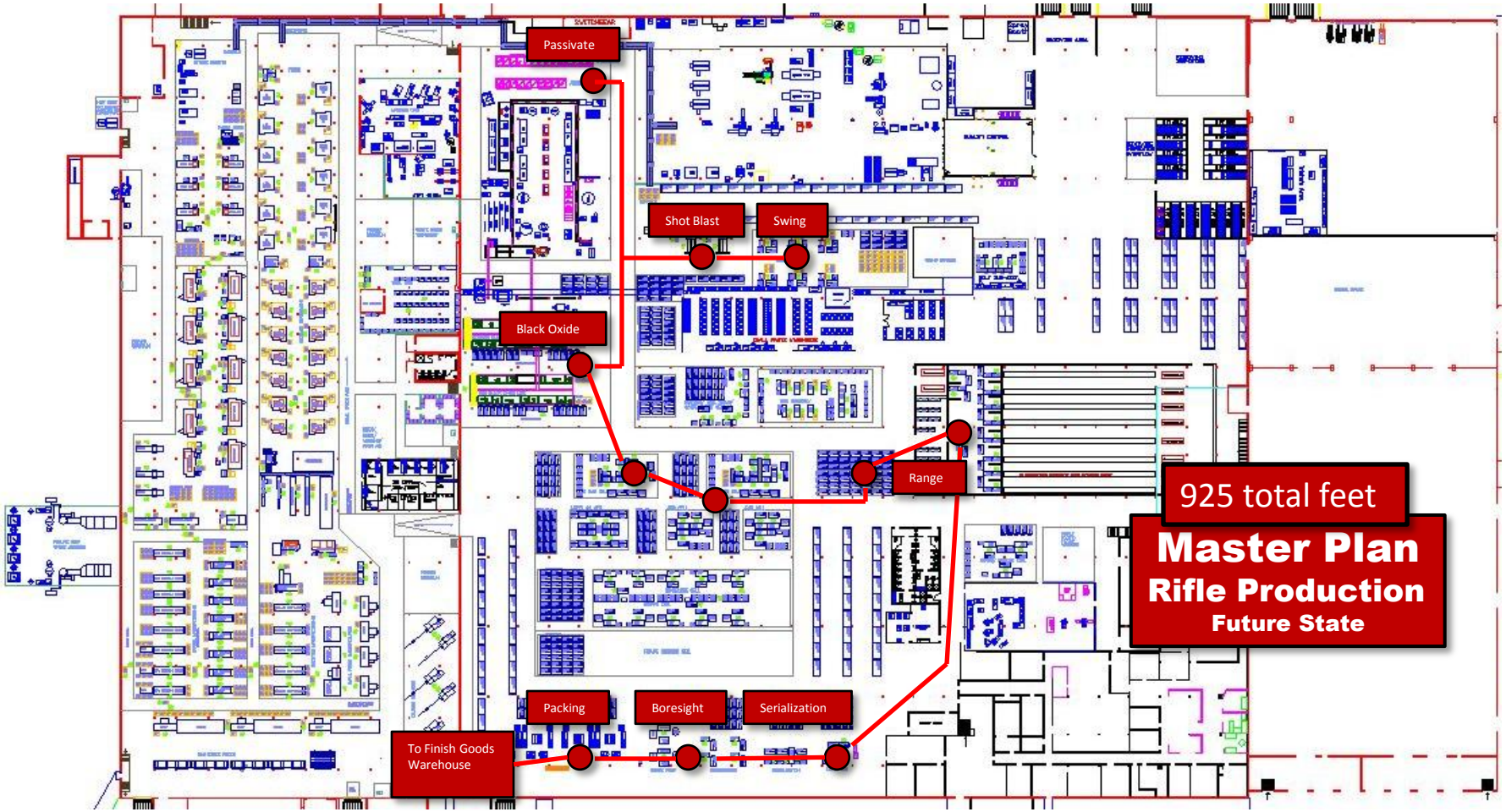


Receiver Manufacturing

June 2014


Heat Treat
Components
Hand File
Okuma A-B
Broach
Turn
Gun Drill
Cutoff
780 total feet
Master Plan
Receiver Manufacturing
Future State

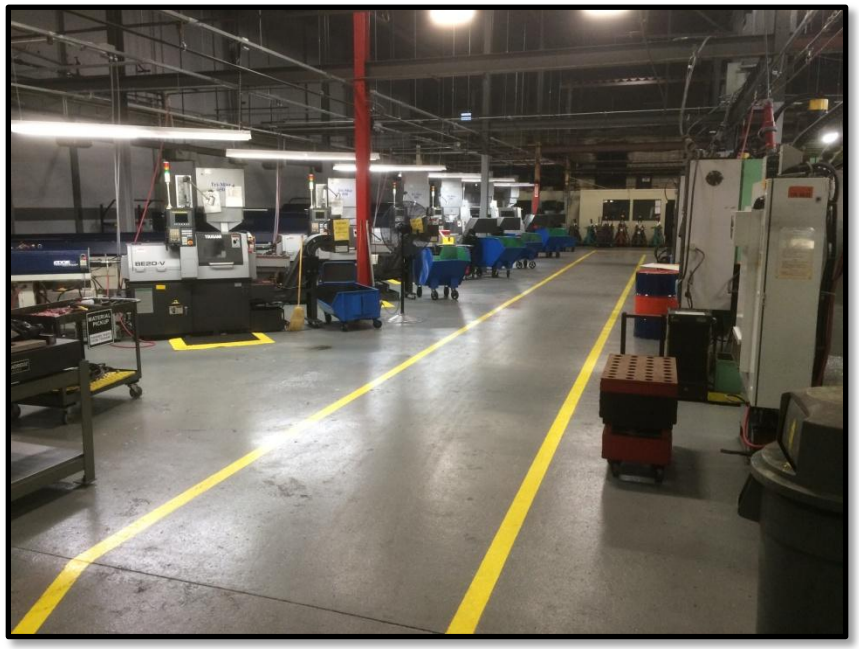

Passivate
Shot Blast
Black Oxide
Swing
Ejector
Roll Stamp
Scope Mount
Assembly
Finished Goods
Packing
Range
Serialization
1,150 total feet
Rifle Production
Current State June 2014

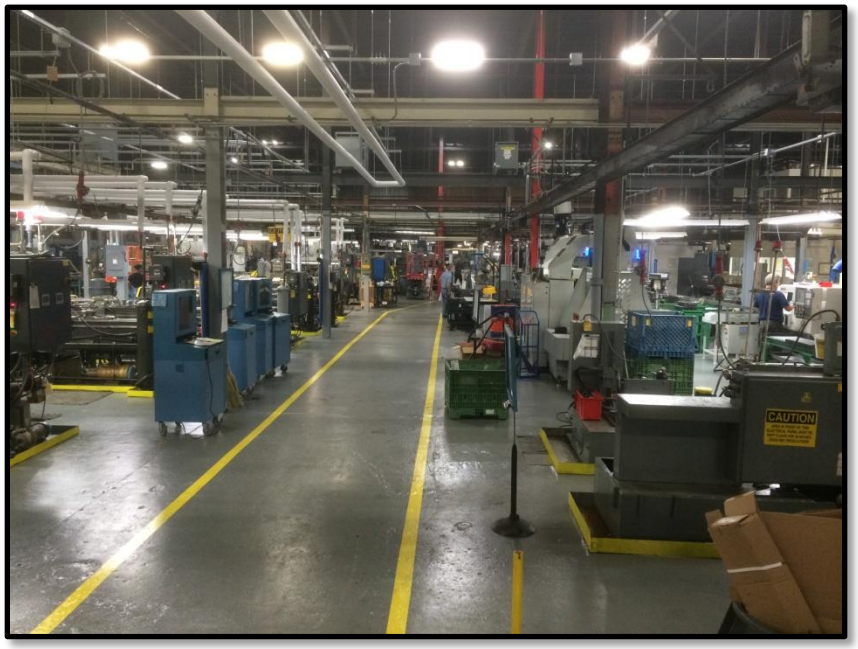

Passivate
Shot Blast
Swing
Black Oxide
Range
Packing
Boresight
Serialization
To Finish Goods Warehouse
925 total feet
Master Plan
Rifle Production
Future State

Factory of the Future

New Manufacturing Plant Layout

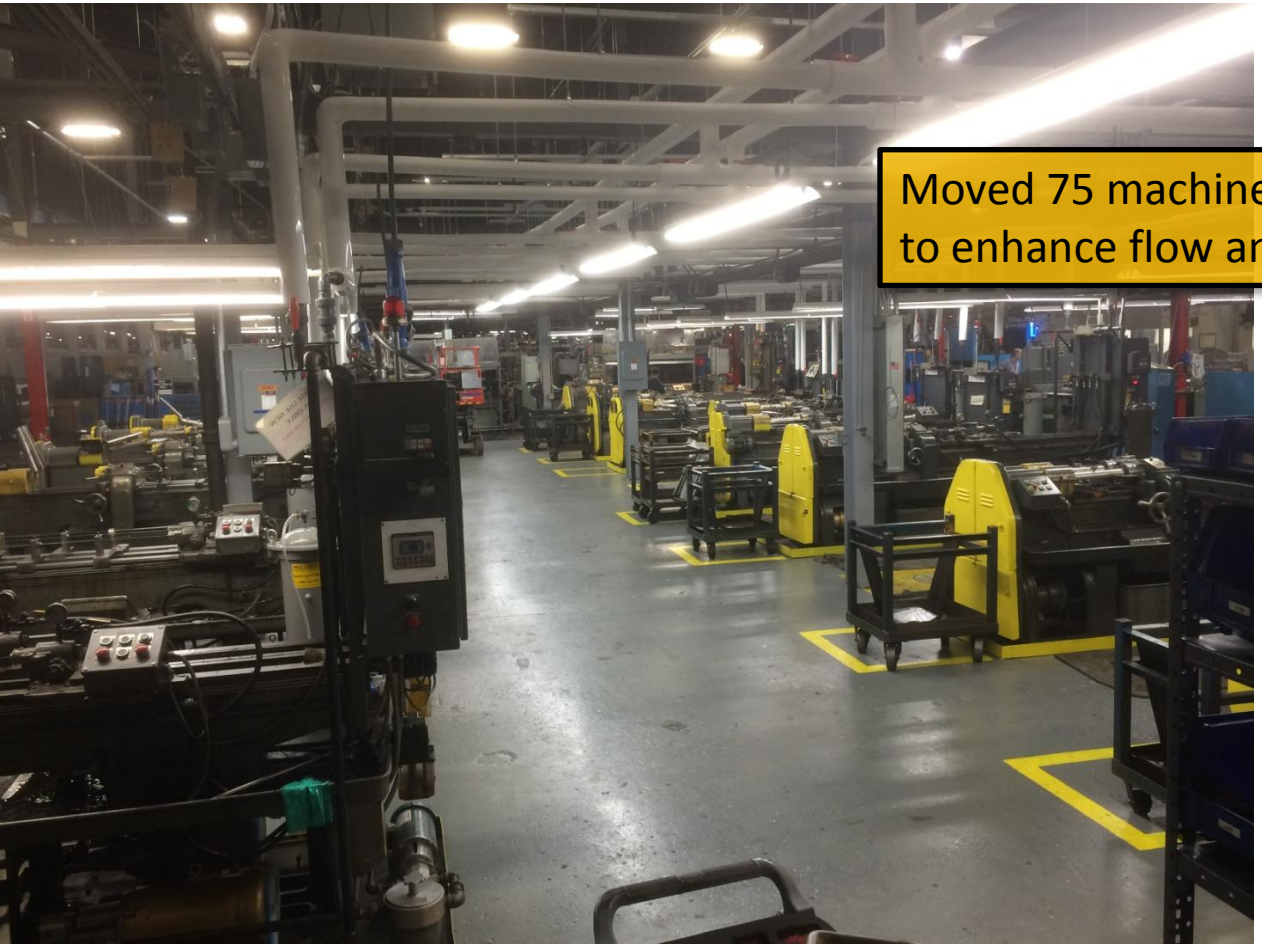
Summer 2014





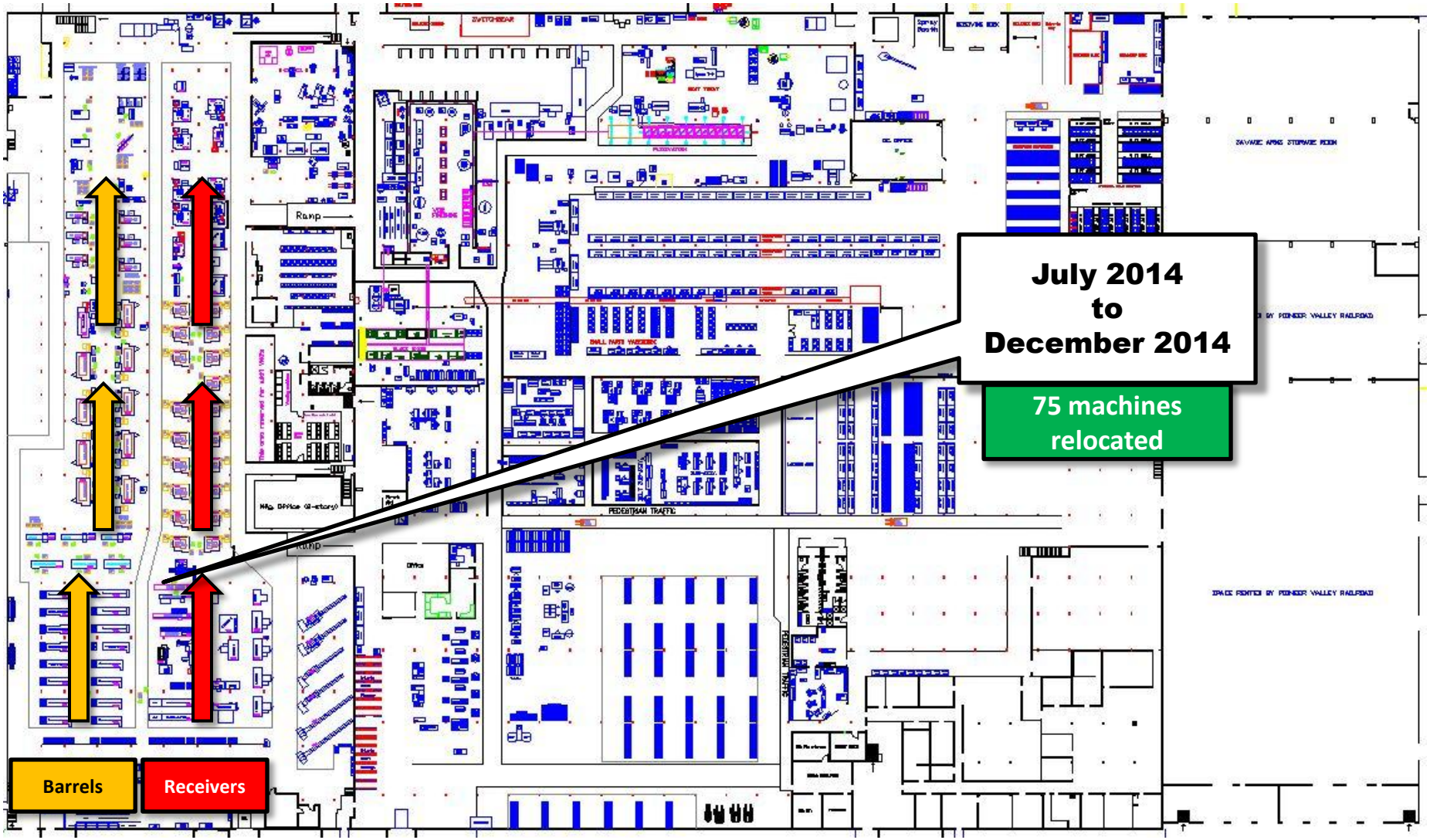
"Creating a clean, safe, and productive work environment"

Factory of the Future



Moved 75 machines since the July Shutdown to enhance flow and reduce lead time

New Manufacturing Plant Layout



Next Steps

Upcoming Employee Training

April 2015

Team Involvement Problem Solving (TIPS)

Leader Effectiveness Training (L.E.T)

MassMEP
Manufacturing Extension Partnership

HOW ARE WE GOING TO CONTINUE TO DO IT?

EMPLOYEE ENGAGEMENT

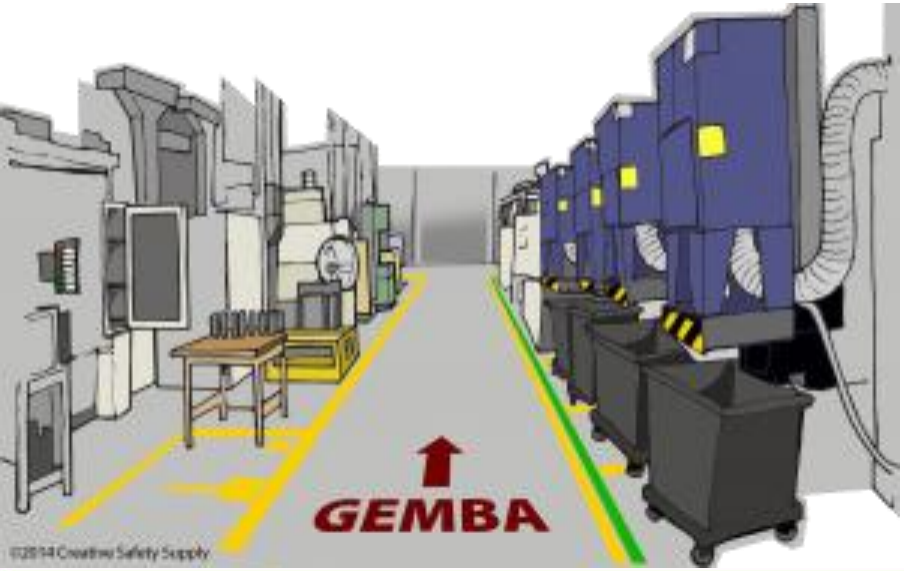
Great People Make Savage!

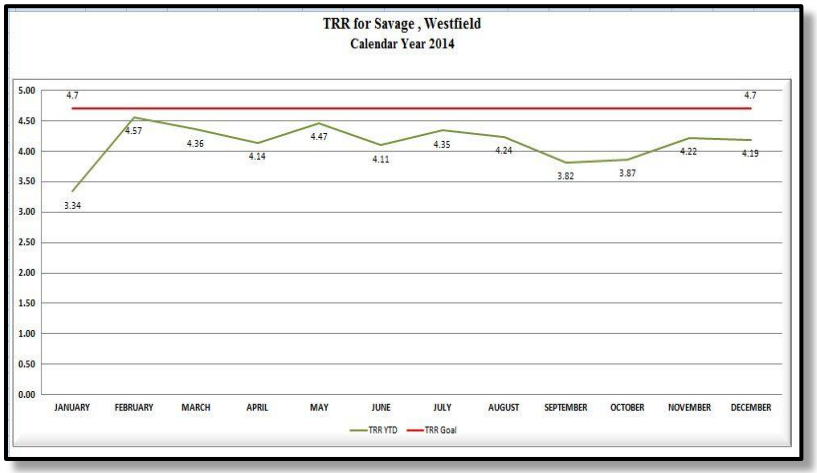
- #1 Rifle Sales
- High Quality Product
- Industry Leading Innovation
- Tremendous Value

Safety (SQDEC)

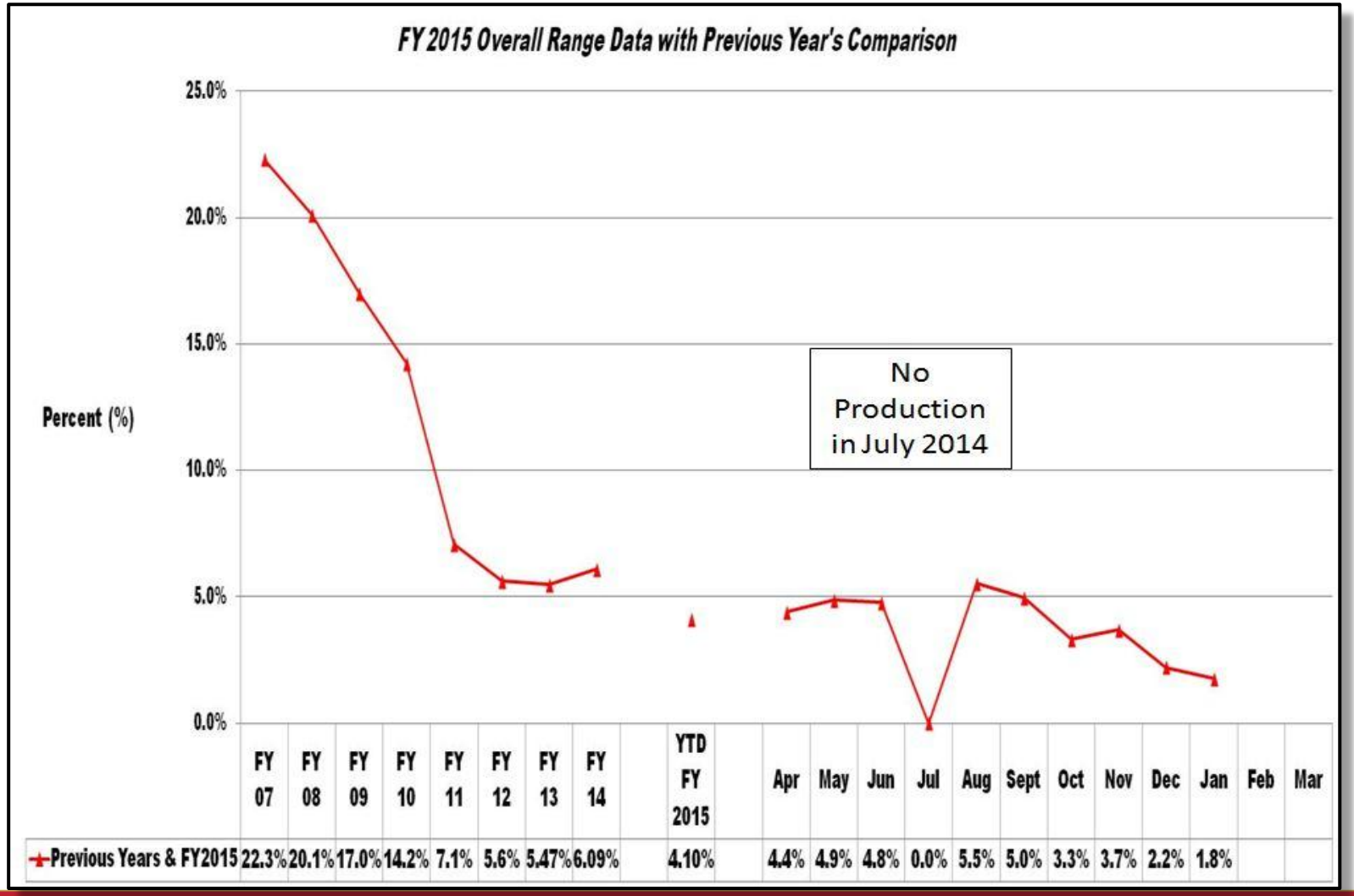
Focus on Safety

Lean Safety Gemba Walks



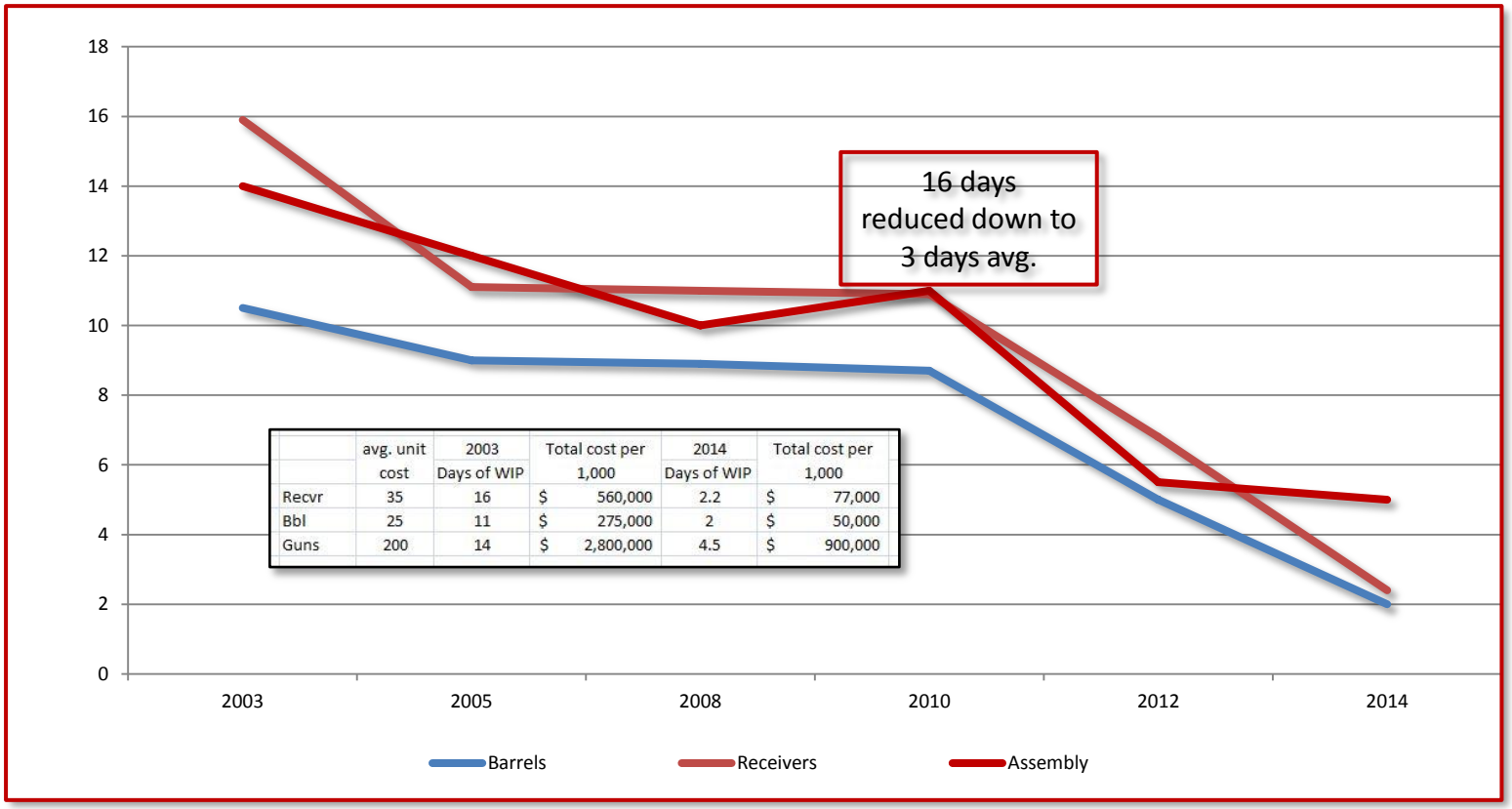


Quality (SQDEC)



	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13	FY 14	YTD FY 2015	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Previous Years & FY2015	22.3%	20.1%	17.0%	14.2%	7.1%	5.6%	5.47%	6.09%	4.10%	4.4%	4.9%	4.8%	0.0%	5.5%	5.0%	3.3%	3.7%	2.2%	1.8%		

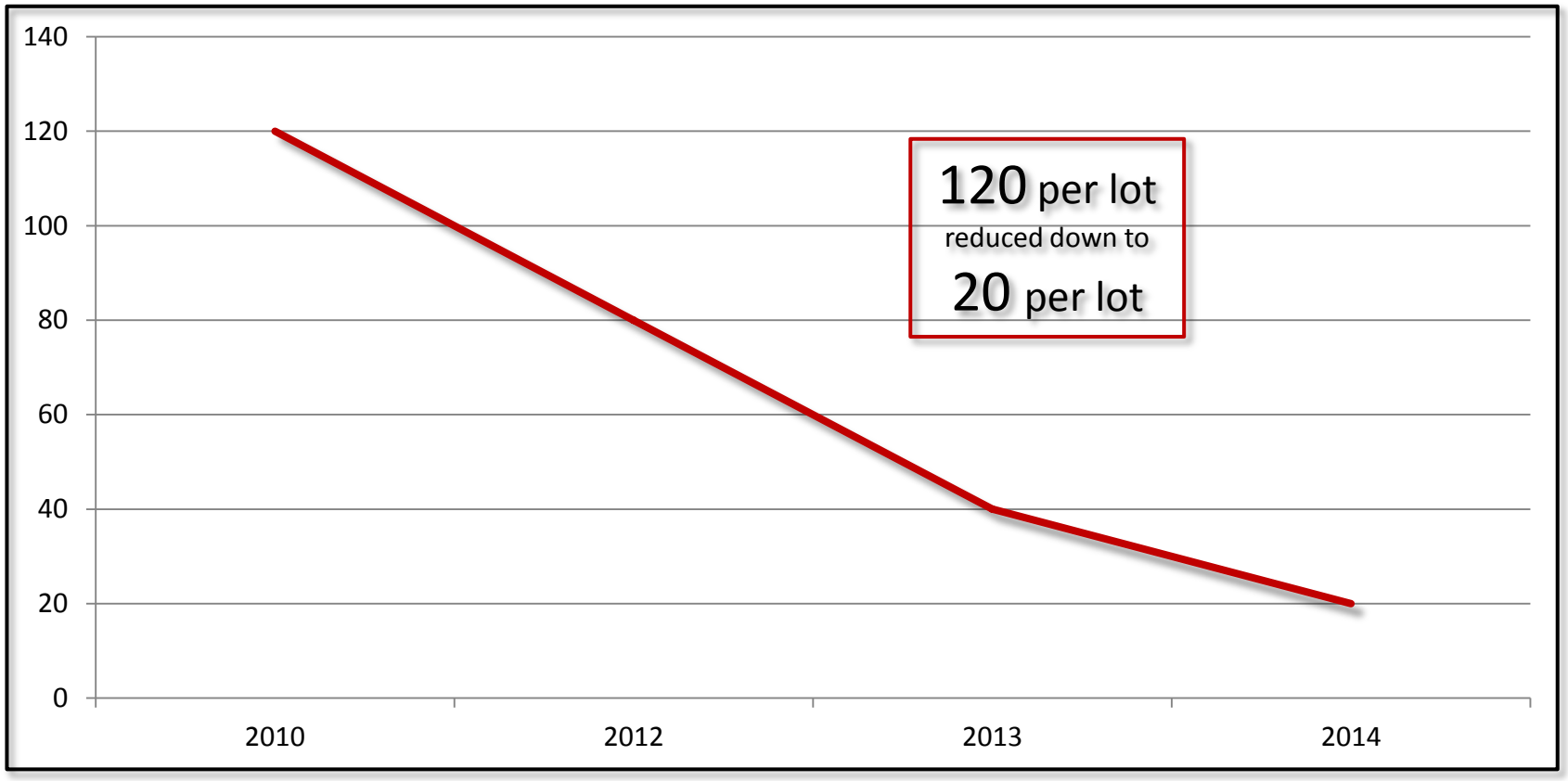
Delivery (SQDEC)



	avg. unit cost	2003 Days of WIP	Total cost per 1,000	2014 Days of WIP	Total cost per 1,000
Recvr	35	16	$ 560,000	2.2	$ 77,000
Bbl	25	11	$ 275,000	2	$ 50,000
Guns	200	14	$ 2,800,000	4.5	$ 900,000

Lead Time Reduction (days of WIP)

Delivery (SQDEC)



Barrel Lot Size Reduction

Employee Engagement (SQDEC)

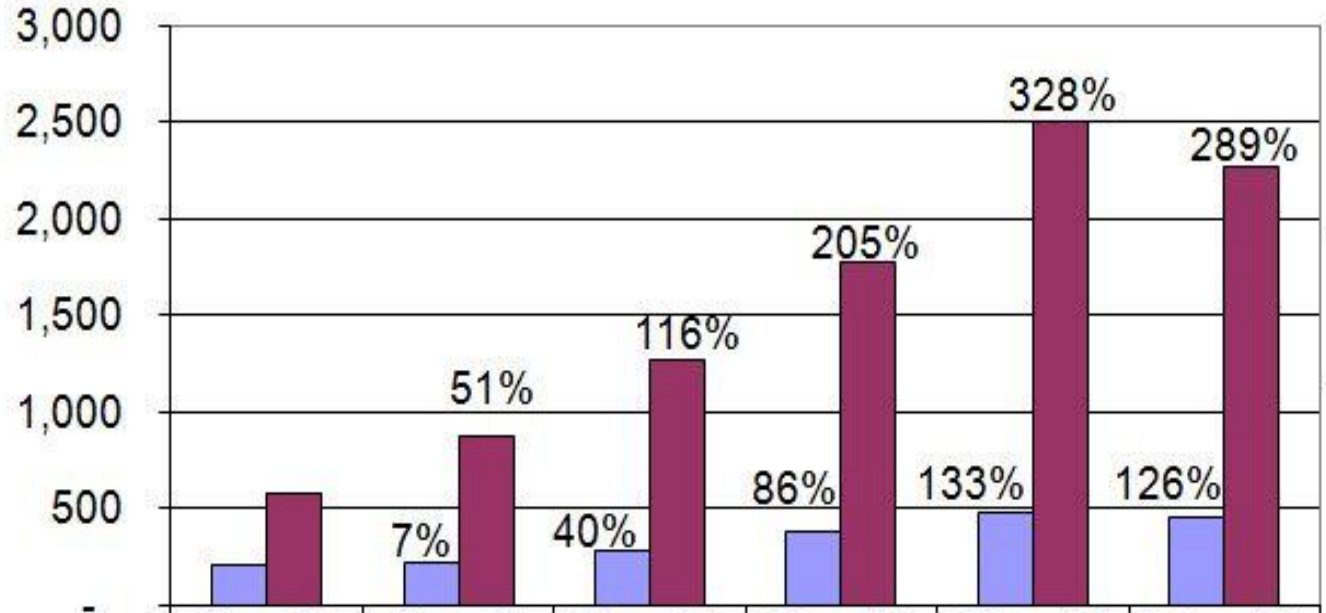
Autonomy
Mastery
Purpose

Cost (SQDEC)

Lean Cost Saving Program Annualized

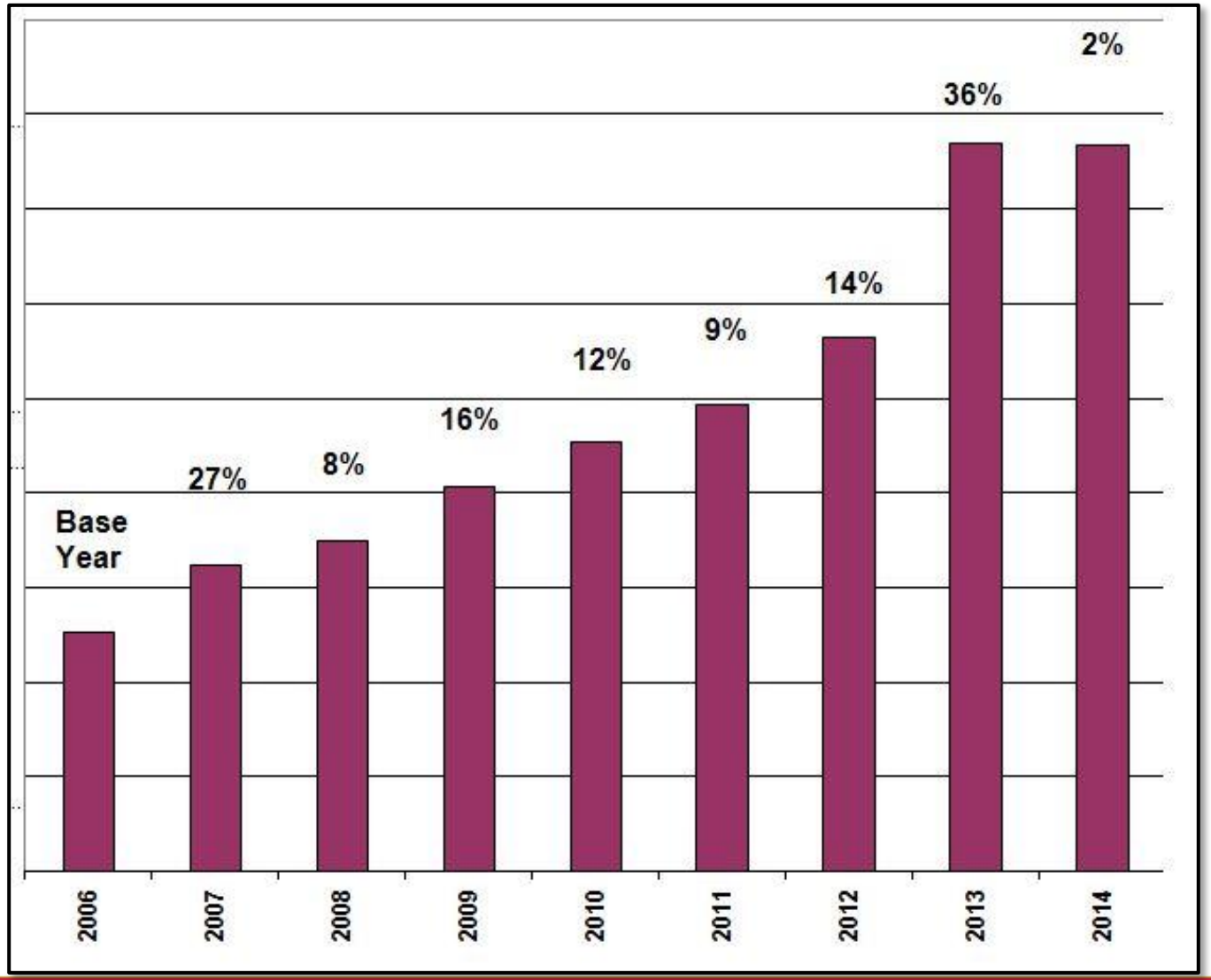
2008 Total	$1,054,634
2009 Total	$2,461,439
2010 Total	$ 897,961
2011 Total	$1,078,761
2012 Total	$1,285,330
2013 Total	$ 230,822 (4 months switched to ATK fiscal year)
2014 Total	$2,270,850
2015 Total	$1,019,387
Eight Year Total	$10,299,184

Westfield Productivity Improvements



	Nov. 09	Nov. 10	Nov. 11	Nov. 12	Nov. 13	Mar. 14
Headcount	203	218	285	377	474	459
Guns/Day	584	879	1,264	1,781	2,498	2,272

Value Added (EBITDA) per Associate



Lessons Learned

- Top Management needs to be totally committed
- Easy to fall back to old habits – “sustain the gains”
- Use Value Stream Mapping to chart the course
- Provide Lean training for all associates
- Create Lean Experts and Champions

Lessons Learned

- Select the right Lean tool for the right application
- Involve and show Respect for People
- Utilize Standard Work and keep on improving
- Go and See the process – Gemba Walks

Thank You!

A link to the full conference survey will be emailed to you Tuesday afternoon.

Session Code: VS-3

Creating a Lean Culture in a Traditional Manufacturing Company

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