LEAN SOLUTIONS ACADEMY

Lean & Six Sigma Training

Lean Yellow& Green Belt Certification

brought to you by:

PATRICK ADAMS CONSULTING

Meet Your Instructor

- Background
- Lean Solutions "Train-The-Trainer" Course
- Internationally Certified Trainer

CLASS SCHEDULE

Day 1

o Roles and Responsibilities of Belts

o What is Lean & Six Sigma?

o Lean Principles

o Standard Work

o 8 Wastes

o 5S

o Voice of the Customer (VOC) and CTQs Process

o Jidoka

o Poke Yoke

Day 2

o Day 1 Review

o PDCA

o Kaizen

o Pull

o Kanban

o Flow

o Visual Management

o SMED

o Total Productive Maintenance

o **YELLOW BELT EXAM**

(as Homework)

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BODY
OF KNOWLEDGE

Yellow Belt

The Fundamentals of Lean Six Sigma	Defining a Process / CTQ
History / Process / Cause & Effect	The 8 Elements of Waste / Belt Roles
Principles of Lean / Six Sigma	5S / Lean Tools / Visual Management / SMED
Process Mapping / DMAIC	Kanban / Poka-Yoke / Standardized Work
PDCA / Kaizen & Kaizen Events	Lean & Six Sigma Belt Roles
Kano Analysis	Total Productive Maintenance
Voice of Customer, & Business	Value Add & Non Value Add Work

Lean Green Belt

Project Management	Fishbone Diagrams / Graphical Analysis
Project Charter	Lean Metrics & Projects
SIPOC	FMEA
7-Quality Tools / Pareto Analysis	Facilitating a Kaizen Event
Control Charts	Strategy Execution
Control Plans	Hoshin Kanri
Gantt Chart	Change Management
Structured Problem Solving	

Six Sigma Green Belt

Six Sigma Statistics	Correlation and Regression
Measurement Systems Analysis	Introduction to DOE
Process Capability	Hypothesis Testing

Black Belt

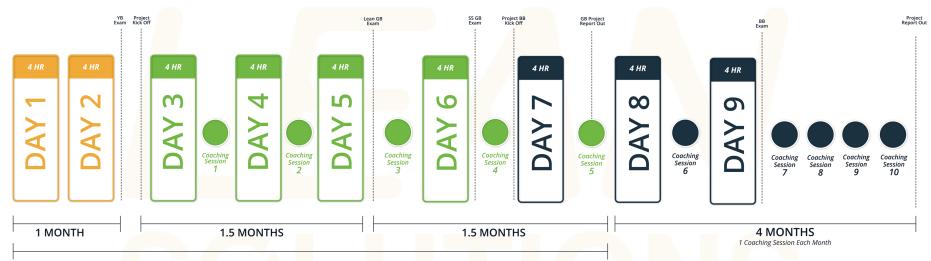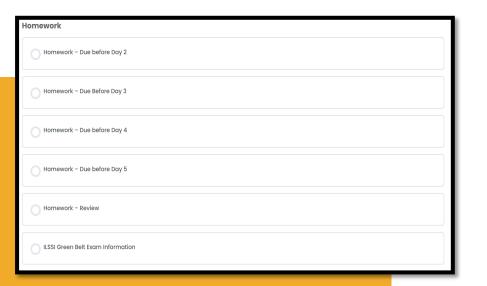|	
Mann-Whitney / Kruskal-Wallis	Orthogonal Designs
Friedman Mood's Median / Simple Linear Regression	Full Factorial Experiments & Designs
1 Sample Sign / 1 Sample Wilcoxon	Fit, Diagnose Model and Center Points
One and Two Sample Proportion	Taguchi Designs Control Phase
Chi-Squared (Contingency Tables)	Statistical Process Control (SPC)
Correlation / Regression Equations	Data Collection for SPC / I-MR Chart
Regression Equations / Residuals Analysis	Xbar-R Chart / U Chart / P Chart
Non- Linear Regression	NP Chart / X-S chart
Multiple Linear Regression	CumSum Chart / EWMA Chart
Confidence & Prediction Intervals	Binomial Distribution and Calculations
Designed Experiments / OFAT	Poisson Distribution and Calculations
Experiment Objectives	Design for Six Sigma (DFSS) / Hoshin Kanri
Experimental Methods	Cost Benefit Analysis / ROI, Payback Period
Experiment Design Considerations	
Linear & Quadratic Mathematical Models	

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DAY 1 — 4 HR

DAY 2 — 4 HR

DAY 3 — 4 HR

Coaching Session 1

DAY 4 — 4 HR

Coaching Session 2

DAY 5 — 4 HR

Coaching Session 3

DAY 6 — 4 HR

Coaching Session 4

DAY 7 — 4 HR

Coaching Session 5

DAY 8 — 4 HR

Coaching Session 6

DAY 9 — 4 HR

Coaching Session 7

Coaching Session 8

Coaching Session 9

Coaching Session 10

YB Exam

Project Kick Off

Lean GB Exam

SS GB Exam

Project BB Kick Off

GB Project Report Out

BB Exam

Project Report Out

1 MONTH

1.5 MONTHS

1.5 MONTHS

4 MONTHS
1 Coaching Session Each Month

4 MONTHS
Classes Every Other Week

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HOMEWORK

Homework

- ○ Homework – Due before Day 2
- ○ Homework – Due Before Day 3
- ○ Homework – Due before Day 4
- ○ Homework – Due before Day 5
- ○ Homework – Review
- ○ ILSSI Green Belt Exam Information

As a Yellow Belt student, you are expected to review and complete the homework for each lesson.

The assignments can be accessed on the student dashboard inside your course.

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YELLOW BELT
CERTIFICATION EXAM

o Lifetime certification

o Done online on your student dashboard after training is finished

o Open Book

o 50 Multiple Choice Questions

o Pass mark is 70%

o Result issued immediately

o Retake is available

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YELLOW BELT
CERTIFICATION EXAM

Find information on how to access the exam on the student dashboard

○ ILSSI Green Belt Exam Information

Download the class PowerPoint slides (as a searchable pdf) to help while studying for and taking the exam

📄 **Course**   📖 **Materials**

Green Belt PowerPoint Slides (pdf)
Green Belt Project Requirements (pdf)

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LEAN SIX SIGMA ROLES & RESPONSIBILITIES

Champion **+ Executive Support**

Black Belts

Green Belts

Yellow Belts

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CHAMPION/ PROCESS OWNER

Champions help to identify and select the most important projects to work and break down political barriers / roadblocks for Lean Six Sigma to succeed

○ Assist with Project selection and initiation
○ Obtain needed project resources and eliminate roadblocks
○ Participate in project review meetings
○ Provide Governance / Ask the right questions
○ Set up a training programs

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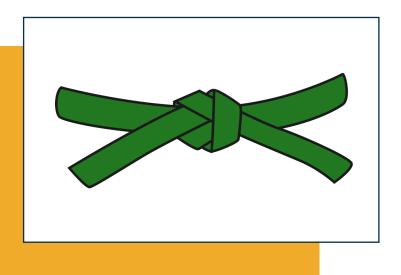
BLACK BELT

Black Belts are Lean Six Sigma process experts, think strategically and lead larger projects within the business.

- o Approx 1 Black Belt every 50 - 100 employees (1%)
- o Dedicated to process improvement 100% of time
- o Project team leader for larger / high profile projects
- o Facilitates project teams and helps Green belts
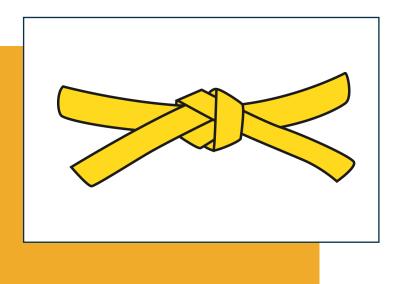- o Thinks strategically and towards Enterprise level goals
- o Works cross-functionally

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GREEN BELT

Green Belts are practitioners of Lean Six Sigma improvement and lead small/medium projects or support larger Black Belt Projects.

○ Approx 1 Green Belt for every 10-30 employees (5%)
○ Involved approx 50% time on projects
○ Typically works projects within their functional area
○ Team members for larger projects
○ Team leaders for small / medium projects

YELLOW BELT

Yellow Belts are Workers and Functional Specialists and apply the Lean Six Sigma Methodology to their own work and serve on project teams on a part-time basis.

- As many as possible (target is 100% of workers)
- Functional workers, Subject Matter Specialists. Team members
- Provide support to Black Belts and Green Belts as needed
- Team members on project teams
  - Supporting projects with process knowledge and data collection

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What is

Lean & Six Sigma?

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LEAN & SIX SIGMA TIMELINE

Guinness Brewery

Walter Shewhart Introduces SPC Statistical Process Control

W. Edwards Deming

Joseph Juran

1900

1930

1950

Ford Assembly Line

Gilbreth,
•Management Theory
•Industrial Engineering

Toyota Production System
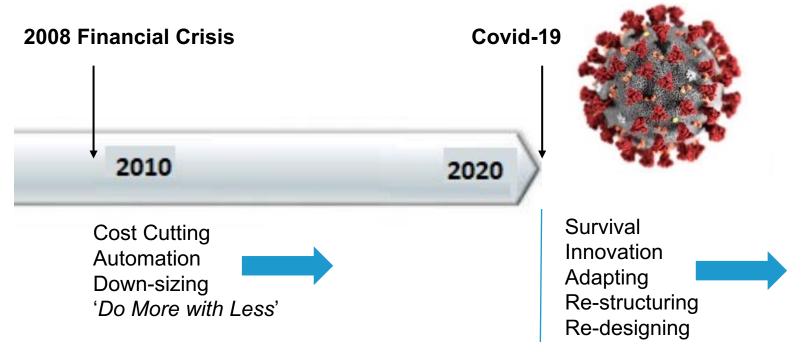Taiichi Ohno
Shigeo Shingo
Kaoru Ishikawa

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LEAN & SIX SIGMA TIMELINE

LEAN & SIX SIGMA TIMELINE

Shift in Focus

2008 Financial Crisis

Covid-19

2010

2020

Cost Cutting
Automation
Down-sizing
'*Do More with Less*'

Survival
Innovation
Adapting
Re-structuring
Re-designing

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Walter Shewhart
(SPC and Control Charts)

W. Edwards Deming
(Quality Management
PDCA Plan, Do, Check, Act)

INFLUENTIAL LEADERS

IN LEAN & SIX SIGMA PRINCIPLES

The evolution of Lean & Six Sigma was heavily influenced by American and Japanese engineers, statisticians and quality control experts 1950-1980.

Shigeo Shingo
SMED, Poka Yoke

Lillian Gilbreth
Process Flow
Ergonomics

Joseph Juran
(Quality Planning, Quality
Improvement
Quality Control)

Taiichi Ohno
7-Wastes, Gemba-Walk
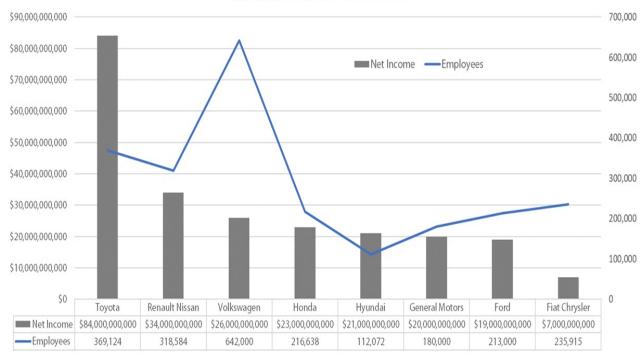
Kaoru Ishikawa
7-Quality Tools

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Toyota Production System (TPS)

HOUSE OF LEAN

Keep it Simple
Keep it Visual
Continue to Improve

Empowered Employees

Just-In-Time

Takt Time Planning

Continuous Flow

Pull Systems

Quick Changeover

High Performance Work Teams

Continuous Improvement

PDCA

Kaizen · Eyes for Waste

5 Why's · Problem Solving

Jidoka

Automatic Stops

Andon

Error Proofing

Quality Control

Six Sigma

Lean Fundamentals

Day by Hour Tracking	Standard Work/ Management Audits	Tracking Centers & Strategy Deployment
Value Stream Mapping	Total Productive Maintenance	Plan For Every Part
5S + Safety	Visual Controls	Leveled Production

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Superiority of the Toyota Production System

Cumulative Net Income 2014-2017

	Toyota	Renault Nissan	Volkswagen	Honda	Hyundai	General Motors	Ford	Fiat Chrysler
Net Income	$84,000,000,000	$34,000,000,000	$26,000,000,000	$23,000,000,000	$21,000,000,000	$20,000,000,000	$19,000,000,000	$7,000,000,000
Employees	369,124	318,584	642,000	216,638	112,072	180,000	213,000	235,915
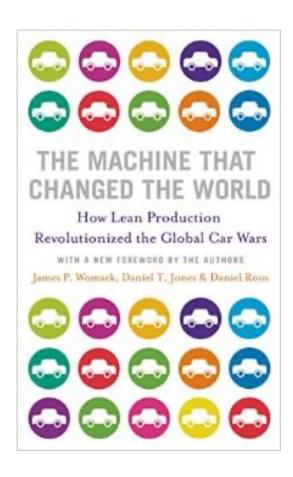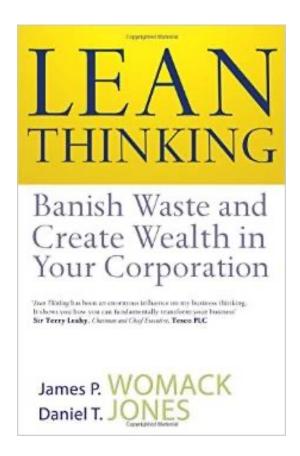
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Data Source: Yahoo Finance

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"The Machine that Changed the World" 1990

"Lean Thinking" (1993)

Historical Phases in Manufacturing & "Lean Principles" Applied Outside of Toyota

	When	What	Examples
Craft Production	Before 1900s	Individual pieces **made by experts**	Everyone
Mass Production	1910 – 1980s	**Large volumes of standard** product made in specialized processes	FORD
Lean **Manufacturing**	1970s – 1990s	**Small batches** with pull, approaching "1-pc flow"	Japanese companies, Intro to US
Lean **Operations**	2000s – Future	**Manufacturing companies and Non-manufacturing companies** improving operations using Lean principles	Banking, Insurance, Manufacturing
Lean **Enterprise**	2000 – Future	Operations, Design Engineering, Marketing, Sales, and support processes fully integrated	Everyone

TOYOTA

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ORIGINS OF SIX SIGMA
MOTOROLA & GENERAL ELECTRIC (GE)

Bob Galvin: CEO of Motorola 1980's

1985 Bill Smith coins the term "Six sigma"

1987 Motorola trademarks the term "Six Sigma"

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ORIGINS OF SIX SIGMA
MOTOROLA & GENERAL ELECTRIC (GE)

Jack Welch : CEO of GE 1981-2001

Jack Welch (CEO) made Six Sigma the management and corporate culture of General Electric 1981 – 2001.

o   Every manager was trained as at least a Green Belt level.
o   During his tenure at GE, the company's value rose 4,000%.

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WHY IS IT CALLED
SIX SIGMA?
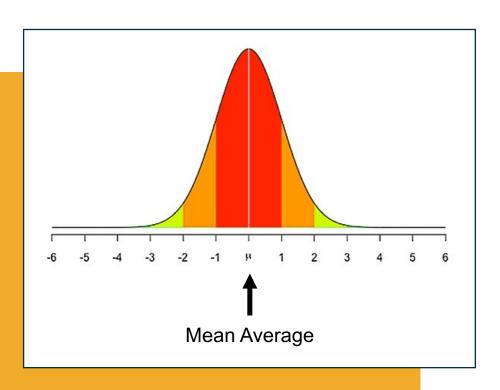
σ, *sigma*

'Sigma' is a Greek Symbol to signify the mathematical concept called **Standard Deviation**. This is an important measure of **Variation** in a process.

$$\sigma = \sqrt{\frac{\sum_{i=1}^{N}(X_i - \mu)^2}{N}}$$

You don't need to remember or even understand this equation…Its just 'behind the scenes'!!

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Mean Average

SIX SIGMA

Six Sigma refers to a process having 6 Standard Deviations (Sigmas) between the mean average of the process (center) and the closest customer specification limit.

*LSL = Lower Specification Limit
*USL = Upper Specification Limit

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DEFECTS VS PROCESS SIGMA LEVEL

Process Sigma Level	Defects per Million Opportunities (DPMO)
1	691,500
2	308,500
3	66,800
4	6,200
5	233
6	3.4

DEFINITION :
A "Six Sigma Process" is one that produces no more than 3.4 defects per million opportunities for defects

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3.4 DPMO

A "Six Sigma Process" is often described one that produces no more than **3.4 Defects Per Million Opportunities for defects**

3.4 DPMO (Defects Per Million Opportunities)

0.00034 % Defects

99.99966 % Correct

WHAT DOES A 0.1%
DEFECT RATE LOOK LIKE?

What is 99.9% Quality?
0.1 % Defects

- 1 unsafe plane landing per day at JFK International Airport
- 100 wrong drug prescriptions per day in US
- 10,000 Houses without electric / day in US
- 100,000 wrong bank transfers per day
- 1 million e-mails sent incorrectly per day

This is why we need Six Sigma processes !

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Lean & Six Sigma Complement Each Other

Lean can work alone

Six Sigma can work alone

But…they work really great together!

LEAN
PRINCIPLES

1. Understand the **value** in the product or

2. Identify the **value stream** in each product or service

3. Make the product or service **flow**

4. **Pull** value from the downstream (just in time delivery)

5. Continuous Improvement towards **perfection**

6. Involve workers and **respect workers** opinions

NOTE: Only the first 5 Lean Principles were taught.
Many books and videos still refer to the '5 Lean Principles'

Source: Lean Thinking by James P. Womack and Daniel T. Jones

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SIX SIGMA
PRINCIPLES

1. **Reduce Variation** and you will reduce Defects / Errors

2. **Root Cause Analysis of problems** (RCA)

3. **Use Data** for Decision making (instead of guessing !)

4. Use of **Statistical Analysis** tools and charts

5. Process **Optimization** using Designed Experiments and Regression Analysis, Predictive Modelling. Hypothesis Tests

6. Improvement projects using the **DMAIC** Framework

We Use Lean & Six Sigma For

Process Improvement

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Increase Value
Traditional View of Our Processes

Inputs → Operations → Outputs → Customer

Raw Materials
Raw Data
Manpower
Energy

Finished Goods
Refined Materials
Information
Services
etc

Lower Value → **Higher Value**

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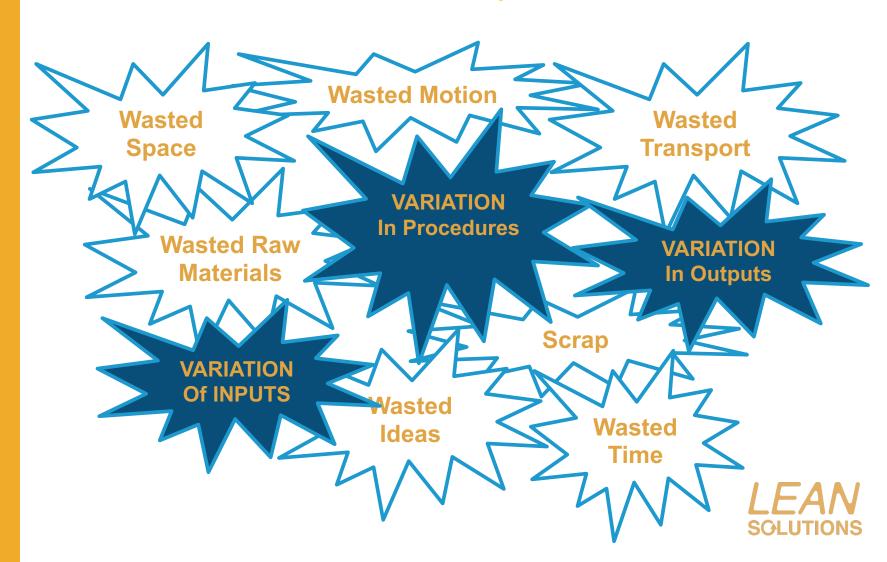
Waste & Variation
What Our Processes Actually Look Like

Wasted Motion

Wasted Space

Wasted Transport

VARIATION In Procedures

Wasted Raw Materials

VARIATION In Outputs

Scrap

VARIATION Of INPUTS

Wasted Ideas

Wasted Time

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3-STAR MANUFACTURING INC.

What are the possible Defects?

o **Shapes**

o **Colors**

o **Size**

o **Concentric**

What Defect Rate is acceptable?
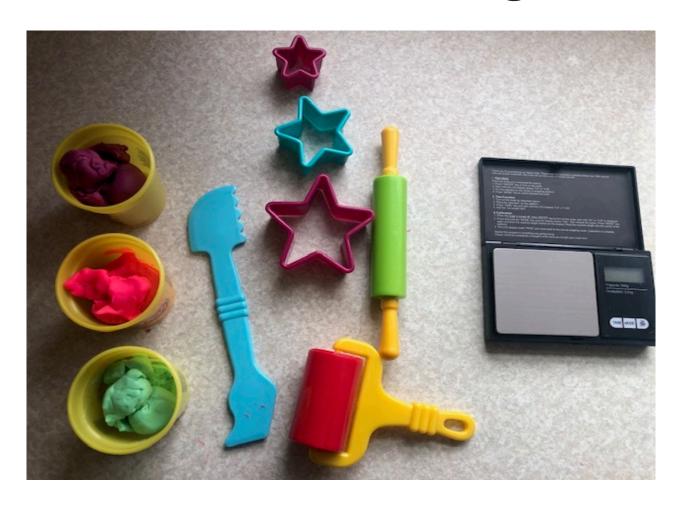
3-STAR MANUFACTURING INC.

PERFECT FOR CAKE DECORATIONS

- 3 Star Shapes
- 3 different Colors
- 3 different Size Stars
- Concentric Shapes

- Target Weight =   10 grams
- Upper Specification Limit = 12 grams
- Lower Specification Limit =   8 grams

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3-Star Manufacturing Inc.

3-Star Manufacturing Inc.

ROLL → WEIGH → FLATTEN → CUT → ASSEMBLE → WEIGH

Roll Ball

Small : 8 to 12 grams   Target = 10 grams

Medium : 13 to 17 grams   Target = 15 grams

Large : 18 to 22 grams   Target = 20 grams

INPUTS

What do we need to create Value for Customers ?

Hint : **The '4 M' rule**

M A T E R I A L S

M A N P O W E R

M A C H I N E S

M E T H O D

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INPUTS

What do we need to create Value?

Examples of Inputs in your work (Which 'M' is it ?) :

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

OPERATIONS

Transforming the Inputs into Outputs

Examples of Operations at your company :

1. _____

2. _____

3. _____

4. _____

OUTPUTS
What Your Customer Wants

The **'TOP 5'** Outputs at your company :

1. _____

2. _____

3. _____

4. _____

5. _____

Increase Value

Lower Value ➡️ Higher Value

Inputs ➡️ **Our Business Process** ➡️ Outputs ➡️

Customer

- o Safer
- o Easier
- o Better Quality (less defects & rework)
- o Faster (on time)
- o Lower Cost

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Shigeo Shingo

*'There are four purposes of improvement: **easier, better, faster, and cheaper.** These four goals appear in order of priority. Hence the first is to make the work easier for workers while improving the fruits of their labour.'*

'Intensifying the work should never be undertaken even if the same working hours are maintained.'

Non-Stock Production : The Shingo System of Continuous Improvement', (1988)

Shigeo Shingo was a primary architect in the development of the Toyota Production System.

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SQCD

1. Easier and **Safer** for workers (S)
2. Produce Better **Quality** Outputs for customers (Q)
3. Lower the **Cost** of Production (C)
4. **Deliver** the Outputs on Time (D)

The **SQCD** model of Production

SUMMARY

At This Point You Should Be Able To…

o Describe the defined roles of Lean & Six Sigma belts

o Describe the goals of our process improvement

o Understand the origins of Lean & Six Sigma

o Describe the principles of Lean

o Describe the principles of Six Sigma

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QUIZ 1:

1. What was the name of the first company to use the name 'SIX SIGMA' to describe its Quality Management System?
   - **MOTOROLA**

2. What is the First Principle of Lean production ? What is the most important thing that a Lean process must produce?
   - **VALUE** (for the customer of the process)

3. Which Japanese company is considered as being the first to use true 'Lean Production "effectively and successfully"?
   - **TOYOTA**

4. A basic principle of Six Sigma is to always find the true original source of a defect or problem. This is called _____?
   - **ROOT CAUSE ANALYSIS**

5. A "Six Sigma Process" is often described one that produces no more than 3.4 DPMO What does DPMO stand for?
   - **DEFECTS PER MILLION OPPORTUNITES FOR DEFECTS**

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QUIZ 1:

6. What is the role of a Yellow Belt on a Lean Six Sigma project?
    - A YELLOW BELT IS A TEAM MEMBER WHO ASSISTS A GREEN OR BLACK BELT, USING THEIR KNOWLEDGE OF THE PROCESS THAT THEY CURRENTLY ARE WORKING WITHIN.

7. What is the role of a Green Belt in an organisation ?
    - A GREEN BELT IS A PROJECT TEAM LEADER FOR SMALL AND MEDIUM SIZED PROCESS IMPROVEMENT PROJECTS.

8. What is the role of a Black Belt in an organisation ?
    - A BLACK BELT IS A PROJECT TEAM LEADER FOR LARGE PROBLEM SOLVING / IMPROVEMENT PROJECTS or OVERSEES THE WORK OF GREEN BELTS FOR MULTIPLE PROJECTS. A BLACK BELT IS A FULL TIME PROBLEM SOLVER FOR THE ORGANIZATION.

STANDARD WORK

ONE OF FOUR
RULES OF TOYOTA

All work shall be highly specified as to content, sequence, timing and outcome.

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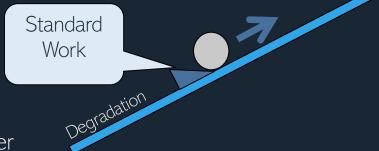
WHAT IS STANDARD WORK

o Detailed work sequence of the operator

o Provides a routine for consistency of an operation

o Details the best process we currently know

o Is the basis for improvement by defining the normal

WHY STANDARD WORK?

o Prevents backsliding

o Makes problems obvious

o Removes ambiguity

o Makes managing schedules/resources easier

o Agree to work together/agree to change together

Standard Work

Degradation

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STANDARD WORK DOCUMENT

STANDARD WORK
AUDIT PURPOSE

o Check understanding of the standard

o Discover individual difficulties
  o Did lack of training lead to the problem
  o Kaizen: to take away difficulty

o Identify waste in process

Standard Work audits are NOT meant to be punitive

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WHY AUDIT
STANDARD WORK?

o Go to Gemba

o Establish standards if not in place

o Kaizen day after day, even the small things

o Kaizen creates basis for larger change

o Developing people

o Encourage team work

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STANDARD WORK
AUDIT AGENDA

- ✔ Member trained & documented?
- ✔ Work area layout correct?
- ✔ Work in progress within allowance?
- ✔ Step sequence followed?
- ✔ Within time?
- ✔ Results discussed with member?

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What to do if someone is not following the standard?

ASK WHY
They're not following the standard

RESPOND TO
The reason they indicate

STANDARD
WORK SUMMARY

- Every facility must implement and maintain Standard Work

- Applying Standard Work demonstrates how methods to improve quality, increase operational speed, and reduce costs are all interconnected

- Standardized Work establishes the foundation for all productivity, quality, safety, and cost improvements of the future

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STANDARD
WORK SUMMARY

Standard Work - The BEST combination of people and machines (assets) while using the minimum amount of materials, equipment and space

We need to test out possible improvements by changing only one thing at a time.

Standard work should be developed by those who perform the tasks. The operators that do the work are most likely to know how to do it well and are the experts.

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VALUE & WASTE

Lean focuses on identifying which activities add value, and which do not...

Value Added Activity

o Transforms or shapes (for the 1st time) material or information to meet customer requirements

o Anything the customer is willing to pay for ONE TIME ONLY

Non-Value Added Activity (Waste)

o Anything else that consumes resources or is related to rework or scrap

Incidental Non-Value

o Serves you or the company but the customer

doesn't value it

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WHAT DO YOU
WANT TO PAY FOR?

If you were the patient, what would you be willing to pay for?

Value Added steps are those the customer is willing to pay for – all else is a form of Non-Value Added or Waste.

Doctor Visit	
Making appointment	10 min
Driving to the doctor's office	30 min
Filling out insurance and health history forms	10 min
Waiting in the reception area	20 min
Walking to the vitals room	2 min
Nurse taking your blood pressure and weight	4 min
Walking to the exam room	2 min
Waiting in the exam room for the doctor	15 min
Exam by doctor	15 min
Checking out at the front desk	3 min
Driving home	30 min
TOTAL	**141 min**

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Recognizing Waste

D O W N

DEFECTS
Waste from a product or service failure to meet customer expectations

OVERPRODUCTION
Waste from making or staging more product than needed

WAITING
Waste from time spent waiting for other processes, approvals etc.

NON-UTILIZED TALENT
Waste due to people's talents, skills, and knowledge that are not utilized

T I M E

TRANSPORTATION
Wasted time, resources, and costs when unnecessarily moving products

INVENTORY
Wastes resulting from excess products, materials, or storage points

MOTION
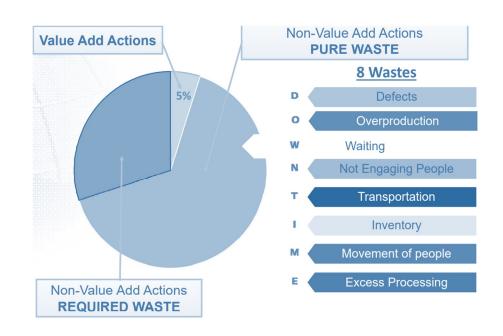Wasted time and effort related to unnecessary movements by people

EXTRA-PROCESSING
Waste related to more work or higher quality than is required

CATEGORIES
OF ACTION

Value Add Actions

Non-Value Add Actions PURE WASTE

5%

8 Wastes

D	Defects
O	Overproduction
W	Waiting
N	Not Engaging People
T	Transportation
I	Inventory
M	Movement of people
E	Excess Processing

Non-Value Add Actions REQUIRED WASTE

WASTE
WALK

A planned visit to where work is being performed to observe what's happening and to note the waste.

o Explain to the people in the area of observation what you are doing.

o Study the area for 20-30 minutes.

o As you see work that appears to be waste, jot down the example you see.

o Take action immediately if possible or develop a plan to remove waste

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Waste Walk Form

Date: xx / xx / xx
Location/area: Main Production
Observer: Craig T.

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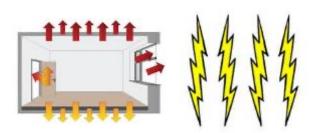
Type of Waste	Definition	Observations
Defect/Rework	Product that does not meet customer requirements	Excessive amount of Hoods in Repair Bay, 4 Racks at 20 per rack
OverProduction	Producing more than is required	There are 35 Left Hand Rockers but only 7 Right Hand Rockers. These ship as sets of one each
Waiting	Delays in the process, waiting for next step to occur	Paint Line is Full of parts waiting to be loaded
Non-Utilization of Talent and/or Resources	Not utilizing people's skills properly	Lay up operators are being used to hang parts on the paint line
Transportation	Unnecessary movement of material from one location to another	Material Handler is required to move parts from lay-up, to bonding, to sanding, and to paint.
Inventory	More supplies/equipment than required to service customer	275 Hood outer panels are held at bonding
Motion	Movement that does not add value to the work being completed	Left and Right Hinges are removed from boxes and put in Totes to be staged at bonding cell
Excess-Processing	More work is done than required by the customer, or things are made more complicated than necessary	Hood outer panel is getting sanded in areas that are no longer used to bond to inner panel

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'Non-Traditional' Categories of Waste

Utility/Energy (Heat/Electrical) Losses

Miscommunications

Over - Communications

Skilled Staff Losses

3-Star Manufacturing Inc.

Where is the **Waste**?

ROLL → **WEIGH** → **FLATTEN** → **CUT** → **ASSEMBLE** → **WEIGH**

QUIZ 2 :

1. All work shall be highly specified as to content, sequence, timing and _____.
   - **OUTCOME**

2. True or False? Standard work provides a routine for consistency of an operation.
   - **TRUE**

3. True or False? Standard work helps to hide problems.
   - **FALSE**

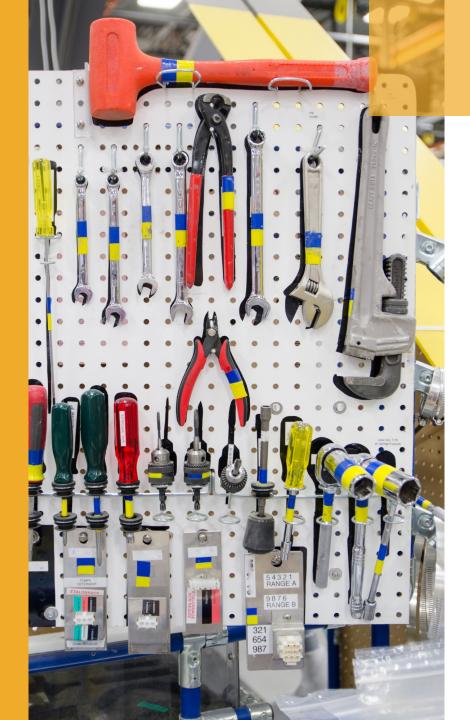4. Discussion: Why is it so important to audit standard work?

LEAN SOLUTIONS

QUIZ 2 :

1. Which of the traditional 8-Wastes of 'DOWNTIME is concerned with reducing the complexity of processes and taking out unnecessary steps or activities ?
   - **NON-ESSENTIAL PROCESSING / OVER PROCESSING**

2. What is the name of the Waste of producing more that the customer demand can absorb ?
   - **OVER-PRODUCTION**

3. What is Waste called when an activity or step in process needs to be repeated because it was not done 'Right-First-Time' ?
   - **REWORK / DEFECTS**

4. What Waste results in Queues or Backlogs of materials or work ?
   - **WAITING (DUE TO A BOTTLE-NECK IN THE PROCESS)**

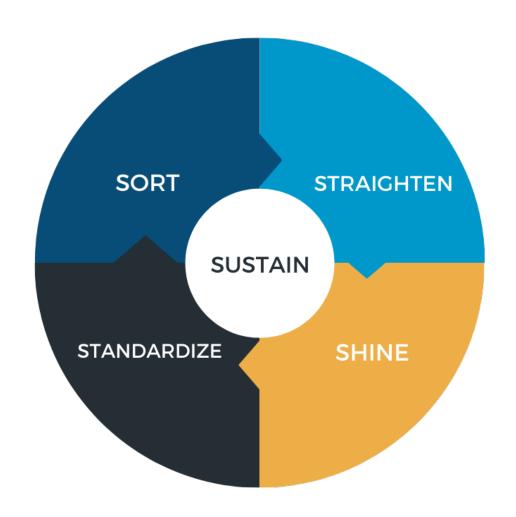5. What is the Japanese word for 'Waste' ?
   - **MUDA**

LEAN SOLUTIONS

5S

Continuous Improvement
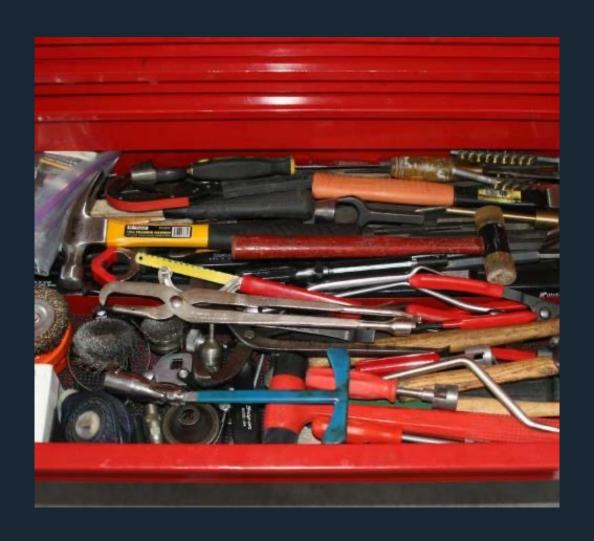should not be just an event.

LEAN SOLUTIONS

WHY 5S?

Workplace Organization and Visual Management Fundamental to Your Facility

- SAFER!
- Problems Become Visible
- Promotes culture

Result: Improved Safety, Quality and Cost

LEAN SOLUTIONS

FIND A FLATHEAD SCREWDRIVER

FIND A FLATHEAD SCREWDRIVER

Exercise #1

60

97 63
37 10 58 35 17 70 16 43 25
89 69 8 34 73 7 84
28 46 19 26 44 66 64
86 75 15 96
81 1 62 55 36 24
2 80 27 94
91 38 45
51 94 54
61 47 77 82 74 42 33
11 29 9 18 100 6 78 83
20 56
53 60 85 21 91 31 40 87 93 23 32 90
98 68 71 4 14 99
12 48 13
3 59 41 5
57 76 67 95
52 30 39 22 49 50 88 65
79 92 72

LEAN SOLUTIONS

SORT

o Critically examine everything

o Red Tag Process

    o Always use-Have a place for it

    o Sometimes use-Tag and Date

    o Never use-Red tag area

o Need a 6mm Hex? Keep only the 6mm Hex, not a whole set

o Members know best what is needed

o Everything in the area should have a purpose

LEAN SOLUTIONS

Exercise #2

60

37 10 35 17 16 43 25

28 46 19 26 44 8 34 7

1

38 2 27 45 36 24 15

47

11 20 29 9 18 42 33 6

12 21 31 40 4 23 32

13 14

48 5

3 41

30 39 22 49 50

LEAN SOLUTIONS

STRAIGHTEN or SET IN ORDER

o For what's left, where does it go?

o Be mindful of frequency of use and how much is used

o Be Visual

o Arrange so things are easy to find and readily retrieved.

o "A place for everything and everything in it's place."

SHINE

o Clean the area (tools, equipment, lighting, etc.)

o Re-painting may be required

o Implement regular housekeeping so that any dirt
   or grease is immediately obvious.

o Always use your 5S Color Standards

LEAN SOLUTIONS

Exercise #3

STANDARDIZE

o Implement Work Center 5S Board

o Take a picture of the area

o Assign an area owner

o Develop standard work for regular housekeeping

o Implement Daily End of Shift Checks

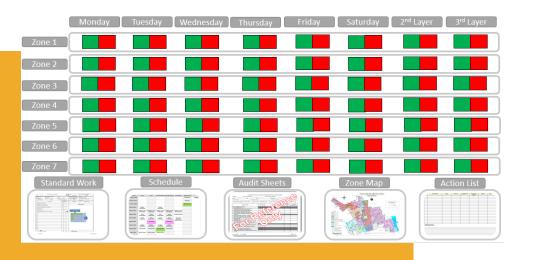# Exercise #4

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

SUSTAIN

Implement Layered Process Audit

in order to sustain improvements

SUSTAIN
LAYER 1 AUDIT

o Layer 1 audits are completed daily by team leaders based on a posted schedule

o Area owner is responsible for any red items on Layer 1.

o Layer 1 checks that the area matches the picture and the work center 5S board is being completed

What "GOOD" Looks Like...
The Area Does NOT Look Like This Because...
Owner Initial When Addressed:
Date Audit Completed:
Spreading & Cutting Area
Layer 1

What "GOOD" Looks Like...
The Area Does Look Like This.
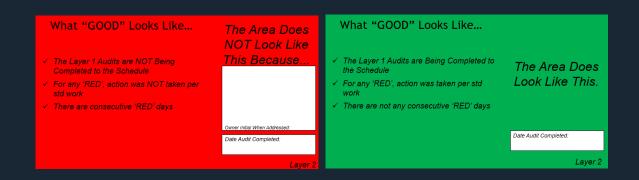Date Audit Completed:
Spreading & Cutting Area
Layer 1

LEAN SOLUTIONS

SUSTAIN
LAYER 2 AUDIT

o Layer 2 audits completed by the area Supervisor one time per week.

o The Layer 2 audits are specifically auditing audit completion to schedule.

o The area Supervisor is responsible for any red items in Layer 2.

What "GOOD" Looks Like...

The Area Does NOT Look Like This Because...

✓ *The Layer 1 Audits are NOT Being Completed to the Schedule*

✓ *For any 'RED', action was NOT taken per std work*

✓ *There are consecutive 'RED' days*

Owner Initial When Addressed:

Date Audit Completed:

Layer 2

What "GOOD" Looks Like...

The Area Does Look Like This.

✓ *The Layer 1 Audits are Being Completed to the Schedule*

✓ *For any 'RED', action was taken per std work*

✓ *There are not any consecutive 'RED' days*

Date Audit Completed:

Layer 2

LEAN SOLUTIONS

SUSTAIN LAYER 3 AUDIT

Layer 3 audits are completed by the Operations Manager or Plant Manager once per month.

What "Good" Looks Like…

Y   N   No items present in area without designated location

Y   N   Aisleways are clear and clean without obstruction

Y   N   All part racks and containers labeled with proper ID

Y   N   All surfaces free of dirt and dust, "Hospital Clean" standard

Y   N   Records of required 5S activities are dated, initialed & current

Y   N   Team has documented action items on team W3I to improve   workplace organization, reduce / eliminate sources of   clutter / debris

Y   N   Layer 2 audits are being completed to schedule

The Area Does NOT Look Like This Because…

1 Action Item To Address:

Owner Initial When Addressed:

Date Audit Completed:

LEAN SOLUTIONS

5S Audit & Results

5S Workplace Scan Checklist

		Number of Observations >>	0	1-2	3-4	5-6	>6
Sort	**Distinguish between what is needed and not needed**						
	1	Unneeded equipment, tools, furniture, etc. are present			x		
	2	Unneeded items are on walls, notice boards, etc			x		
	3	Items are present in walkways, stairways, corners, fire exits etc.				x	
	4	Unneeded inventory, supplies, parts, or materials are present				x	
	5	Safety hazards (water, oil, chemical, machines) exist		x			
		Subtotal >>	0	1	4	6	0
Set in Order	**A place for everything and everything in it's place**						
	1	Correct places for items are not obvious			x		
	2	Items are not in their correct places			x		
	3	Walkways, workstations, equipment locations are not indicated				x	
	4	Items are not put away immediately after use				x	
	5	Height and quantity limits are not obvious		x			
		Subtotal >>	0	1	4	6	0
Shine	**cleaning, and looking for ways to keep it clean and organised**						
	1	Floors,walls stairs, and surfaces are free of dirt, oil, and grease			x		
	2	Equipment is not kept clean and free of dirt, oil, and grease			x		
	3	cleaning materials are not easily accessible		x			
	4	Lines, labels, signs, etc are not clean and unbroken	x				
	5	Other cleaning problems of any kind are present		x			
		Subtotal >>	0	2	4	0	0
Standardize	**Maintain and monitor the first three categories**						
	1	Necessary information is not visible			x		
	2	All standards are not known and visible			x		
	3	Checklist don't exist for all cleaning and maintenance jobs				x	
	4	All quantities and limits are not easily recognizable				x	
	5	How many items can't be located in 30 seconds		x			
		Subtotal >>	0	1	4	6	0
Sustain	**Stick to the rules**						
	1	How many workers understand the 5s principals					x
	2	How many times last week was daily 5s not performed					x
	3	Number of times that personal belongings are not neatly stored				x	
	4	Number of times job aids are not available or up to date				x	
	5	Number of times last week daily 5s inspection were not performed		x			
		Subtotal >>	0	1	0	6	8
		Total >>	0	6	16	24	8
		Grand Total 5S Score	54				

Departme nt:
Date: Scored By:
Place an "x" in the appropriate box based on number of issues observed.

Monthly 5S Overview

Radar axes: 1 - Sort, 2 - Set in Order, 3 - Shine, 4 - Standardize, 5 - Sustain
Scale: 0, 5, 10, 15, 20

Monthly Audit Results

Jan-06	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
65	60	55	60	45	51	46	46	54			

5S Your Computer Hard/Shared Drive

5S Principle	Description
Sort	• Check all your files and software, and get rid of any that are unnecessary
Set In Order	• Organize your files and optimize the use of file folders • Keep in mind how often you need them and how much time you need to store them • Create specific shortcut icons for the most used files or programs
Shine	• Eliminate any files under deleted items, sent items and the recycle bin
Standardize	• Establish procedures for maintaining your computer 5S system
Sustain	• Include hard drives in 5S audits • Focus on how people maintain files and program organization, and the time they spend ding so

5S 3-Star Manufacturing Inc.

5S IN YOUR COMPANY

DISCUSSION

o What areas of your work could do with 5S?

o Who do you need to get involved?

o When are you going to try 5S?

LEAN
SOLUTIONS

QUIZ 3 :

1. Which stage of the 5S method is used to ensure that the workers have the good habits and discipline to continue the other 4S tasks?
   - **SUSTAIN**

2. In 5S the action of removing unnecessary tools, equipment and materials from the workspace is called

   _____.
   - **SORT**

3. Cleaning the workplace of dirt, dust and litter is called what in 5S ?
   - **SHINE**

4. Give one example of a 5S method used for **SET IN ORDER / STRAIGHTEN**
   - **SHADOW BOARDS**
   - **RACKS**
   - **COLORED LABELS**
   - **FLOOR MARKING etc**

Lean Principles & Tools

6 FUNDAMENTALS OF LEAN

o Value

o Value Stream

o Flow

o Pull

o Perfection

LEAN SOLUTIONS

WHO IS YOUR CUSTOMER?

IN LEAN SIX SIGMA…

o Value is always viewed "Through the eyes of the Customer"

- o Who is our customer ?

- o What is The Voice of our Customer (VOC) ?

- o What is Critical to Quality (CTQ) to our Customer ?

LEAN SOLUTIONS

WHO IS YOUR CUSTOMER?

'Internal Customers' VS 'External Customers'

o An internal Customer could be a different department or operation. It could be the next downstream operation in the process.

o Can you name some different types of 'Internal/External Customers'?

LEAN
SOLUTIONS

WHAT IS A CTQ?
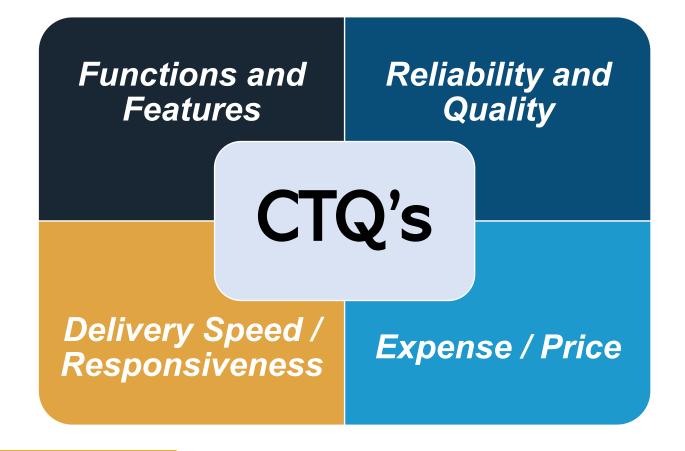
Critical to Quality (CTQ's) are measures we use to capture VOC properly.

- Also referred to in some literature as :
    - CTC's – Critical to Customer
    - CTS's – Critical to Satisfaction
    - CTQC - Critical to Quality Characteristics

- CTQ's are a tool to help to break down VOC into well defined and measurable terms.

LEAN SOLUTIONS

DEFINING CTQ'S

Customer CTQs usually fall into one of 4 categories :

Functions and Features

Reliability and Quality

CTQ's

Delivery Speed / Responsiveness

Expense / Price

LEAN SOLUTIONS

DEVELOPING CTQ'S

1 IDENTIFY YOUR CUSTOMERS

2 CAPTURE VOC

3 DEVELOP CTQ'S

LEAN
SOLUTIONS

SPECIFICATION LIMITS
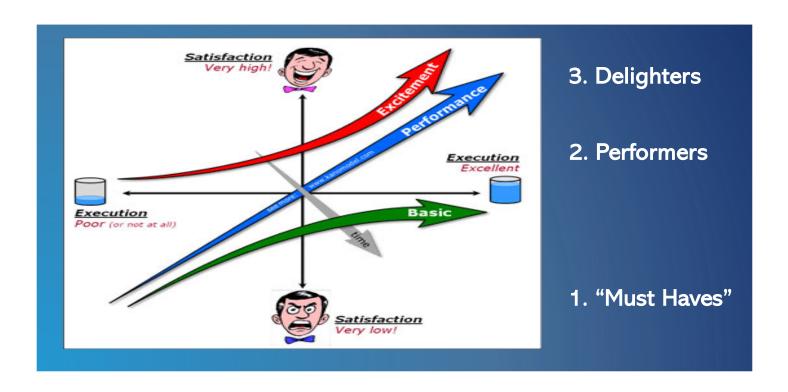
"Specification Limits" are Lean Six Sigma's way of defining your customer expectations

USL = Upper Specification Limit

LSL = Lower Specification Limit

Also called 'Tolerance limits' in some businesses

LEAN SOLUTIONS
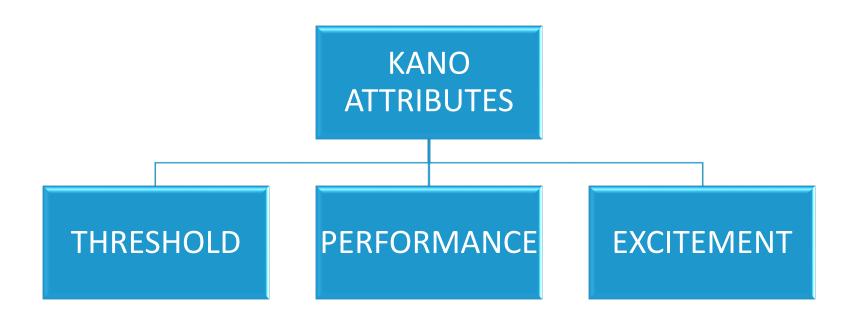
KANO ANALYSIS

Developed in the 1980s by Professor Noriaki **Kano**, which classifies customer preferences into three main categories

KANO ANALYSIS

The Kano Model has three main categories of attributes:

CTQ's & KANO

Consider a 3-Star Manufacturing

o What are the CTQs for the process ?

o What at the Basic Requirements ?

o What are Performers ?

o What at Delighters ?

3-Star Manufacturing Inc.

CTQS: _____

_____

_____

o   Basic Requirements

_____

o   Performers

_____

o   Delighters

_____

Poka Yoke & Jidoka

POKA YOKE & JIDOKA

PREVENT DEFECTS

- Create no defects / errors
- Accept no defects / errors
- Pass no defects / errors

JIDOKA

- **Work** stops immediately when a problem first is detected.

- The **Root Cause** of the defect is discovered and corrected before work continues

- This prevents defects being passed on downstream

- This short term disruption to FLOW will improve both FLOW and QUALITY in the long term

JIDOKA
"Automation with a human touch"

LEAN SOLUTIONS

POKA YOKE
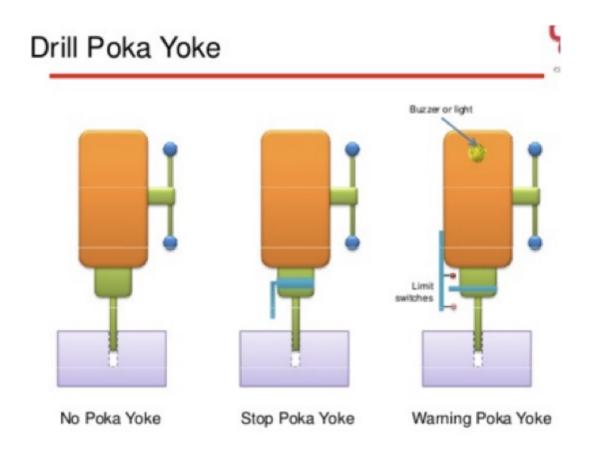
Originally called Baka Yoke (Idiot Proofing) it was changed to Poka Yoke (mistake proofing) by Toyota in 1960's so as not to dishonor anyone to be labeled as an "Idiot".

Poka Yoke = Mistake Proofing

Prevent mistakes rather than correct mistakes
Prevent defects rather than correct defects

POKA YOKE EXAMPLES

Drill Poka Yoke

Buzzer or light

Limit switches

No Poka Yoke   Stop Poka Yoke   Warning Poka Yoke

LEAN SOLUTIONS
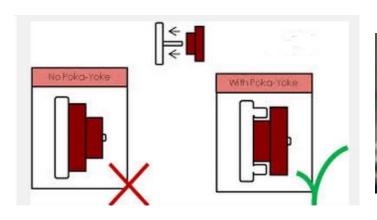
POKA YOKE EXAMPLES

POKA YOKE OFFICE EXAMPLES
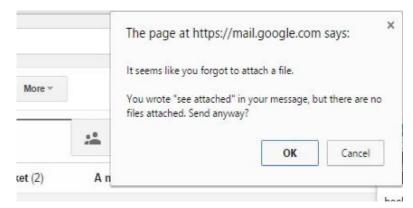
QUALITY AT SOURCE
(UPSTREAM QUALITY)

o Quality means meeting requirements of the customer (or next step in the process) and not creating defects.

o We can use tools such as **poka yoke** (mistake-proofing) and **visual control** to prevent errors

LEAN
SOLUTIONS

POKA YOKE
EXAMPLES IN THE OFFICE

What are some of the common mistake proofing devices on automobiles?

What are the current mistake proofing devices at your company?

Where might you be able to implement mistake proofing at your company?

LEAN
SOLUTIONS

QUIZ 4 :

1. What Tool is used to understand what is Critical to Quality (CTQ) by Forming 3 categories: *threshold, performance,* and *excitement*?
   - **KANO ANALYSIS**

2. Splitting Customers into groups according to different needs or behaviours is called _____.
   - **SEGMENTING**

3. CTQs are also sometimes called CTCs or CTSs. What does CTS stand for?
   - **CRITICAL TO SATISFACTION**

4. Give one example of a method used to understand the **Voice of the Customer**?
   - **SURVEYS**
   - **FEEDBACK**
   - **FOCUS GROUPS**
   - **REPEAT SALE METRICS, etc**

LEAN SOLUTIONS

HOMEWORK REVIEW

(Open Computers and Log into your Portal)

End of Day 1

Lean & Six Sigma Training

Lean Yellow Belt
Certification

CLASS SCHEDULE

Day 1

- Roles and Responsibilities of Belts
- What is Lean & Six Sigma?
- Lean Principles
- Standard Work
- 8 Wastes
- 5S
- Voice of the Customer (VOC) and CTQs Process
- Jidoka
- Poke Yoke

Day 2

- Day 1 Review
- PDCA
- Kaizen
- Pull
- Kanban
- Flow
- Visual Management
- SMED
- Total Productive Maintenance
- **YELLOW BELT EXAM (as Homework)**

LEAN SOLUTIONS

QUIZ 1 REVIEW:

1. What was the name of the first company to use the name 'SIX SIGMA' to describe its Quality Management System?
   - MOTOROLA

2. What is the First Principle of Lean production ? What is the most important thing that a Lean process must produce?
   - VALUE (for the customer of the process)

3. Which Japanese company is considered as being the first to use true 'Lean Production "effectively and successfully"?
   - TOYOTA

4. A basic principle of Six Sigma is to always find the true original source of a defect or problem. This is called _____?
   - ROOT CAUSE ANALYSIS

5. A "Six Sigma Process" is often described one that produces no more than 3.4 DPMO What does DPMO stand for?
   - DEFECTS PER MILLION OPPORTUNITES FOR DEFECTS

LEAN
SOLUTIONS

QUIZ 1 REVIEW:

6. What is the role of a Yellow Belt on a Lean Six Sigma project?
   - A YELLOW BELT IS A TEAM MEMBER WHO ASSISTS A GREEN OR BLACK BELT, USING THEIR KNOWLEDGE OF THE PROCESS THAT THEY CURRENTLY ARE WORKING WITHIN.

7. What is the role of a Green Belt in an organisation ?
   - A GREEN BELT IS A PROJECT TEAM LEADER FOR SMALL AND MEDIUM SIZED PROCESS IMPROVEMENT PROJECTS.

8. What is the role of a Black Belt in an organisation ?
   - A BLACK BELT IS A PROJECT TEAM LEADER FOR LARGE PROBLEM SOLVING / IMPROVEMENT PROJECTS or OVERSEES THE WORK OF GREEN BELTS FOR MULTIPLE PROJECTS. A BLACK BELT IS A FULL TIME PROBLEM SOLVER FOR THE ORGANISATION.

LEAN SOLUTIONS

QUIZ 2 REVIEW:

1. All work shall be highly specified as to content, sequence, timing and _____.
   - **OUTCOME**

2. True or False? Standard work provides a routine for consistency of an operation.
   - **TRUE**

3. True or False? Standard work helps to hide problems.
   - **FALSE**

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LEAN SOLUTIONS

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LEAN SOLUTIONS

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LEAN
SOLUTIONS

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   - **SURVEYS**
   - **FEEDBACK**
   - **FOCUS GROUPS**
   - **REPEAT SALE METRICS, etc**

LEAN SOLUTIONS

PDCA

BALL TOSS EXERCISE

LEAN
SOLUTIONS

KAIZEN &
CONTINUOUS
IMPROVEMENT

Plan   Do

改 善

Change   Good

WHAT IS
KAIZEN?

o Kaizen is a Japanese word made up of two distinct characters:

o Small changes for the better = Continuous Improvement

o Managing daily improvement (part of Lean Management System)

o Continuous Improvement Projects

LEAN SOLUTIONS

WHAT IS A
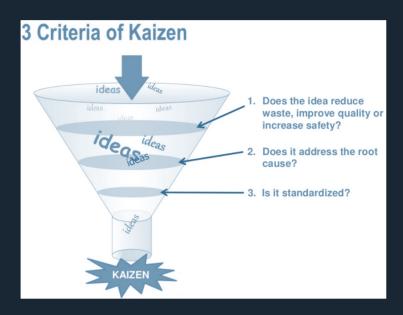## KAIZEN EVENT?

A Kaizen Event (different than Kaizen as a mindset) is a focused team activity with a specific, aggressive breakthrough objective aimed toward solving a well-defined problem.
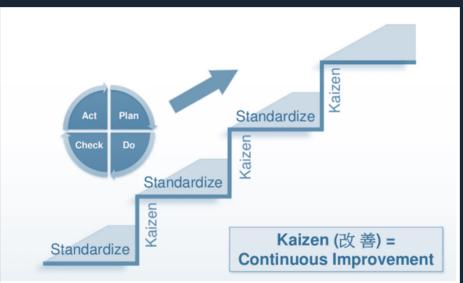
You can expect to accomplish huge results in a very short time frame (usually 2-5 days).

Plan   Do

改 善

Change   Good

Huge results
In a
Short time
frame

LEAN
SOLUTIONS

KAIZEN IS A CONTINUOUS PROCESS

VARIETIES OF KAIZEN METHODS

Individual (1-2 people) Versus Teamed (5-9)

Day-to-Day (2 second- improvements) Versus Special Event

Limit the hours spent on the project
The project scope must be considered when limiting available time

Kaizen	Innovation
Un-dramatic	Dramatic
Low Cost	High Cost
Low Risk	High Risk
Human Effort	Technology
No Brainer	More Thought

BENEFITS
OF KAIZEN

- Empowers employees, enriches the work experience & brings out the best in everyone

- Promotes the growth of the Employee & the Company

- Improves quality, safety, cost structures, delivery, environments, throughput & customer service/satisfaction

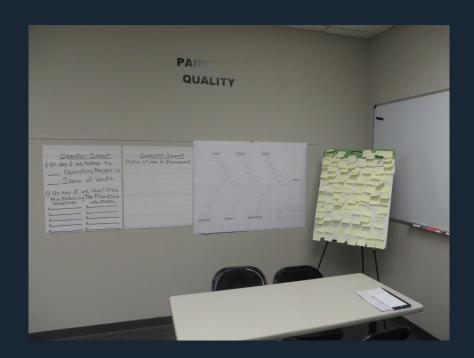- Provides guidance from employees & serves as a barometer for leadership
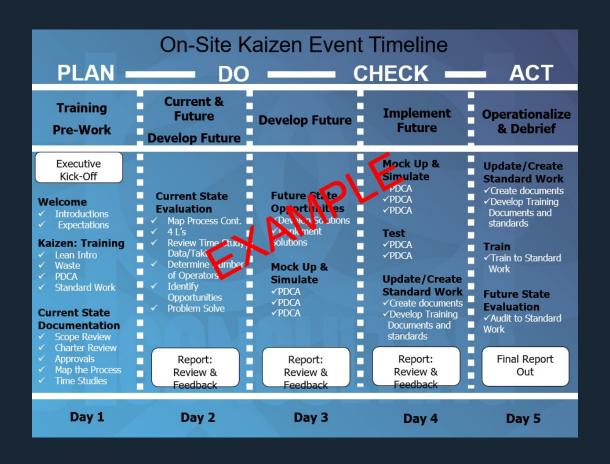
LEAN SOLUTIONS

TRADITIONAL KAIZEN

One Week Commitment

Lots Of Prep Work

Lots Of Ideas & Actions

LEAN
SOLUTIONS

WHAT'S IN A WEEK – A LOT

WHAT'S
Different About The Kaizens At Plasan?

- The weeklong 5-Day Kaizens have been swapped

- Four, quick, 5 hour Kaizens were held in the month of January.

- Involved in the Kaizens were representatives from Maintenance, Engineering, Quality, Supervisors, Team Leads, and the experts, the operators.
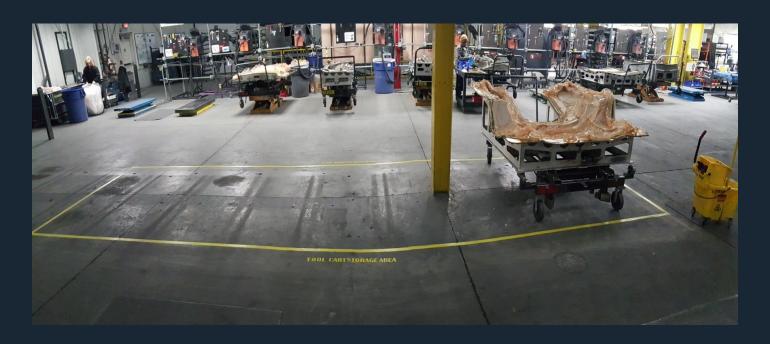
LEAN SOLUTIONS

AUTO CLAVE QUICK KAIZEN
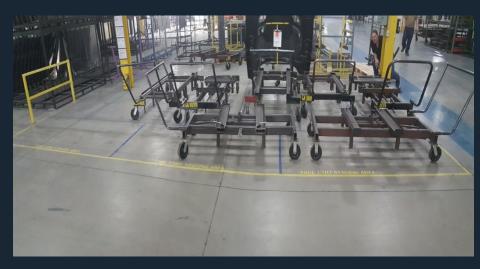

DEPLOYMENT CHAMPION - SUPERVISOR

GUARD RAIL WAS ADDED
TO PREVENT OVERFLOW INTO CART PARKING
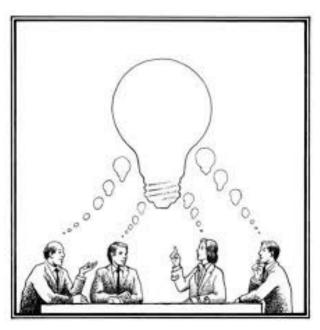

LEAN SOLUTIONS

WHAT CAN WE DO DIFFERENTLY?

SUGGESTED
KAIZEN PROCESS

1. Employee identifies a problem, waste/loss, or an opportunity for improvement and writes it down.

2. Employee develops an improvement idea and discusses it with his or her supervisor.

3. Supervisor reviews the idea within 24 hours and encourages immediate action.

4. Employee implements the idea. If a larger improvement idea is approved, the employee should take leadership to implement the idea.

5. Idea is written up on a simple form in less than three minutes.

6. Supervisor posts the form to share with and stimulate others and recognizes the accomplishment.

LEAN S♀LUTIONS

CAPTURE THE IDEAS

Continuous Improvement Idea

Name: Shift: Dp #: 3016-   Date:

Which of the seven wastes does this idea reduce? (Circle One)

Over-Production   Transportation   Motion   Waiting   Inventory   Defects   Over-Processing

Which measure does this impact on the team board? (Circle One)

Safety   Quality   Schedule   Cost   Culture   Environment

Continuous Improvement Idea *(Attach additional information, as required.)*

_____

_____

_____

_____

Improvement Results *(Attach additional information, as required.)*

_____

_____

_____

_____

Reviewed	Accepted	Not Accepted	Implemented	Complete	Implemented = Completed by mbr Complete = Recognized by mgmt	Award given/amount: Date:
☐	☐	☐	☐	☐		

:pe 02/11/2019   WHITE: HMS   YELLOW: Team Leader/Supv   PINK: Member

LEAN SOLUTIONS

GEMBA WALKS

WHAT IS A
GEMBA WALK?

The Gemba walk is an essential part of the Lean management philosophy.

o Its purpose is to allow managers and leaders to observe the actual work process, engage with employees, gain knowledge about the work process and explore opportunities for continuous improvement.

o A Gemba Walk is also an opportunity for managers and leaders to coach and receive coaching.

LEAN
SOLUTIONS

GEMBA WALKS
ARE NOT DONE ALONE

Gemba walks are meant to be coaching opportunities.

Step 1: Use your LSW to establish a day/time and stick to your schedule. Make it routine!

Traditional Management Style: "Do It My Way"

Lean Leadership Style: "Follow Me, and We'll Figure This Out Together"

LEAN SOLUTIONS

DEFINE
THE PURPOSE

Define 'purpose' for walk – why doing it?

Define scope for walk – where headed?

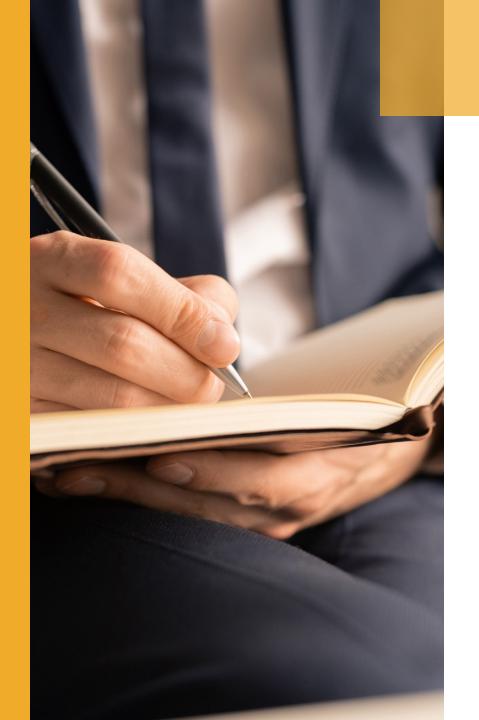**Coach appropriate behaviors to participants:**

o One conversation at a time.

o Show respect. Listen more than you talk.

o Make no on the spot judgements, seek to understand.

LEAN
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TYPES OF
GEMBA WALKS

- Safety

- 5S

- Waste – Waste Walk

- Process Focus – Never Focus on Individuals

- Walk the Value Stream of a Product

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WHAT TO DO
ON A GEMBA WALK

o If with another leader, ask to SEE their leader standard work

o Review Hr x Hr and Tier Boards

o Review corrective actions / plans for top issues

o Discuss team board problem solving process

o Review training matrix and ensure plans are in place

o Pay attention to lean waste and review plans

LEAN SOLUTIONS

TIPS & POINTS
TO REMEMBER

Step 1: Create a Theme

Before a walk begins, managers should pick a theme to guide the entire Gemba walk. This narrows the focus of the Gemba walk and yields better results, as attention is not spread amongst different themes and objectives. Once a theme has been chosen it's easier to tailor your Gemba walk questions to the theme you chose, and ask quality questions.

LEAN
SOLUTIONS

TIPS & POINTS
TO REMEMBER

Step 2: Prepare the Team

Inform the team by explaining what a Gemba walk is and what to expect from a routine Gemba walk. Share this in your Tier Meetings. Consider sharing your checklist, too.

This lowers a team's anxiety as the Gemba walk will not be perceived as an evaluation, but rather, a collaboration between participants. Getting buy-in from the team beforehand will also raise questions that could have been missed.

LEAN
SOLUTIONS

TIPS & POINTS
TO REMEMBER

Step 3: Focus on the Process

Stick to the evaluation of the process and how things are done. Here, a checklist can help. By writing questions that force you to assess the process, not the person, you can avoid the most common Gemba walk mistakes: **blaming.**

Remember: **You are there to identify opportunities of improvement in the process and barriers on the shop floor hindering productivity.**

LEAN SOLUTIONS

TIPS & POINTS
TO REMEMBER

Step 4: Keep the Value Stream Front & Center

Make sure your checklist traces the whole value stream. By sketching these questions out beforehand, you can ensure you don't miss any crucial stations or processes.

Focusing the bulk of your Gemba walk on the value chain is more effective in identifying bottlenecks and potential pockets of waste. Removing such bottlenecks will improve overall performance across the value chain.

TIPS & POINTS
TO REMEMBER

Step 5: Record Your Observations

Record everything. Record every data point you encounter on your Gemba walk. Don't make assumptions or recommendations before journaling everything you find on the Gemba walk. Here, checklists are helpful. You can record your observations as answers to the questions you know you need answered. You can also just take notes or record and document your findings via video.

Regardless of method: **record, record, record!**

LEAN
SOLUTIONS

TIPS & POINTS
TO REMEMBER

Step 6: Get a Second Vantage Point

Once the Gemba walk has concluded and all relevant information has been recorded, seek a second opinion. Better yet, have another team member write their own checklist. **Having a fresh set of eyes review your findings could yield important insights.**

Comparing checklists can help you locate any gaps in your own thinking. This second perspective could be someone far removed from the operations or an experienced operator who did not take part in the Gemba walk. Feedback reveals overlooked information.

LEAN
SOLUTIONS

TIPS & POINTS
TO REMEMBER

Step 7: Solicit Feedback

Present your findings to the team regardless of outcome. Whether your findings were insignificant and no changes need to be made to the operations or vice versa. This brings the collaboration between stakeholders full circle and negates any feelings of being watched by the team during the Gemba walk.

If changes need to be made, include them in your presentation tying back to your findings. This brings buy-in from all stakeholders and increases probability of success once the change to operations occurs.

Conclusion

Gemba walks are a crucial observational method for assessing a manufacturing operation. Checklists are an easy, quick tool for adding structure to your observations, and for getting more out of the gemba walks you schedule. Use a checklist and stick to your plan.

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QUESTIONS
TO ASK

Simple 3 Question Summary:

1. What is Working?

2. What Is NOT Working?

3. Given That, What Will You Do Differently Going Forward?

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GEMBA CHECKLIST

✔ What are you currently working on?

✔ Is there an established process for this type of work?

✔ Do you have any problems with the established processes?

✔ Why is there a problem? How can you fix the problem?

✔ What do you do to recognize root cause of the problem?

✔ Who do you speak with if there's a certain problem?

LEAN SOLUTIONS

QUIZ 5:

1. What does kaizen stand for?
   - **SMALL CHANGE FOR THE BETTER / CONTINUOUS IMPROVEMENT**

2. What are the three criteria of kaizen?
   - **DOES THE IDEA REDUCE WASTE, IMPROVE QUALITY, AND/OR INCREASE SAFETY?**
   - **DOES THE IDEA ADDRESS THE ROOT CAUSE?**
   - **IS IT STANDARDIZED?**

3. What are the different types of Gemba walks?
   - **SAFETY, 5S, WASTE, VALUE STREAM WALK**

WHAT IS
QUICK CHANGEOVER?

A process for *dramatically* reducing setup time changeover time

Also Known as:

o Single Minute Exchange of Dies (SMED)
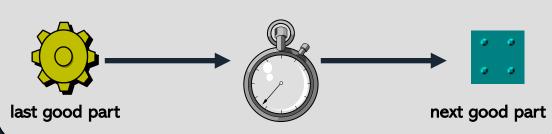
o Setup Reduction

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SET UP DEFINITION

During this time the equipment is idle and not producing parts.

The length of time it takes to changeover a machine from the <u>last good part</u> of a production run to the <u>first good part</u> of the next production run.

last good part

next good part

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WHY IMPLEMENT
QUICK CHANGEOVER

Shorter setup times

⬇

Reduced Inventory

More frequent setups

⬇

Increased Accuracy

Smaller batch sizes

⬇

Improved Flexibility & On-Time Delivery

Shorter lead times

⬇

Improved Quality

Competitive Advantage

LEAN SOLUTIONS

1 set-up 60 minutes

Model A

380 minutes run

Requires $11,400 in inventory.

440 available minutes

6 set-ups 10 minutes

Model F

Model E

Model D

380 minutes run

Model C

Model B

Requires $1,900 in inventory.

83% reduction in inventory!
&
83% reduction in leadtime

Model A
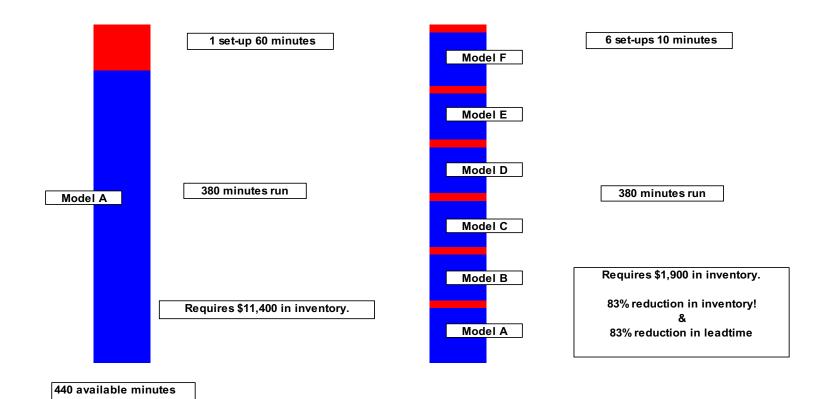
6 different models produced.
1900 parts required per day.
Cycle Time = 12 seconds
1900 parts /12 seconds each =
380 minutes required per day.

It will take 6 days to cycle thru all models requiring inventory of at least 6 days of each model. That is 11,400 pieces total, if each costs $1 there is $11,400 because of set-up.

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QUICK CHANGEOVER: DEFINITION

Internal Set-Up Activities

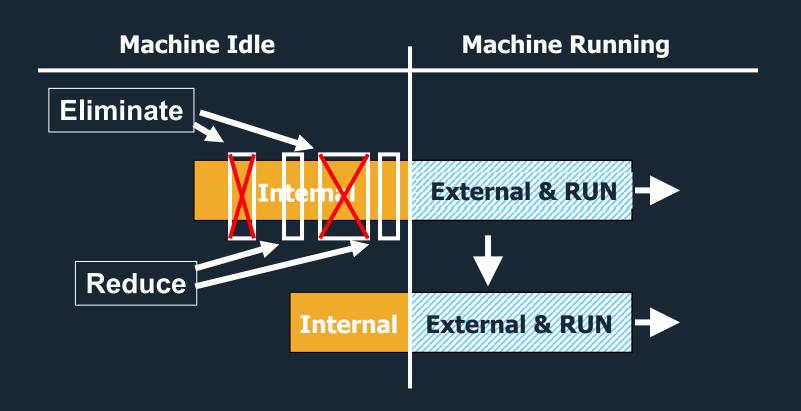- An activity or task that can only be performed while the machine is stopped. (Stopping the machine to change a tool)

External Set-Up Activities

- An activity or task that can be performed while the machine is running (Prepare tools, tooling, and required paperwork, while the machine is running)
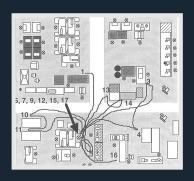
LEAN SOLUTIONS

Steps	Pre-Work	
1. Measure total changeover time, study current conditions. "Document Reality." (Video)		**60 Minutes**
2. Identify internal vs. external steps and calculate individual times.		5 5 3 5 3 8 6 11 3 11 E I E I E I E I E I
3. Strip out external steps and pull them forward before previous part run ends.	20 Min. E	I
4. Reduce and eliminate the internal setup, adjustments, etc.	20 Min. E	I 20 Minutes
5. Reduce the external elements.	10 Minutes E	I 20 Minutes
6. Identify parallel tasks. Two people working in harmony with one another, rather than one.	10 Minutes E	I 10 Minutes
7. Practicing the new and improved changeover method	8 Minutes E	I 8 Minutes
8. Standardize and improve the new changeover procedure over time.	8 Minutes E	I 8 Minutes

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REDUCE/ELIMINATE INTERNAL STEPS
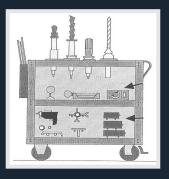
o Implement good 5S
o Standardize spacer & fixture heights
o Pre-set stops, gauges, limit switches, and tools
o Add center lines and reference planes
o Use of Changeover Carts
o Preset locations to eliminate measurement

REDUCE/ELIMINATE INTERNAL STEPS

o Numerical Settings vs. "feel"
o Gauges used so that adjustment can be preset without producing any defective parts
o Color-coding setup locations per part numbers
o V-notch and pin locators for dies
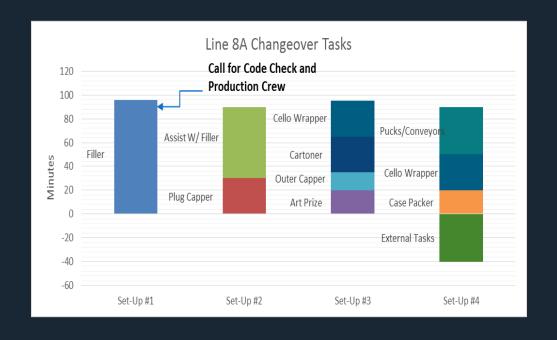o Quick Release Clamps (one-turn / one-motion)

REDUCE/ELIMINATE INTERNAL STEPS

- o Develop changeover sequencing (playbook)
- o Develop standardized work chard (create a checklist)

Line 8A Changeover Tasks

REDUCE/ELIMINATE INTERNAL STEPS

LINE 9 CHANGEOVER PRE-PLAN and TRACKING

C/O PRE-PLAN (Prepared 24 Hours Prior)

Date: _____

Initial or NAP all boxes

- [ ] Full Line or Partial Line? (Check One) ___ Full Line ___ Bulk Pack
- [ ] Product Ready, BP #: _____ , BP Name: _____
      If not ready, who was called? _____
- [ ] If Hot Fill or Tempered Fill, product verified at temperature. If not, action taken? _____
- [ ] BP Supply Method Verified (Check One)
      ___ By 2nd Floor _____ By Barrels
- [ ] Packet Ready
- [ ] Centerline Sheets Printed and in Color?
- [ ] External Parts and Equipment Staged. If not, why not? _____
- [ ] Wet Parts: [____] Pulled [____] Sanitized [____] Assembled
- [ ] Pucks Cleaned and Ready

ACTUAL CHANGEOVER

Completed SKU: _____ , Going To SKU: _____

C/O Team Goals: ___3___ C/O Hours ___70__ Ramp-Up %

C/O Start Time: _____ , C/O Completion Time (1st Good Case Off): _____

Set-up Crewleader, Groupleader or Changeover Point Person formally checks C/O progress at the 1-hr and 2-hr mark and initials off. If 30 minutes or more behind as compared to Playbook timeline, check roadblocks and take appropriate action.
- [ ] One Hour C/O Progress Check
- [ ] Two Hour C/O Progress Check

WITH CHANGEOVER TEAM INPUT OR FOR CHANGEOVER TEAM TO RECORD

"Roadblocks" that extended Changeover or Ramp ups: (ex: not full c/o team, wrong change parts pulled, line not ready, centerline adjustments needed, mechanical breakdown, component issues, bad seals, etc.):
Initials:
- [ ] _____
- [ ] _____
- [ ] _____
- [ ] _____

Ramp Up Roadblocks: (Only document startup issues after the line is called "Up and Running")

- [ ] _____
- [ ] _____
- [ ] _____
- [ ] _____

POST-CHANGEOVER REVIEW

Actual C/O Time: _____ Hours   Actual Ramp-up % _____
1) Roadblocks captured on electronic Roadblocks sheet ("S:" Drive)
2) Action Items created and assigned, with owner and due date (unless resolved on shift)   Rev. 10/6/14
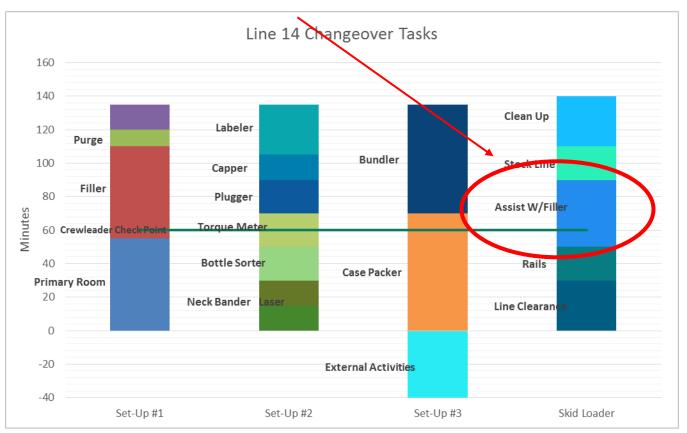
Pre-Plan Meeting & Checklist

Set-up #1:_____

Set-up #2:_____

Set-up #3:_____

Set-up #4:_____

C/O Point Person:_____

External C/O Tasks Checklist

[ ]	Prep & Sanitize Tools for Filler	[ ]	Sanitize Sheets Filled Out
[ ]	Place Ladder in position	[ ]	Verify Sanitization Window
[ ]	Get Cleaning Supplies	[ ]	Wet Parts Sanitized and Assembled
[ ]	Paperwork/Centerline	[ ]	Barrel Pump Sanitized and Assembled
[ ]	Stage Parts Cart	[ ]	Verify Parts pulled/Initialed to Centerline Sheet
[ ]	Filler Codes Set For Next Run	[ ]	Take EOR Settings Before Run Is Complete

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PARALLEL TASKS

Identify areas where two or more people can work together.

Line 14 Changeover Tasks
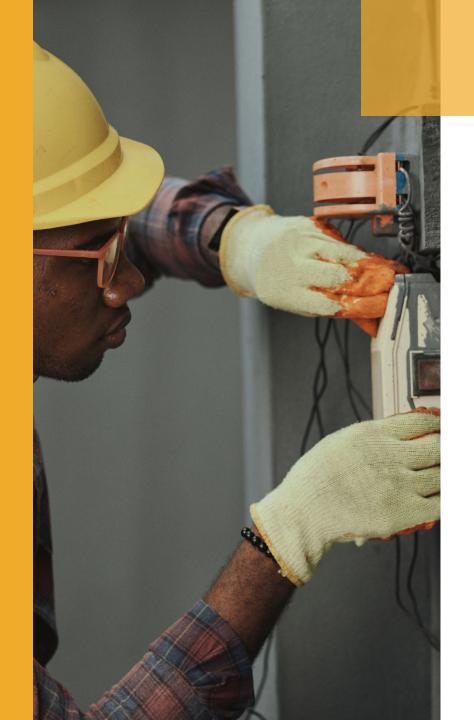
STANDARDIZE/IMPROVE THE PROCEDURE OVER TIME

TOTAL PRODUCTIVE MAINTENANCE

LEAN SOLUTIONS

WHAT IS

TOTAL PRODUCTIVE MAINTENANCE?

A set of techniques which ensures that each and every machine in the production process is always able to perform its required task

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WHAT IS
TOTAL PRODUCTIVE MAINTENANCE?

o The approach needs to be Total; It requires the participation of all employees. Production operators are trained to handle routine maintenance activities such as lubricating, cleaning, tightening and inspecting equipment on a regular basis

o It blurs the distinction between the roles of production and maintenance by placing a strong emphasis on empowering operators to help maintain their equipment.

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WHY IMPLEMENT
TOTAL PRODUCTIVE MAINTENANCE?

TPM increases stability by…

o Reducing unscheduled downtime

o Determining abnormal / normal conditions at a glance

o Improving knowledge on equipment operation and maintenance

o Equipment performs as expected

o Equipment is ready when needed

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TPM APPROACH

A shared responsibility for the equipment;
o It gives operators a chance to take ownership of their equipment
o Frees up the resources needed to fix problems caused by lack of maintenance
o Operators work together with maintenance

It seeks the total productivity of all the equipment;
o Achieved by focusing on the elements which account for the usual major losses, or downtime that occur to equipment

RESTORE TO ORIGINAL CONDITION

DOES THE MACHINE HAVE AN OIL LEAK?

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DOES THE MACHINE HAVE AN OIL LEAK?

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MEASURE OEE

OEE stands for "Overall Equipment Effectiveness".

OEE is a metric that identifies the percentage of planned production time that is truly productive. It was developed to support TPM initiatives by accurately tracking progress towards achieving "perfect production".

Simply put – it identifies the percentage of manufacturing time that is truly productive.

DEVELOP
THE ROUTINE & SCHEDULE

o Research equipment-maker's recommendations

o Add "experience-based" things to be done

o Utilize all your resources when determining tasks

o Use Preventative Maintenance System already in place

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TRAIN PERSONNEL
ON RESPONSIBILITIES

Operating equipment correctly and safely

- Do operators know how to start-up, shut-down and operate the equipment?

- Can operators run the equipment safely?

- Can operators changeover the equipment safely and in the targeted time?

Knowing recommended equipment maintenance

- Do operators have the required level of knowledge on the equipment?

- Do operators understand how to perform the required Preventative Maintenance routine, and scheduled tasks?

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OUR ROLES & RESPONSIBILITIES

Operators perform routine maintenance

- Think of them as the car owner
- Goal is to keep the car at optimal performance
  - Learn to properly operate car
  - Check and refill fluids
  - Keep automobile clean
  - Provide feedback to mechanic when problems occur

Maintenance delivers specialized service

- Think of them as the Mechanics
- The goal is a well running automobile
- Provide pre-scheduled maintenance
- Diagnose problems when car not performing to expectations
- Trained to handle more complex repair
- Provide feedback to car owner

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MONITOR
TO IMPROVE

o Visual card systems are effective to monitor the TPM Systems

o TPM Tasks are listed on colored cards; Red/Incomplete and Green/Completed

o Tasks are broken up into Daily, Weekly, and Monthly Requirements

o When a TPM task is complete the card is turned from red to green

o Cards are flipped back to red depending on the frequency of the TPM task i.e., the beginning of the week, or month

o The TPM system is monitored using Layered Process Audits

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TPM FOUNDATION:
DAILY DATA

Hour by Hour can be used to identify the losses that are occurring
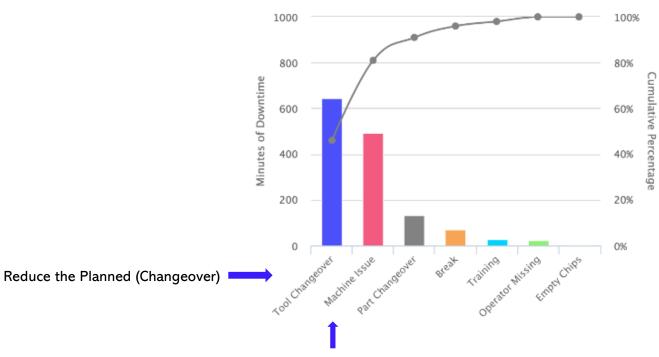
There are five main categories of losses:
1. Equipment downtime
2. Changeover
3. Minor stops
4. Speed Loss
5. Rework/Scrap

Break down each category for effective Problem Solving

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PARENTO ANALYSIS

Use Team Improvement Boards to Pareto Losses

Reduce the Planned (Changeover) →

Eliminate the Unplanned Issues

VISUAL
MANAGEMENT

LEAN
SOLUTIONS

LEARNING
OBJECTIVES
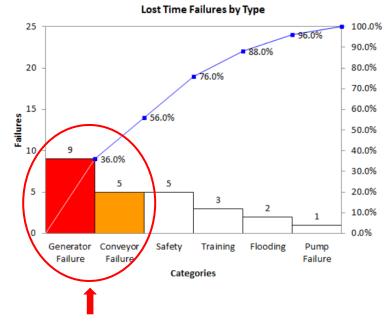
o Understand what is Visual Management

o Understanding why Visual Management is important in a Lean Environment

o Learn how to implement Visual Management that fits in your organization

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WHAT IS

VISUAL MANAGEMENT?

o   The ability to manage everything in
    your business visually

o   Managing visually is the ability of a
    system to quickly show the current
    status to anyone that stands and
    observes, within 30 seconds.

o   *EVERYONE* in your business
    understands and knows how to
    respond if something is wrong.

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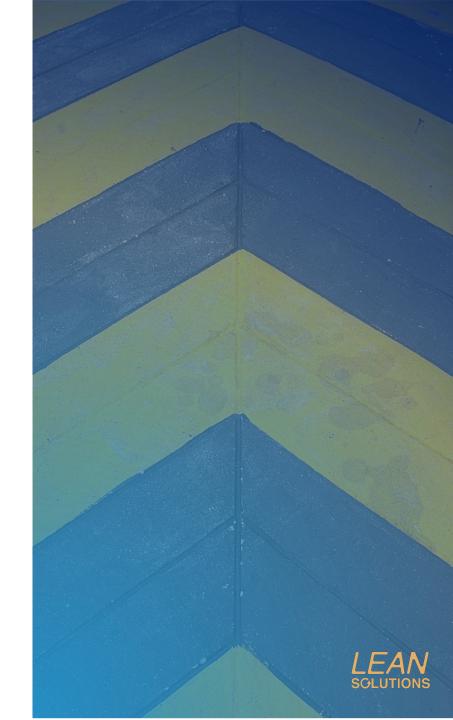
WHAT IS
VISUAL MANAGEMENT?

- Visual Management helps us become more effective problem-solvers by helping us with problem detection, since it helps us identify abnormalities quickly and easily.

- Visual Management helps us manage with our eyes. Done correctly, it helps us see at a glance how we're doing without having to read through reports, look up data, or wait for a briefing.

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4 COMMON TYPES

VISUAL SIGNALS

Visual Instructions

Visual Management

Visual Representations

LEAN SOLUTIONS

4 COMMON TYPES

Visual Signals

VISUAL INSTRUCTIONS

Visual Management

Visual Representations

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4 COMMON TYPES

- Visual Signals
- Visual Instructions
- **VISUAL MANAGEMENT**
- Visual Representations

LEAN
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4 COMMON TYPES

🔸 Visual Signals

🔹 Visual Instructions

🔵 Visual Management

⚫ **VISUAL REPRESENTATIONS**

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WHY
VISUAL MANAGEMENT

Provide Real Time Information

Reduce Waste and Poor Quality

Empowerment and Ownership

Drive Accountability

Faster Response Time to Problems

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WHY
VISUAL MANAGEMENT

Easy to See Processes

Workflow is Clear

Inexperienced Can Understand

Easier to Manage

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WHY
VISUAL MANAGEMENT

Develop a Routine

Daily, Weekly, Monthly

Show All Areas of the Organization

Should be a Display of Plant Performance

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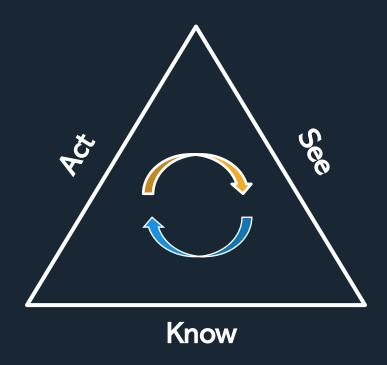
THE VISUAL OFFICE

Make problems visible

Communicate status

Improve productivity

Improve confidence

Act

See

Know

VISUAL MANAGEMENT CYCLE

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How do we Implement Visual Management?

SAFETY

AND SIMPLE IDENTIFICAITON

Fire Dangers

Fire Extinguishers

Chemical Dangers

Storm Shelters

Emergency Shut Off's

Electrical Box Clearance

High Voltage Notification

Evacuation

COMMON
COLORS

DANGER

WARNING

CAUTION

NOTICE

VISUAL MANAGEMENT AND 5S

DESIGNING VISUAL SYSTEMS

o Who is your audience

o Using the right media

o Don't overdo it

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LEADING CHARACTERISTICS
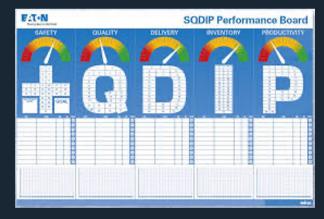
o Clear and easy to understand

o Team ownership

o Promote team ownership

o Close to the process

o Limit the data displayed

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VISUAL MANAGEMENT
BOARD EXAMPLES

Safety Cross

QDPI Indicators
with Safety 1st

HOW TO START
YOUR VM JOURNEY

- Go See

- Brainstorming Activity – What problems are you trying to solve?

- Team members understand why VMS are beneficial

- Discuss VMS components

- Create board using the VM board elements

- Try it out! Check and adjust as needed

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POINTS
TO REVIEW

o Keep it Clear and Concise

o Who, What, Where

o Basic Markings First

o Understandable for All

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6 FUNDAMENTALS OF LEAN

o Value

o Value Stream

o Flow
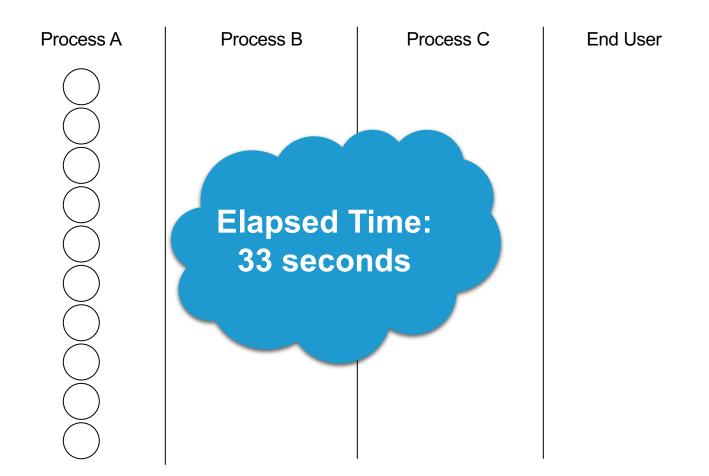
o Pull

o Perfection

BATCH & QUEUE

Process A   Process B   Process C   End User

**Elapsed Time:
33 seconds**

SINGLE PIECE FLOW

Process A   Process B   Process C   End User

Elapsed Time:
15 seconds!
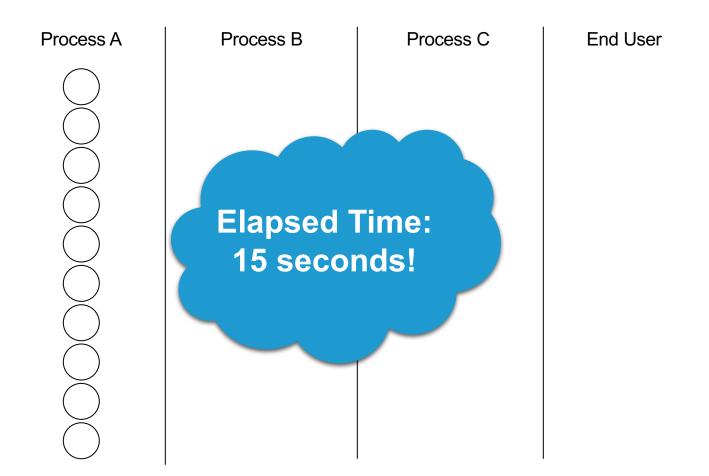
Upstream (suppliers)

"The ideal arrangement for Flow production should resemble a watershed: the river being the main assembly track, fed by tributaries in the shape of sub-assembly lines which, in turn, would be supplied by streams representing the machine lines fed by brooks typifying the material conveyors. Each part should flow continuously forward … ultimately to the sea - the customers."

Frank Woollard, *Principles of Mass and Flow Production*, 1954

Downstream (customers)

FLOW & PULL

Enablers for Flow

1. Use Single Piece Flow or Smaller Batches
2. Total Productive Maintenance (TPM)
3. Line Balancing (Cycle Times and Takt Times)
4. Theory of Constraints
5. Mistake Proofing (Poka Yoke)
6. Jidoka
7. SMED (Quick Change Over)

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SOLUTIONS

ONE PIECE FLOW VS BATCH
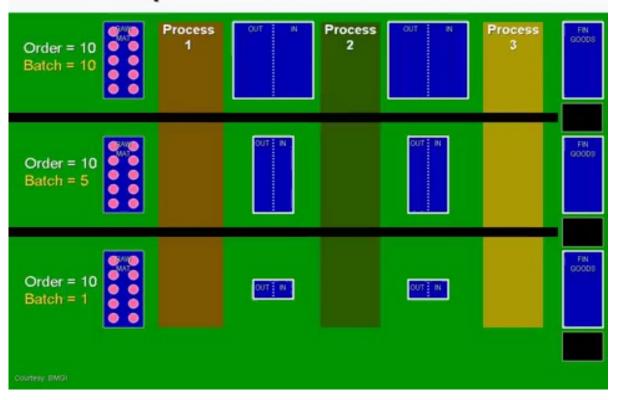
https://www.youtube.com/watch?v=cnLuztl-aGg

ONE PIECE FLOW VS BATCH

Flow – One piece flow versus Batch Production

https://www.youtube.com/results?search_query=single+piece+flow+vs+batch

BATCH VS SINGLE PIECE FLOW

https://www.youtube.com/watch?v=cu9CVFEHee4&list=PLGvZFHF27rGzmn1iFmj8v_3rCn07ytImO

LEAN SOLUTIONS

LINE BALANCING

Understand the TAKT TIME and CYCLE TIMES of the operations in your process and BALANCE your line. The goal is :

CYCLE TIMES = TAKT TIME

Definitions:

TAKT TIME = Demand Time =   Time needed to produce each unit of product or service in order to keep up with customer demand

CYCLE TIME = Actual time taken for production of each unit or service

Note: Always be aware for the specific definition of Cycle Time in your work or business because there can be subtle differences between companies

LINE BALANCING EXAMPLE

Demand is 4,800 units per month. Assuming 30 days per month and 8 hours per day.

Therefore TAKT TIME in minutes is:

Total time period in minutes ÷ total number units demanded

(30 x 8 x 60) ÷ 4800 = 3 minutes

QUIZ 6:

1. What is the Japanese name used for 'Mistake Proofing' of a process step ?
   - **POKA YOKE**

2. FLOW is critical to any process. What needs to Flow in an Airport or Hospital ?
   - **PEOPLE, INFORMATION, LUGGAGE, EQUIPMENT**

3. **SMED** is an acronym used in Lean Manufacturing. What is another name for SMED?
   - **QUICK CHANGE OVER**

4. A fundamental concept of any Lean Process is that it has no delays, constraints, waiting or bottlenecks. This Lean concept is called _____.
   - **FLOW**

LEAN SOLUTIONS

Case Study of Improved Flow Production

PRODUCTS

Shelves for Food Sector

Modular Cold Rooms

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THE PLANT

ANALYSIS OF FLOWS
IN JANUARY - 2017

Flow Analysis
Long distances
Waste (motion & transport)
High utilization of forklifts

WIP

Heavy, distant, forklift

NVA movements

Long distance

Forward and backward

OUTPUTS

INPUTS

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CREATING FLOW
DOOR INJECTION PRESS

Before

After

Before
o No material Flow
o Machine stopped due to lack of prepared parts.
o Preparation stopped due to lack of components.
o Push production. No balance.
o Use of forklifts. Rack storage.
o 4 shifts (7 days / week) – total of 14

After
o Material Flow
o Machine is **pulling** production from Prep
o Preparation with Kanban system from warehouse.
o Reduced use of forklifts. Materials in conveyors or pallets.
o 3 shifts (5 days / week) – total of 13
o Tools: 5S, Kanban, Create Flow, Kaizen

LEAN SOLUTIONS

Make Space for Flow

CLEAR AISLES

5S & Organization also played an important role in reducing waste

No Need for Forklifts

From "we need more forklifts trucks!" to "we need more wheels and trolleys"

LEAN SOLUTIONS

Layout Changes - More Flow, Less Waste

Change Layouts (team work)

Changed machine position so that material could flow directly to warehouse or next process

Reduce stock / increase flow

Remove pallet racking storage => material needs to flow + less use of forklifts

LEAN SOLUTIONS

Removing WIP – More Flow, More Space

Prodution Area Shelves /WIP

Flow, space and less WIP

Removing this racks was one of the first actions. Benefits helped to reduce resistance to change!

The next step was changing machines and giving a fresh look to the shopfloor!

LEAN SOLUTIONS

Reducing the Need of Forklift Trucks

Milk-run for long profiles

Long aluminium profiles (6m / 20ft) were now simple to deliver to cutting machine

Materials moved in trolleys

Build trolleys to materials that are difficult to transport, assuring no damages or scratches

LEAN SOLUTIONS

QUALITY ACTIONS

PROBLEM SOLVING TRAINING

Train & Practice

Basic Quality Tools!!

QUALITY ALERTS

Visually displayed in all areas

LEAN SOLUTIONS

MORE IMPROVEMENT EXAMPLES

**Ergonomic
No pallet.
No Forklift.
No damages.**

**Kanban Board
near operator**

**Colour code to
prevent mistakes**

LEAN SOLUTIONS
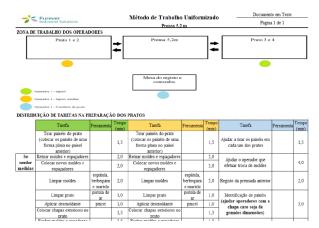
SMED (RAPID CHANGEOVER)
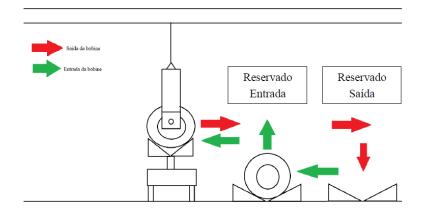
Organization & Visual Management

Standards & Team Work

Reduce time

Preparation – External activities

RESULTS 2017 VS 2018

Weekly Results

RESULTS	Jun-17	Nov-18
OUTPUT (m2/week)	500	1500
OEE	41.7 %	78.9 %
Defects	1.5%	0.2%
Average WIP	50 Units	25 Units

LEAN SOLUTIONS

6 FUNDAMENTALS OF LEAN

o Value

o Value Stream

o Flow

o Pull

o Perfection

LEAN
SOLUTIONS

Pull

(Downstream Demand Driven Production)

Pull is Sometimes Referred to as
'Just-In-Time Production'

JUST IN TIME

"PULL" and "KANBAN" are fundamental for…a JUST-IN-TIME process

- WHAT is needed
- HOW MUCH is needed
- WHERE it is needed
- (WHEN it is needed)

Note: 'WHEN' is usually not necessary because it assumed it is needed ASAP

LEAN
SOLUTIONS

KANBAN

Kanban is the Japanese word for 'card' or 'ticket'

The Kanban card was an authorization for materials to be moved from an Upstream location to a Downstream location. The card had printed on it What was needed How much was needed and Where it is needed.

A sequence of Kanbans pulls material through the process

Electronic signals are generally used today, but the system is still called a Kanban

LEAN
SOLUTIONS

KANBAN CARD EXAMPLE

KANBAN BOARD EXAMPLES

KANBAN BOARD EXAMPLES

KANBAN BOARD EXAMPLES

Returned Kanban
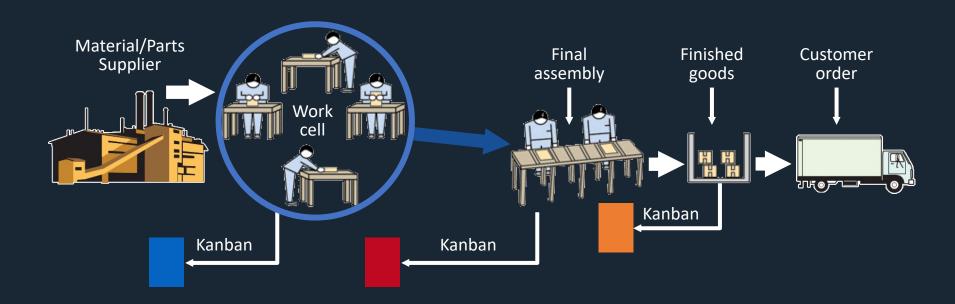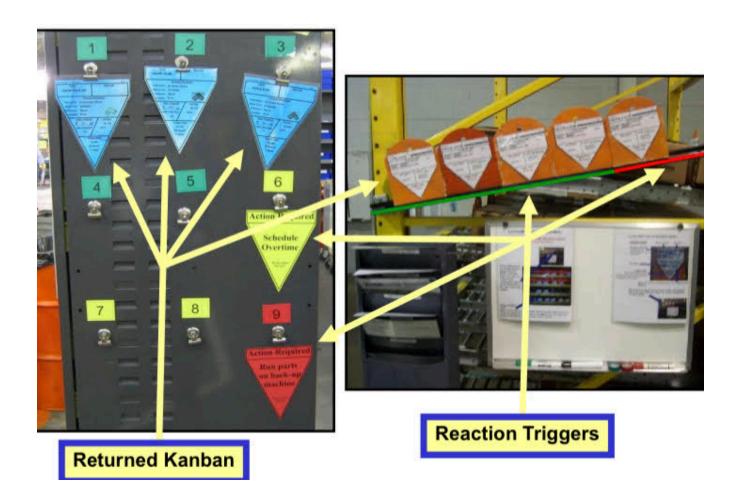
Reaction Triggers

QUIZ 7:

1. What is a 'Gemba Walk' ?
   - **Going to see for yourself what is happening where the real work is done**

2. What is the benefit of having a Visual Work Place ?
   - **All team members can see the status of work and operations easily and at the same time.**

3. Give one example of a Visual Management tool or technique ?
   - **Color Coding,   Notice Boards, Graphs and Charts, Good Labelling**

4. What are the key components to a good SOP (Standard Operating Procedure)?
   - **What**
   - **How**
   - **Why**
   - **Use a picture or video**

5. A fundamental concept of any Lean Process is that it has well defined and repeatable actions by workers. This concept is call _____work
   - **STANDARDIZED**

LEAN SOLUTIONS

HOMEWORK REVIEW

(Open Computers and Log into your Portal)

CONGRATULATIONS!

You have completed the Lean Yellow Belt Section.

Good Luck in your Exam!

office@findleansolutions.com

Facebook.com/findingleansolutions

Meet Your Instructor

- Background
- Lean Solutions "Train-The-Trainer" Course
- Internationally Certified Trainer

LEAN SOLUTIONS

CLASS SCHEDULE

DEFINE

Day 1
- Yellow Belt Class Refresh
- Introduction to DMAIC
- Project Management
    - Charters
    - SIPOC
    - Gantt Charts
- Structured Problem Solving (Steps 1-4)

MEASURE

Day 2
- Green Belt Project Review
    - Problem Statement
    - Measures of Success
    - Timeline
    - Help Needed?
- Structured Problem Solving (Steps 5-10)
- Value Stream Mapping
- Facilitating a Kaizen Event
- Impact/Effort Matrix (Affinity Diagram)

ANALYZE

IMPROVE

Day 3
- Green Belt Project Review
- Strategy Execution
- Hoshin Kanri
- Change Management
- Control and Sustainment

CONTROL

Day 4 (Six Sigma Green Belt Only)
- Six Sigma Statistics
- Measurement Systems Analysis
- Process Capability
- Correlation and Regression
- Introduction to DOE
- Hypothesis Testing

MEASURE

LEAN SOLUTIONS

BODY
OF KNOWLEDGE

LEAN
SOLUTIONS

YB Exam

Project Kick Off

Lean GB Exam

SS GB Exam

Project BB Kick Off

GB Project Report Out

BB Exam

Project Report Out

4 HR — DAY 1 — YB

4 HR — DAY 2 — YB

4 HR — DAY 1 — GB

Coaching Session 1

4 HR — DAY 2 — GB

Coaching Session 2

4 HR — DAY 3 — GB

Coaching Session 3

4 HR — DAY 4 — GB

Coaching Session 4

4 HR — DAY 1 — BB

Coaching Session 5

4 HR — DAY 2 — BB

Coaching Session 6

4 HR — DAY 3 — BB

Coaching Session 7

Coaching Session 8

Coaching Session 9

Coaching Session 10

1 MONTH

1.5 MONTHS

1.5 MONTHS

4 MONTHS
1 Coaching Session Each Month

4 MONTHS
Classes Every Other Week

LEAN SOLUTIONS

HOMEWORK

Homework

- Homework – Due before Day 2
- Homework – Due Before Day 3
- Homework – Due before Day 4
- Homework – Due before Day 5
- Homework – Review
- ILSSI Green Belt Exam Information

As a Green Belt student, you are expected to review and complete the homework for each lesson.

Homework items include information specific to the classroom instruction as well as your project work.

The assignments can be accessed on the student dashboard.

LEAN SOLUTIONS

GREEN BELT
CERTIFICATION EXAM

- Lifetime certification

- Done online on your student dashboard after training is finished

- Open Book

- 100 Multiple Choice Questions

- Pass mark is 70%

- Result issued immediately

- Retake is available

LEAN SOLUTIONS

GREEN BELT
CERTIFICATION EXAM

Find information on how to access the exam on the student dashboard

○ Green Belt Exam Review

Download the class PowerPoint slides (as a searchable pdf) to help while studying for and taking the exam

📄 Course   📑 **Materials**

Green Belt PowerPoint Slides (pdf)
Green Belt Project Requirements (pdf)

LEAN SOLUTIONS

Yellow Belt Review

YB Review:

1. What was the name of the first company to use the name 'SIX SIGMA' to describe its Quality Management System?
   - **MOTOROLA**

2. What is the First Principle of Lean production ? What is the most important thing that a Lean process must produce?
   - **VALUE** (for the customer of the process)

3. Which Japanese company is considered as being the first to use true 'Lean Production "effectively and successfully"?
   - **TOYOTA**

4. A basic principle of Six Sigma is to always find the true original source of a defect or problem. This is called _____?
   - **ROOT CAUSE ANALYSIS**

5. A "Six Sigma Process" is often described one that produces no more than 3.4 DPMO What does DPMO stand for?
   - **DEFECTS PER MILLION OPPORTUNITES FOR DEFECTS**

LEAN SOLUTIONS

YB Review:

1. What is the role of a Yellow Belt on a Lean Six Sigma project?
   - A YELLOW BELT IS A TEAM MEMBER WHO ASSISTS A GREEN OR BLACK BELT, USING THEIR KNOWLEDGE OF THE PROCESS THAT THEY CURRENTLY ARE WORKING WITHIN.

2. What is the role of a Green Belt in an organisation ?
   - A GREEN BELT IS A PROJECT TEAM LEADER FOR SMALL AND MEDIUM SIZED PROCESS IMPROVEMENT PROJECTS.

3. What is the role of a Black Belt in an organisation ?
   - A BLACK BELT IS A PROJECT TEAM LEADER FOR LARGE PROBLEM SOLVING / IMPROVEMENT PROJECTS or OVERSEES THE WORK OF GREEN BELTS FOR MULTIPLE PROJECTS. A BLACK BELT IS A FULL TIME PROBLEM SOLVER FOR THE ORGANISATION.

LEAN SOLUTIONS

YB Review:

1. All work shall be highly specified as to content, sequence, timing and _____.
   - OUTCOME

2. True or False? Standard work provides a routine for consistency of an operation.
   - TRUE

3. True or False? Standard work helps to hide problems.
   - FALSE

4. Discussion: Why is it so important to audit standard work?

YB Review:

1. Which of the traditional 8-Wastes of 'DOWNTIME is concerned with reducing the complexity of processes and taking out unnecessary steps or activities ?
   - **NON-ESSENTIAL PROCESSING / OVER PROCESSING**

2. What is the name of the Waste of producing more that the customer demand can absorb ?
   - **OVER-PRODUCTION**

3. What is Waste called when an activity or step in process needs to be repeated because it was not done 'Right-First-Time' ?
   - **REWORK / DEFECTS**

4. What Waste results in Queues or Backlogs of materials or work ?
   - **WAITING (DUE TO A BOTTLE-NECK IN THE PROCESS)**

5. What is the Japanese word for 'Waste' ?
   - **MUDA**

YB Review:

1. Which stage of the 5S method is used to ensure that the workers have the good habits and discipline to continue the other 4S tasks?
    *   SUSTAIN

2. In 5S the action of removing unnecessary tools, equipment and materials from the workspace is called _____.
    *   SORT

3. Cleaning the workplace of dirt, dust and litter is called what in 5S ?
    *   SHINE

4. Give one example of a 5S method used for SET IN ORDER / STRAIGHTEN
    *   SHADOW BOARDS
    *   RACKS
    *   COLORED LABELS
    *   FLOOR MARKING etc

YB Review:

1. What Tool is used to understand what is Critical to Quality (CTQ) by Forming 3 categories: *threshold, performance*, and *excitement*?
   - **KANO ANALYSIS**

2. Splitting Customers into groups according to different needs or behaviours is called _____.
   - **SEGMENTING**

3. CTQs are also sometimes called CTCs or CTSs. What does CTS stand for?
   - **CRITICAL TO SATISFACTION**

4. Give one example of a method used to understand the **Voice of the Customer**?
   - **SURVEYS**
   - **FEEDBACK**
   - **FOCUS GROUPS**
   - **REPEAT SALE METRICS, etc**

LEAN SOLUTIONS

YB Review:

1. What does kaizen stand for?
    - SMALL CHANGE FOR THE BETTER / CONTINUOUS IMPROVEMENT

2. What are the three criteria of kaizen?
    - DOES THE IDEA REDUCE WASTE, IMPROVE QUALITY, AND/OR INCREASE SAFETY?
    - DOES THE IDEA ADDRESS THE ROOT CAUSE?
    - IS IT STANDARDIZED?

3. What are the different types of Gemba walks?
    - SAFETY, 5S, WASTE, VALUE STREAM WALK

LEAN SOLUTIONS

YB Review:

1. What is a 'Gemba Walk' ?
   - GOING TO SEE FOR YOURSELF WHAT IS HAPPENING WHERE THE REAL WORK IS DONE

2. What is the benefit of having a Visual Work Place ?
   - ALL TEAM MEMBERS CAN SEE THE STATUS OF WORK AND OPERATIONS EASILY AND AT THE SAME TIME.

3. Give one example of a Visual Management tool or technique ?
   - COLOR CODING, NOTICE BOARDS, GRAPHS AND CHARTS, GOOD LABELLING

4. What are the key components to a good SOP (Standard Operating Procedure)?
   - WHAT
   - HOW
   - WHY
   - USE A PICTURE OR VIDEO

5. A fundamental concept of any Lean Process is that it has well defined and repeatable actions by workers. This concept is call _____work
   - STANDARDIZED

LEAN SOLUTIONS

PROJECT CHECK-IN'S

o What is your Problem Statement?
o Give some background on your Project
o What are your goals?

o Do you foresee any roadblocks?

o Do you need help with anything?

o What are your next steps?

LEAN
SOLUTIONS

DMAIC

The Six Sigma Framework for Problem Solving

LEAN SOLUTIONS

Figure 1: *Roadmap Comparisons to the Scientific Method*

Define - The business problem (or opportunity), Team and Scope

Measure - The process current state (as-is) of the problem area

Analyze - Determine Root Cause of the problem

Improve - Identify and Choose Best Solution then implement the solution

Control - Ensure your solution is working. Monitor and Control.

INSERT PIC OF PARTICIPANT/COACH DMAIC PROJECT CHECKLIST

We do NOT need to use all the possible tools on every project.

Be 'LEAN' in selecting correct tools according to:

o The type of problem

o The scale/size of problem

o How much money and time you have

o The skills /experience of your project team

LEAN
SOLUTIONS

DEFINE PHASE

Defining the PROBLEM

Defining the PROJECT

DEFINE

Problem & Project Definition
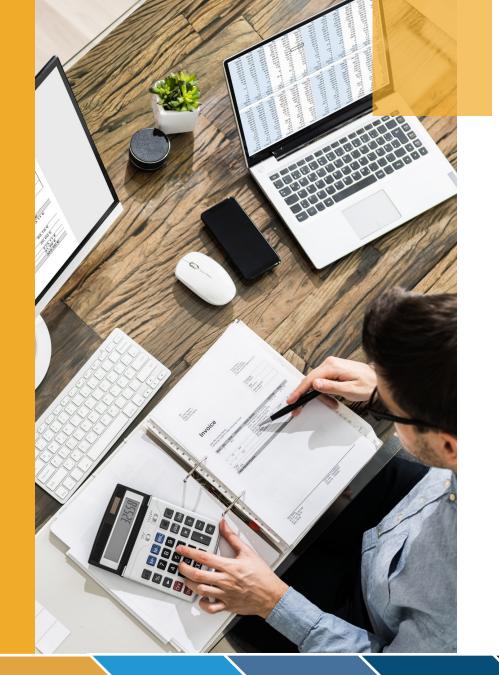
o The most important Phase of any DMAIC Project

o Choose the right problem to tackle

o Define the PROBLEM

o Identify the key TEAM members and STAKEHOLDERS

o Understand the SCOPE

o Present a good BUSINESS CASE

o Develop a PROJECT CHARTER

DEFINE MEASURE ANALYZE IMPROVE CONTROL

LEAN SOLUTIONS

3 DOCUMENT
OUTPUTS OF DEFINE

1. Business Case (including Problem Statement)

2. Project Charter

3. High Level Process Map or SIPOC

LEAN SOLUTIONS

PROJECT SELECTION –
CORE COMPONENTS

Business Case – The Business Case defines the Problem and the Business motivation for considering the project. The Problem is defined with a 'Problem Statement'.

Project Charter – The Project Charter is a more detailed version of the Business Case. This document further focuses the improvement effort. It can be characterized by two primary sections; one, basic project information and two, simple project performance metrics.

High Level Process Map – Used to show a high level understanding of the scope of the process that is to be measured, analyzed, improved and controlled. The SIPOC tool can also be used.

DEFINE **MEASURE** **ANALYZE** **IMPROVE** **CONTROL**

LEAN SOLUTIONS

WHAT IS A BUSINESS CASE?

A Business case has 3 main parts :

1. What is the problem that the business or the customer is experiencing?   This part is called the 'Problem Statement'

2. What is the target or goal we are trying to reach ?

3. What are the consequences for the business if the problem is not solved, or business benefits if it is solved ? In other words, what is the business motivation for a project to solve the problem ?

The Business Case is constructed with the help of the Process Owner / Manager or the Business Owner / Manager.

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

THE PROBLEM STATEMENT

Must include:
1. What is the problem?
2. When/Where are we seeing the problem?
3. What requirement is affected?
4. Who does it affect?

Should not:
1. Be more than one problem
2. Suggest a solution
3. Make assumptions

LEAN SOLUTIONS

THE PROBLEM STATEMENT

Poor:
The widget is too long (1)

Better:
The widget exceeds the requirement (1) of 38cm (3)

Best:
The last 10 production runs (2) show the widget measured an average of 41cm (1), which exceeds the customer (4) requirement of 38cm +/- 2cm.(3**)**

1. What is the problem?
2. When / Where are we seeing the problem?
3. What requirement is affected?
4. Who does it affect?

LEAN SOLUTIONS

BUSINESS CASE EXAMPLE

Problem Statement

- Customer complaints have increased by 50% in 2019.   The 2017 average was 20 complaints per month with a total of 240 over the full year. 2018 average was 21 per month with a total of 252 over the year,   The average for the first 5 months of 2019 is 30 complaints with a total of 150 in 5 months.

Target

- We need to reduce complaints back down to the 2017 level of an average of 20 per month.

Consequences

- We will see a drop in new customers and also customers leaving if we do not reduce the complaints and increase customer satisfaction.

DEFINE **MEASURE** **ANALYZE** **IMPROVE** **CONTROL**

LEAN SOLUTIONS

WHAT IS
A PROJECT CHARTER?

The *Project Charter* expands on the Business Case, it clarifies the project's focus and the measures of project performance. The Project Charter completed by the Six Sigma Belt (Green or Black).

LEAN SOLUTIONS

PROJECT CHARTER DEFINITIONS

o *Problem Statement* - Articulates the pain of the <u>defect</u> or <u>error</u> in the process.

o *Objective Statement* – States how much of an improvement is desired from the project.

o *Project Scope* – Articulates the boundaries of the project. (Use SIPOC diagram)

o *Primary Metric* – The actual <u>measure</u> of the defect or error in the process.

o *Secondary Metric(s)* – Measures of potential consequences (+ / -) as a result of changes in the process.

o Project Black Belt & Process Owner names

o Start date & desired End date

o Division or Business Unit name

o Team Members

o Stakeholder names

LEAN SOLUTIONS

TEAM/PROJECT CHARTER

Project Name:	A better cup of coffee
Date (Last Revision):	xx-xx-xxxx
Prepared By:	Craig T.
Approved By:	Patrick A.

Business Case:	**Opportunity Statement (High Level Problem Statement):**
The coffee in the main break room is not very tasty. Employees are leaving the property at break times to visit either the Starbucks next door, or gas station across the street to get their coffee. There have been some close calls with traffic and associates that are crossing the road. Some associates are having trouble getting back to work on time.	Poor tasting coffee in the main breakroom is causing associates from all three shifts to go to an off-site location to get a quality cup of coffee.
	Defect Definition: Poor tasting coffee

Goal Statement:	**Project Scope:**
Provide coffee that tastes so good associates will not want to leave the site for the duration of their breaks.	**Process Start Point:** Easy, fast, and efficient process to access a great tasting cup of coffee in the main break room.
	Process End Point: Associates leave the break room on time to return to their work area.
Expected Savings/Benefits: Remove time lost due to injuries inflicted due to carelessness and rushing when leaving the site. Equipment and department start up time at the end of breaks to be less than 2 minutes.	**In Scope:** Address the break and coffee experience in the main break room.
	Out of Scope: The three small break areas located on the plant floor, and the office break room.

Project Plan:

Task/Phase	Start Date	End Date	Actual End
Brief all shifts on project	xx-xx-xx	xx-xx-xx	xx-xx-xx
Brainstorming Session	xx-xx-xx	xx-xx-xx	
Identify Countermeasures	xx-xx-xx	xx-xx-xx	
Create Action Plan	xx-xx-xx	xx-xx-xx	

Team:

Name:	Role:	Commitment (%):
Craig T.	Project Champion	100
Patrick A.	Project Owner	50
Liz H.	Project Manager	75
Taylor K.	Core Member	25
Daniell S.	Core Member	25

DEFINE   **MEASURE**   **ANALYZE**   **IMPROVE**   **CONTROL**

LEAN SOLUTIONS

SMART METRIC

When choosing the best METRIC to use as the main measure of success of your project, consider the SMART method of choosing metrics

Specific - Is the metric well defined?

Measurable - How will we measure it easily?
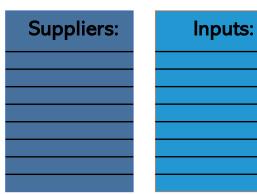
Attainable - Can we achieve the target?

Relevant - Is the metric related to the problem?

Time Bound - When are we going to measure it?

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

SIPOC FOR THE DEFINE PHASE

| Suppliers: | Inputs: | | Outputs: | Customers: |

Process

Suppliers
All internal and external suppliers to the process

Inputs
All inputs to the process i.e. material, forms, information, etc.

Process
One block representing the entire process with its name

Outputs
All outputs for both internal and external customers

Customers
All internal and external customers to the process
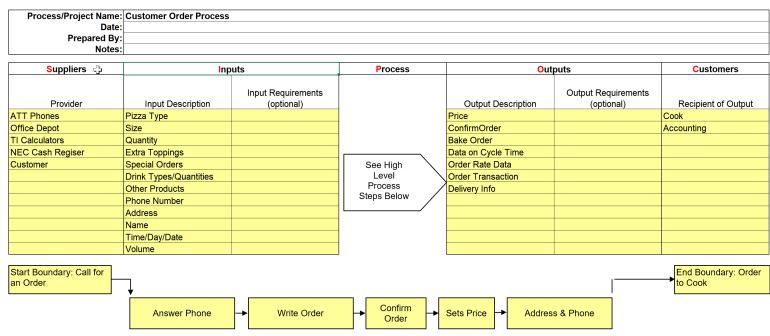
DEFINE → **MEASURE** → **ANALYZE** → **IMPROVE** → **CONTROL**

LEAN SOLUTIONS

SIPOC

SIPOC DIAGRAM for Customer-Order Process

Process/Project Name:	Customer Order Process
Date:	
Prepared By:	
Notes:	

Suppliers	**Inputs**		**Process**	**Outputs**		**Customers**
Provider	Input Description	Input Requirements (optional)		Output Description	Output Requirements (optional)	Recipient of Output
ATT Phones	Pizza Type			Price		Cook
Office Depot	Size			ConfirmOrder		Accounting
TI Calculators	Quantity			Bake Order		
NEC Cash Regiser	Extra Toppings		See High Level Process Steps Below	Data on Cycle Time		
Customer	Special Orders			Order Rate Data		
	Drink Types/Quantities			Order Transaction		
	Other Products			Delivery Info		
	Phone Number					
	Address					
	Name					
	Time/Day/Date					
	Volume					

Start Boundary: Call for an Order → Answer Phone → Write Order → Confirm Order → Sets Price → Address & Phone → End Boundary: Order to Cook

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

LEAN SOLUTIONS

SIPOC FOR THE DEFINE PHASE

Class exercise: Complete this SIPOC for making a package delivery of a product that a customer has purchased through your company website.

Process name : _____

Suppliers	**I**nputs	**O**utputs	**C**ustomers
1._____	1._____	1._____	1._____
2._____	2._____	2._____	2._____

LEAN SOLUTIONS
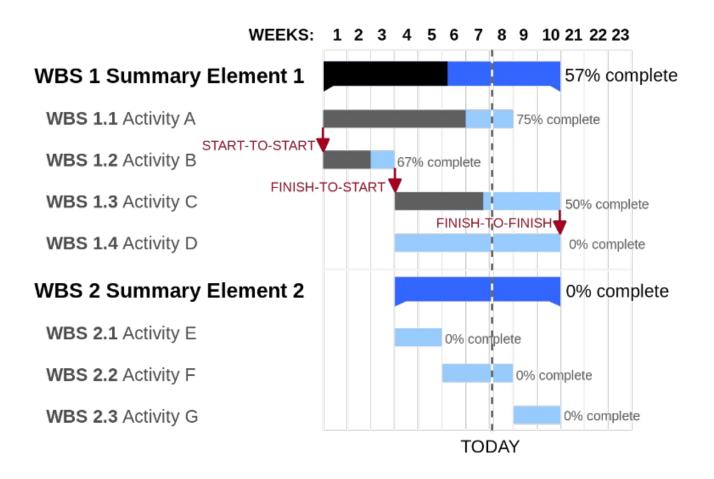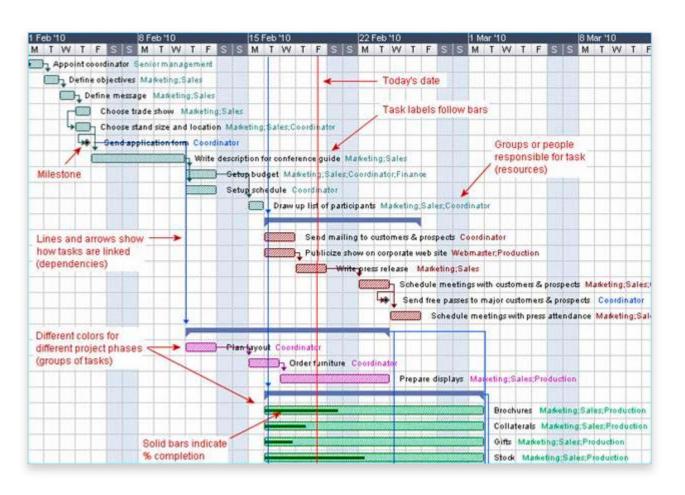
GANTT CHART
CREATE A TIMELINE FOR YOUR PROJECT

GANTT CHART
CREATE A TIMELINE FOR YOUR PROJECT

Karol Adamiecki

Henry Gantt

LEAN SOLUTIONS

SUMMARY

At This Point You Should Be Able To…

o Understand the importance for the Define Phase.

o Understand the 3 main output documents of the Define Phase
- o Business Case
- o Project Charter
- o SIPOC of Level 1 Process Map

o Understand SMART Metrics

o Understand Gantt Charts

QUIZ 1:

1. What is the framework used in Lean Six Sigma for running Lean Six Sigma projects where we are unsure of the root cause or solution ?
   - DMAIC   Define – Measure – Analyse – Improve – Control

2. What are the names of the 3 document deliverables in the DEFINE Phase ?
   - Business Case   (including Problem Statement)
   - Project Charter
   - Scope Statement or SIPOC

3. What does the acronym SIPOC mean ?
   - SUPPLIERS, INPUTS, PROCESS, OUTPUTS, CUSTOMERS

4. What do we call a 1-page summary of your timeline with milestones?
   - Gantt Chart

LEAN SOLUTIONS

STRUCTURED
PROBLEM SOLVING

LEAN SOLUTIONS

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

INTRODUCTION

o What types of problem solving are in use throughout your Organization?

o How effective is the problem solving in your facility at determining the TRUE root cause?

LEAN SOLUTIONS
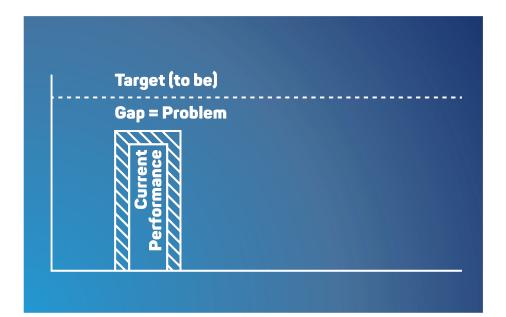
WHY
BASIC PROBLEM SOLVING?

It's a general rule of life that we will try anything easy that doesn't work before we will embrace anything harder that does.

LEAN SOLUTIONS

WHAT IS
A PROBLEM?
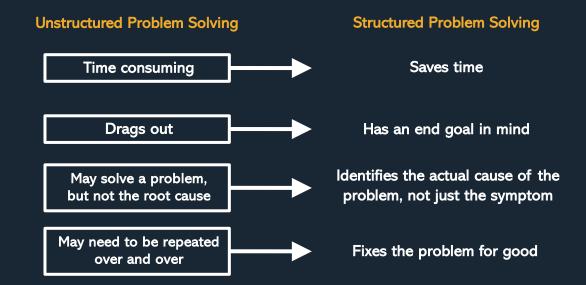
A problem is a "gap" - between:

Current condition – **what is actually happening**
Target or ideal condition – **what should be happening, what is needed**

The diagram on the left shows:
- Target (to be)
- Gap = Problem
- Current Performance

LEAN SOLUTIONS

WE NEED
STRUCTURED PROBLEM SOLVING

Unstructured Problem Solving

Structured Problem Solving

Time consuming →	Saves time
Drags out →	Has an end goal in mind
May solve a problem, but not the root cause →	Identifies the actual cause of the problem, not just the symptom
May need to be repeated over and over →	Fixes the problem for good

DEFINE ▸ MEASURE ▸ ANALYZE ▸ IMPROVE ▸ CONTROL

LEAN SOLUTIONS

WHO SHOULD BE INVOLVED
IN SOLVING PROBLEMS?

- Members (40-400)

- Leads (3-9)

- Middle Management (2-4)

- Upper Management (1-2)

Brought to you by: PATRICK ADAMS CONSULTING
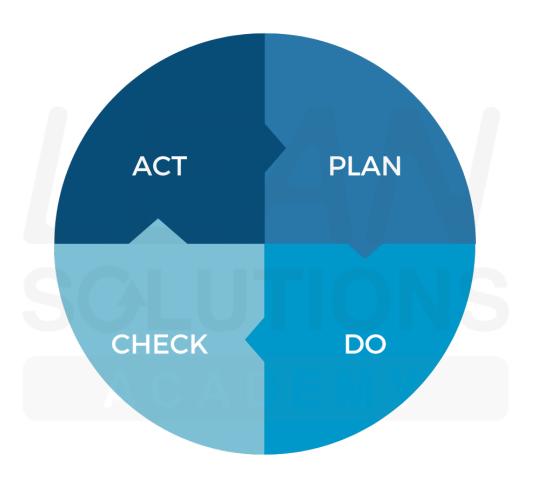
LEAN SOLUTIONS
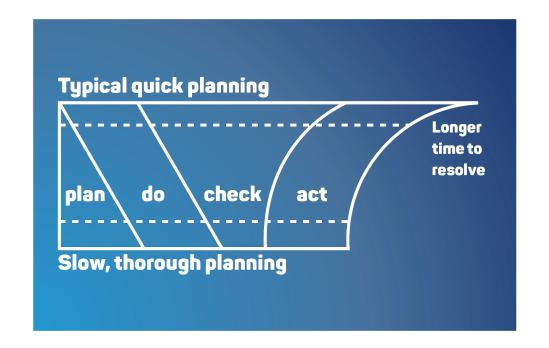
THE ENGINE OF EXECUTION

BALL TOSS EXERCISE

LEAN SOLUTIONS

PRACTICAL
PROBLEM SOLVING

LEAN SOLUTIONS

10 STEP PROBLEM SOLVING METHOD

PLAN the product or process improvement:
1. Describe the problem
2. Understand needs & requirements
3. Use a team approach
4. Identify potential causes
5. Collect & analyze data (to verify root cause)
6. Identify alternatives & select solution
7. Prepare a plan of action
8. Get leadership approval & support

DO the improvement:
9. Implement the solution

CHECK the results:
10. Measure, monitor & control
    your results

ACT on the results: Review and recognition

ACT | PLAN
CHECK | DO

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

LEAN SOLUTIONS

TAKE INTERM STEPS

o If the customer or next operation is at risk, take immediate interim action to contain the problem and prevent it from spreading.
o This step should be considered a band-aid only and not the cure.
o Examples of containment action:
    o Purge stock
    o Inspect work in process
    o Rework and fix errors
    o Alert customers
    o Apply temporary verifications

LEAN SOLUTIONS

THE PROBLEM

Evidence

Incident

Fact

Problem

Reject

Error

Look for systemic issues

Issue

Incidents
Rejects
Errors
Facts

Problems
Issues
Facts

Fact

Problem

Facts
Evidence

**Group observations
(i.e., facts, errors)
into problem categories**

Problem 1

Problem 2

Problem 3

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

"You can't manage what you don't measure."

— W. Edward Deming

LEAN SOLUTIONS
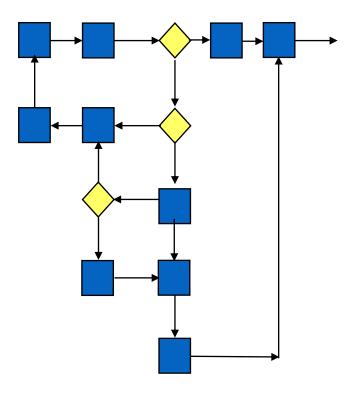
UNDERSTANDING THE PROCESS

We must first understand the Process Flow
before Process Problems can be understood.

LEAN
SOLUTIONS

PROCESS MAPPING

There are usually 3 view of a process:

1

What people *THINK* it is..

2

What it *ACTUALLY* is..

3

What it *SHOULD* be..

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

LEAN SOLUTIONS

STANDARD PROCESS MAPPING SYMBOLS

Standard symbols for Process Mapping:

(available in Microsoft Office™, Visio™, iGrafx™ , SigmaFlow™ and other products)

A RECTANGLE *indicates an activity. Statements within the rectangle should begin with a verb*

A PARALLELAGRAM *shows that there are data*

A DIAMOND *signifies a decision point. Only two paths emerge from a decision point: No and Yes*

An ELLIPSE *shows the start and end of the process*

An ARROW *shows the connection and direction of flow*

1
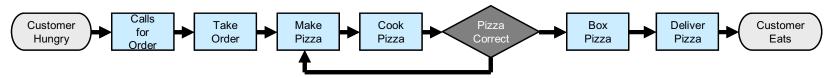
A CIRCLE WITH A LETTER OR NUMBER INSIDE *symbolizes the continuation of a flowchart to another page*

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

LEAN SOLUTIONS
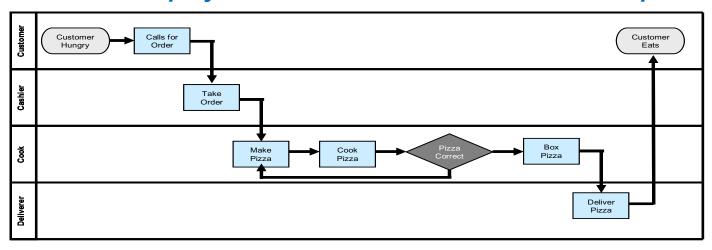
TYPES OF PROCESS MAPS

The Linear Flow Process Map

Customer Hungry → Calls for Order → Take Order → Make Pizza → Cook Pizza → Pizza Correct → Box Pizza → Deliver Pizza → Customer Eats

As the name states this diagram shows the process steps in a sequential flow, generally ordered from an upper left corner of the map towards the right side.

The Deployment-Flow or Swim Lane Process Map

Customer	Customer Hungry → Calls for Order → → → → → → → → Customer Eats
Cashier	Take Order
Cook	Make Pizza → Cook Pizza → Pizza Correct → Box Pizza
Deliverer	Deliver Pizza
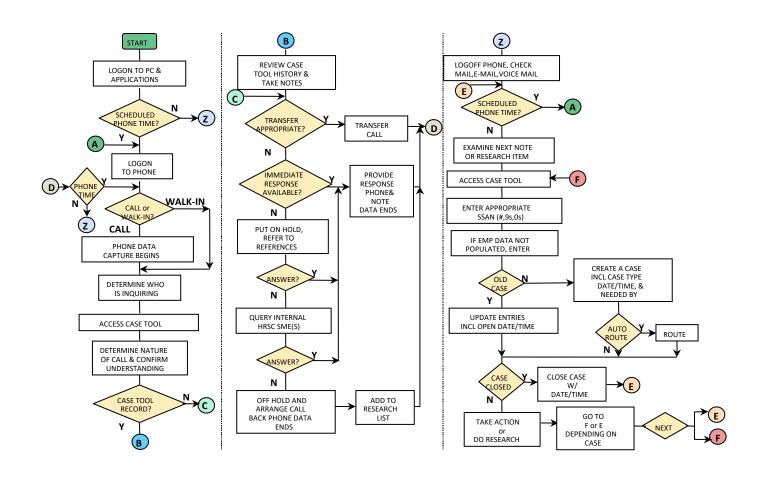
The value of the Swim Lane Map is that is shows you who or which department is responsible for the steps in a process. A timeline can be added to show how long it takes each group to perform their work. Also each time work moves across a Swim Lane there is a "Supplier – Customer" interaction. This is usually where bottlenecks and queues form.

DEFINE — MEASURE — ANALYZE — IMPROVE — CONTROL

LEAN SOLUTIONS

PROCESS MAP EXAMPLE

Column 1:

START

LOGON TO PC & APPLICATIONS

SCHEDULED PHONE TIME? — N → Z

A → Y

LOGON TO PHONE

D → PHONE TIME — Y

N → Z

CALL or WALK-IN? — WALK-IN

CALL

PHONE DATA CAPTURE BEGINS

DETERMINE WHO IS INQUIRING

ACCESS CASE TOOL

DETERMINE NATURE OF CALL & CONFIRM UNDERSTANDING

CASE TOOL RECORD? — N → C

Y → B

Column 2:

B

REVIEW CASE TOOL HISTORY & TAKE NOTES

C →

TRANSFER APPROPRIATE? — Y → TRANSFER CALL → D

N

IMMEDIATE RESPONSE AVAILABLE? — Y → PROVIDE RESPONSE PHONE& NOTE DATA ENDS

N

PUT ON HOLD, REFER TO REFERENCES

ANSWER? — Y

N

QUERY INTERNAL HRSC SME(S)

ANSWER? — Y

N

OFF HOLD AND ARRANGE CALL BACK PHONE DATA ENDS → ADD TO RESEARCH LIST

Column 3:

Z

LOGOFF PHONE, CHECK MAIL,E-MAIL,VOICE MAIL

E → SCHEDULED PHONE TIME? — Y → A

N

EXAMINE NEXT NOTE OR RESEARCH ITEM

ACCESS CASE TOOL ← F

ENTER APPROPRIATE SSAN (#,9s,0s)

IF EMP DATA NOT POPULATED, ENTER

OLD CASE — N → CREATE A CASE INCL CASE TYPE DATE/TIME, & NEEDED BY

Y

UPDATE ENTRIES INCL OPEN DATE/TIME

AUTO ROUTE — Y → ROUTE

N

CASE CLOSED — Y → CLOSE CASE W/ DATE/TIME → E

N

TAKE ACTION or DO RESEARCH → GO TO F or E DEPENDING ON CASE → NEXT → E / F

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

LEAN SOLUTIONS

PERFORMACE MEASURES

o Performance measures are the indicators used to see the difference between what is, and what should (or could) be.

o Established at each level of the organization.

o Often used to describe a problem condition.

DEFINE — MEASURE — ANALYZE — IMPROVE — CONTROL

LEAN SOLUTIONS

MONITORING WITH SPC

Statistical Process Control (SPC):

- ○ SPC is used for monitoring of a process to make sure it is ' in control'

- ○ The most common method of SPC is a <u>Control Chart</u>

- ○ SPC was first introduced in the 1930 by **Walter Shewhart** and then popularized in the 1960 and 1970 by **Joseph Juran** and was the basis of the Motorola '**Six Sigma**' Quality program.

LEAN SOLUTIONS
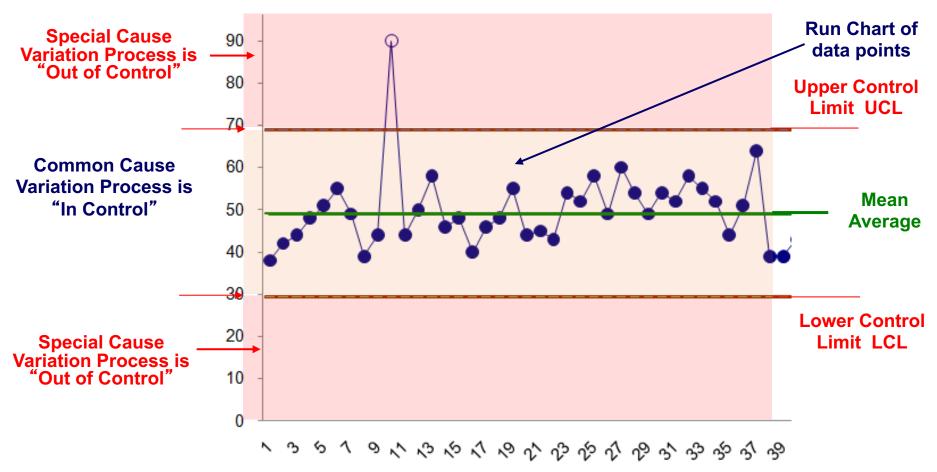
Control Charts

- **Control Charts indicate when a process is "out of control" or exhibiting Special Cause variation.**

- **Control Charts incorporate upper and lower Control Limits.**
  - **The limits are typically +/- 3 σ from the Center Line.**
  - **These limits represent 99.73% of natural variability for Normal Distributions.**

- **Use of Control Charts can be applied to all processes.**
  - **Services, manufacturing and retail are just a few industries with SPC applications.**

- **Control Limits are used to define the limits that the business is setting for the process.**
  - **Ideally Control Limits should be narrower than customer specs.**

CONTROL CHART

Special Cause Variation Process is "Out of Control"

Common Cause Variation Process is "In Control"

Special Cause Variation Process is "Out of Control"

Run Chart of data points

Upper Control Limit UCL

Mean Average

Lower Control Limit LCL

Sequence/Time Scale

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

2 types of Variation shown on Control Chart
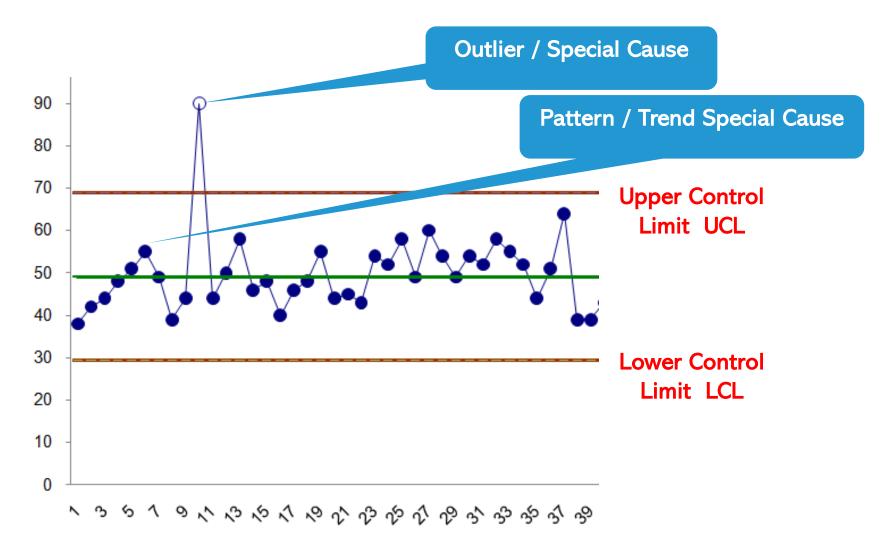
1. Common Cause Variation

Expected, natural and inherent in every process.   Due to random small changes in the process inputs. Small changes in temperature, vibration, wait time or worker energy level are examples. 'Chronic' variation

2. Special Cause Variation / Assignable Cause Variation
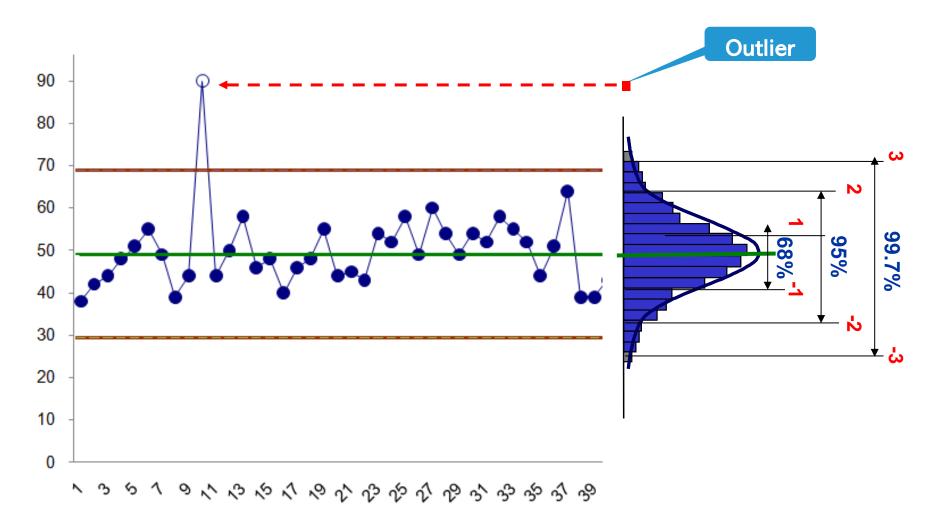
Unexpected, not part of the process. Often due to external influences out of our control such as accidents, mechanical or electrical failures. 'Sporadic' variation. Can be either an **'Outlier'** or an unusual **'Pattern or Trend'** in the data. See the 'Western Electric' tests for Special Causes.

CONTROL & OUT OF CONTROL

Considerations when selecting a control chart
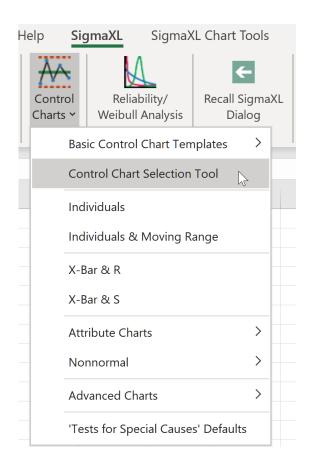
There are over 10 different types of Control Charts!

Many factors influence the choice of which control chart to use.
These include:
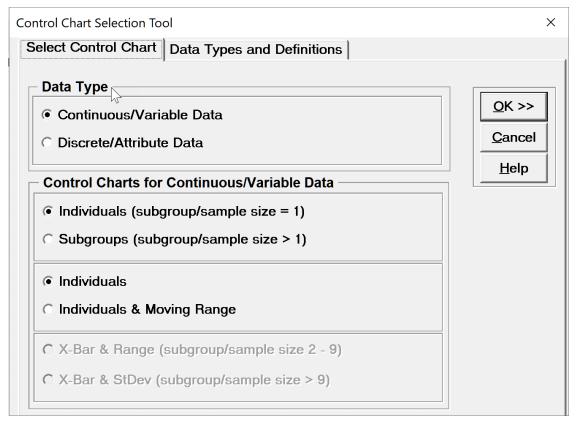
1. The type of data being charted (Variable or Attribute)

2. The required sensitivity (size of the change to be detected) of the chart

3. The subgroup size / sample size

4. The ease and cost of sampling

5. Production volumes

Capability Studies:

- Are intended to be regular, periodic, estimations of a process's ability to meet customer requirements.

- Can be conducted on both Variable (Quantitative) and Attribute (Yes or No) Data.

- Are most meaningful when conducted on stable, predictable processes.
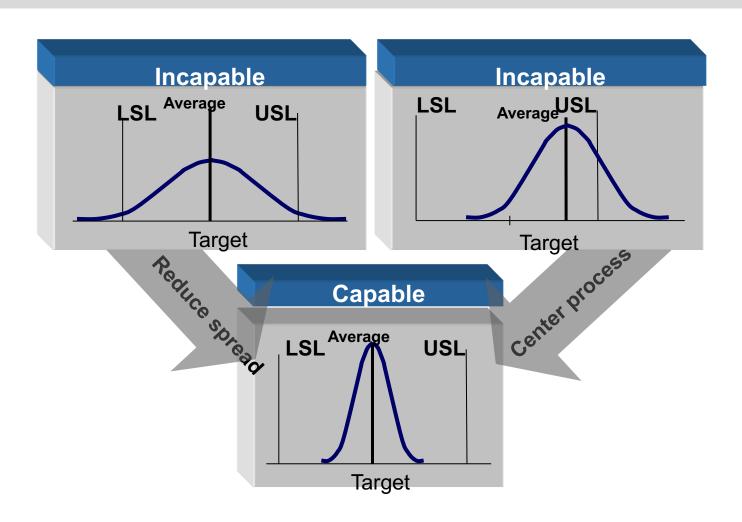
Understanding Process Capability

Process Capability / Process Performance :

- **The ability of a process to meet the expectations of the customer**

- **Provides insight as to whether the process has a:**

  - **Centering Issue (relative to specification limits)**
  - **Variation Issue**
  - **A combination of Centering and Variation**
  - **Inappropriate specification limits**

- **Provides a baseline metric for improvement.**
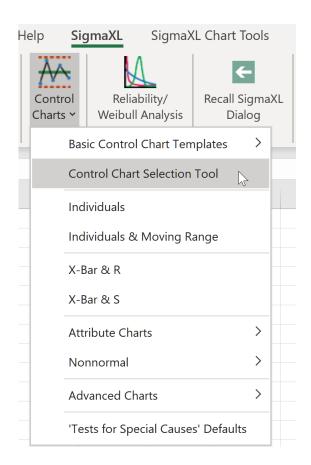
Capability Defined
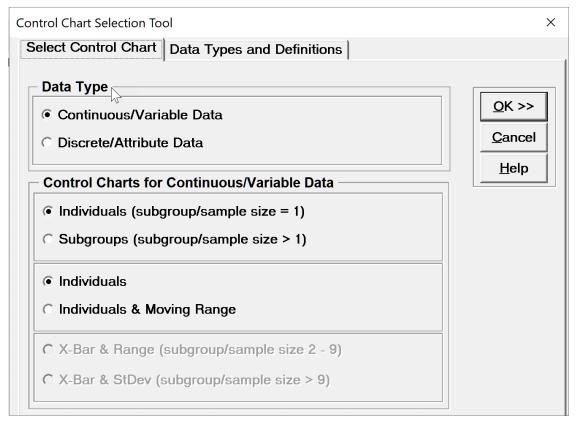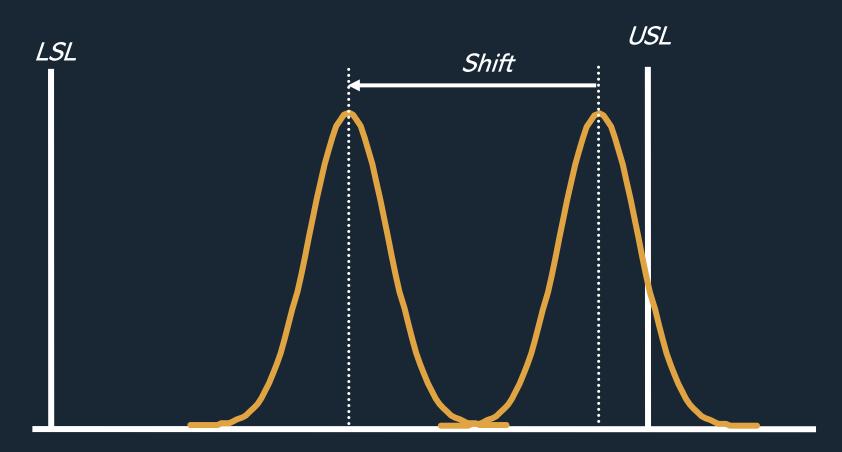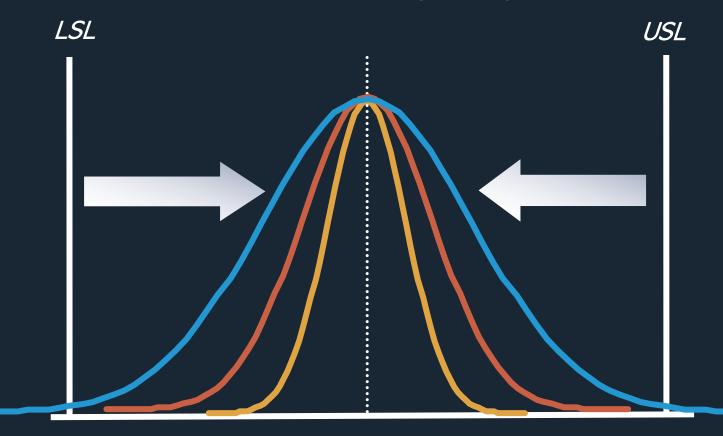
Incapable

LSL   Average   USL

Target

Incapable

LSL   Average   USL

Target

Capable

LSL   Average   USL

Target

Reduce spread

Center process
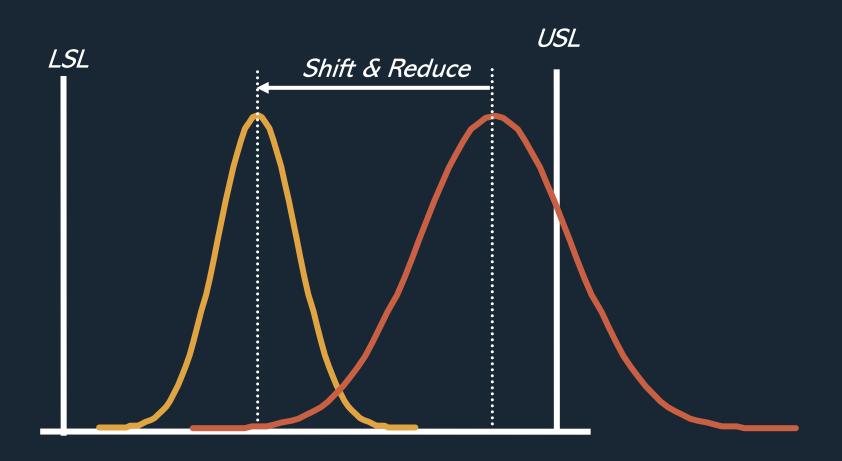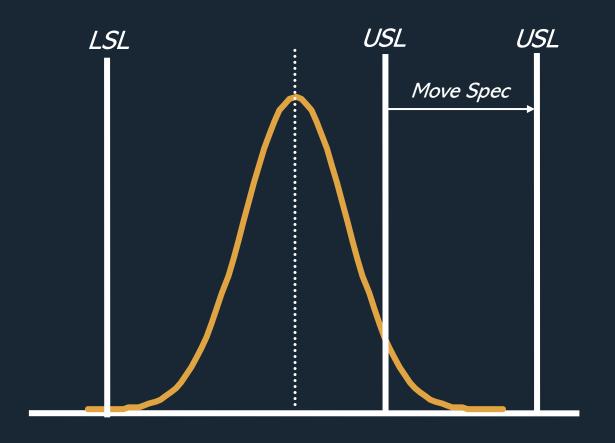
MOVING CUSTOMER SPECIFICATION LIMITS

Customers usually do not go for this option but if they do…it is the easiest way to increase capability !

DEFINE · MEASURE · ANALYZE · IMPROVE · CONTROL

LEAN SOLUTIONS

Remember, the Goal of the Measure Phase was to:

Evaluate the "As-Is" Capability of the Process.

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ANALYZE PHASE

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SOLUTIONS

The Analyze Phase is

The Analyze Phase is for determining the ROOT CAUSE of the problem that we are trying to solve.

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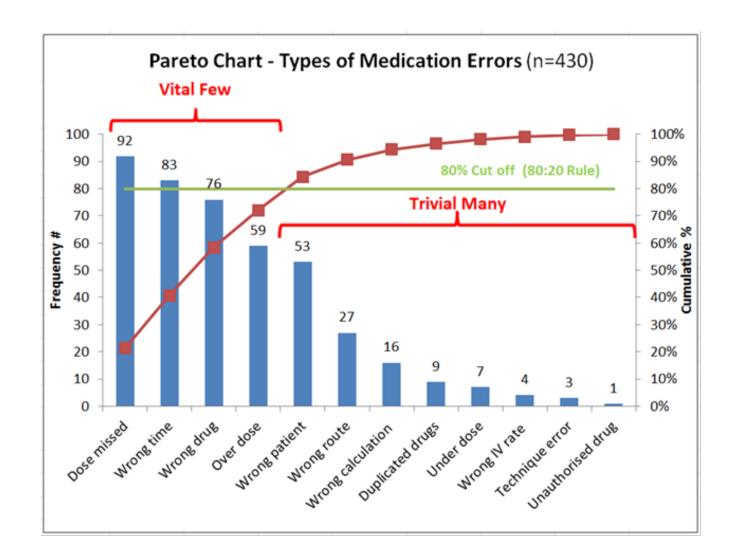
THE PARENTO PRINCIPLE

o The Pareto Principle was first developed in 1906 by Italian economist, Vilfredo Pareto, who observed that 20% of the population owned 80% of the wealth.

   o Also called the 80 : 20 rule.

o Joseph M. Juran adapted Pareto's economic observations to business applications.

o Juran stated that "80% of Defects in Process Outputs are as a result of 20% of the total Defective Process Inputs

LEAN SOLUTIONS

Pareto Chart - Types of Medication Errors (n=430)

PARETO
CHART
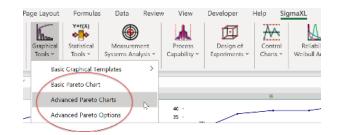
Excel Pareto Chart
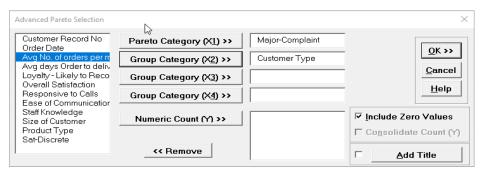
A Pareto Chart is a vertical bar graph in which values are plotted in descending order of frequency from left to right. This classifies problems and defects by type in the order of quantities and illustrates the cumulative percent total as a line graph.
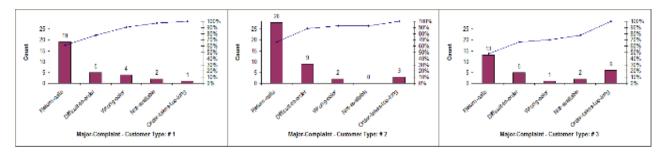
The Pareto principle is also call the 80/20 rule because roughly 80% of the problems come from 20% of the causes.

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SIGMAXL ADVANCED PARETO CHART EXAMPLE

LEAN SOLUTIONS

SIGMAXL

Open SigmaXL on your computer…

○ Open Excel and Click on SigmaXL

○ Go to the 'Help' dropdown and click on sample data (choose 'customer data')

○ Under SigmaXL, hover over Graphical Tools dropdown and click on Basic Pareto Chart

○ Check the box for use entire data set, click next. Place 'major complaint' into pareto category.

○ Finish.

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PERFORMACE MEASURES

Remember...
THE PROBLEM STATEMENT

Must include:
1. What is the problem?
2. When/Where are we seeing the problem?
3. What requirement is affected?
4. Who does it affect?

Should not:
1. Be more than one problem
2. Suggest a solution
3. Make assumptions

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STEP 2

UNDERSTAND NEEDS & REQUIREMENTS

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UNDERSTAND NEEDS & REQUIREMENTS

o Determine customer needs, requirements and expectations.

o Product and process requirements must be understood prior to efforts to improve or change them.

o Understand technical requirements.

o Determine mandatory criteria.

o Assess any potential risk.

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

FMEA (RISK ANALYSIS)

WHY CREATE A FMEA?

Failure Modes and Effects Analysis (FMEA)
is a methodology to manage…

RISK!!!

THE FMEA MATRIX

For a Process FMEA:

#	Process Function (Step)	Potential Failure Modes (process defects)	Potential Failure Effects (Y's)	S E V	Potential Causes of Failure (X's)	O C C	Current Process Controls	D E T	R P N	Recommend Actions	Responsible Person & Target Date	Taken Actions	S E V	O C C	D E T	R P N
1																
2																
3																
4																
5																
6																
7																
8																
9																

RPN = Risk Prioritization Number
SEV = Severity of the Failure
OCC = Probability of Occurrence of the Failure
DET = Difficulty to detect the Failure
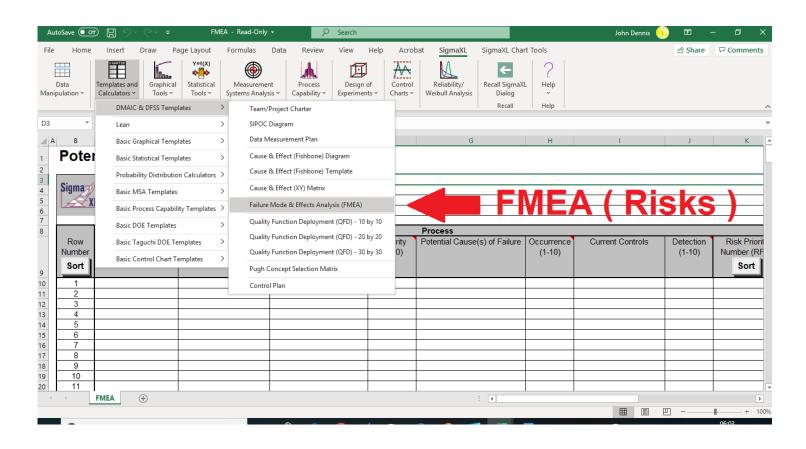
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Calculate RPN for your Business Risk if there was a new Lockdown in next 3 months for Covid19 that lasts more than 3 months ! Compare to RPN risk of a Financial Crash in Stock Market of more than 40% in next 3 months.

STEP 3

USE A TEAM APPROACH

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USING A TEAM APPROACH

Collaborate with cross-functional team members from various levels that have a vested interest in solving the problem.

Philosophy

o Problem-solving efforts should be fact-based
o The person doing the job is the probably the most knowledgeable about it.
o People want to be involved and want to do their jobs well.
o More is accomplished together.
o Greater success comes with a structured approach.
o Are there employees with undiscovered talents.

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LEAN SOLUTIONS

THE MARSHMALLOW CHALLENGE

PETER SKILLMAN

DEFINE MEASURE ANALYZE IMPROVE CONTROL

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THE CHALLENGE

Build the Tallest Free-Standing Structure

20 Sticks of spaghetti + 1 yard tape + 1 yard string + One marshmallow

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THE KIT

LEAN SOLUTIONS

THE RULES

1 Build The Tallest Freestanding Structure

2 The Entire Marshmallow Must Be On Top

3 Use As Much Or Little Of Kit As You Want

4 Break Spaghetti, Cut Yarn As You Wish

5 May Not Hold Structure Up

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

LEAN SOLUTIONS

Was Your Team

SUCCESSFUL

In Building A Free-standing Structure?

WHY OR WHY NOT?

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

LEAN SOLUTIONS

Would you do anything
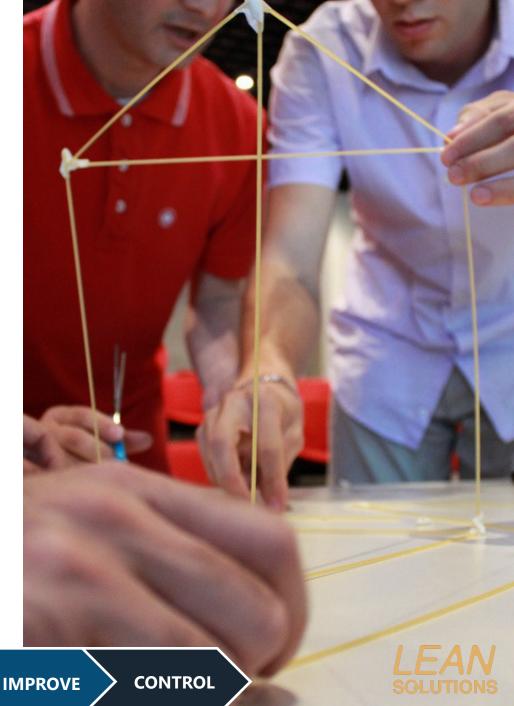
DIFFERENTLY

If you could do it over again?

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Be honest…How well did You work as a

TEAM?

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

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WHO CONSISTENTLY
PERFORMS POORLY?

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RECENT BUSINESS SCHOOL GRADUATES

WHO CONSISTENTLY
PERFORMS WELL?

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

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RECENT KINDERGARTEN SCHOOL GRADUATES
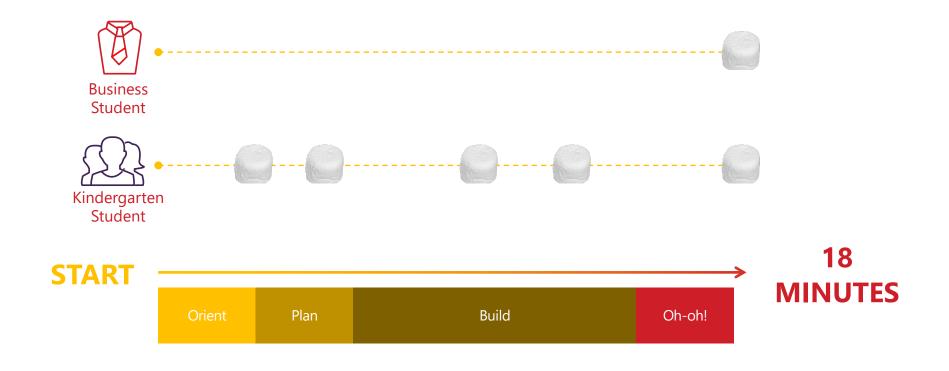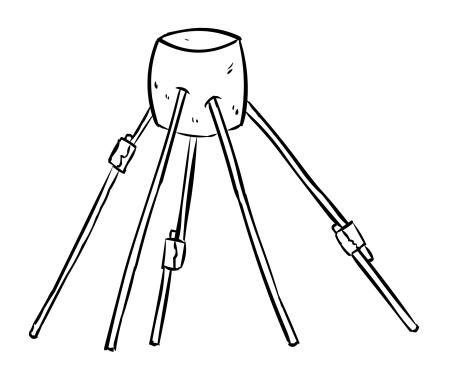
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SIMPLE ACTIVITY, DEEP LESSON

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PROBLEM SOLVING LESSONS

✓ Use a Team Approach – Collaborate Quickly!

✓ Diversified Skills Matter

✓ Use Rapid PDCA Cycles (Prototyping Matters)

✓ Drive out Hidden Assumptions with PDCA Cycles

DEFINE **MEASURE** **ANALYZE** **IMPROVE** **CONTROL**

LEAN SOLUTIONS

PROBLEM SOLVING:
PRODUCT INNOVATION RED CUP CHALLENGE

CONFLICT RESOLUTION:
PAPER RINGS

CREATIVE THINKING:
INFINITE LOOPS

COMMUNICATION:
BACK-TO-BACK

TEAM BUILDING:
PAPER CHALLENGE

DEFINE MEASURE ANALYZE IMPROVE CONTROL

LEAN SOLUTIONS

STEP 4

IDENTIFY POTENTIAL CAUSES

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

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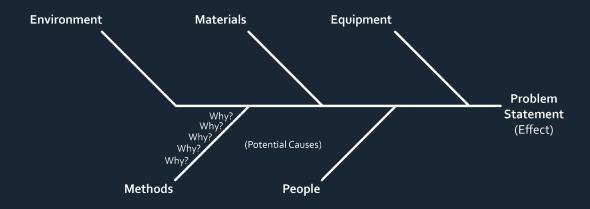
CAUSE & EFFECT DIAGRAM

o Using a Cause & Effect Diagram, consider potential causes in each category.

o Ask "Why?"

o Use branches, stems, and twigs on the diagram to display each response.

LEAN SOLUTIONS
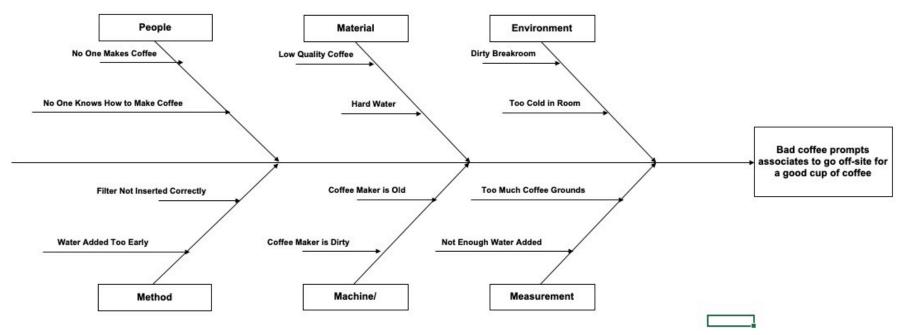
CAUSE & EFFECT (FISHBONE) DIAGRAM

Process/Project Name:	A Better Cup Of Coffee
Date:	xx-xx-xx
Prepared By:	Craig T.
Notes:	Brainstorming Session

People

No One Makes Coffee

No One Knows How to Make Coffee

Filter Not Inserted Correctly

Water Added Too Early

Method

Material

Low Quality Coffee

Hard Water

Coffee Maker is Old

Coffee Maker is Dirty

Machine/

Environment

Dirty Breakroom

Too Cold in Room

Too Much Coffee Grounds

Not Enough Water Added

Measurement

Bad coffee prompts associates to go off-site for a good cup of coffee

Notes:
1. Overwrite the text in the Cause, Sub-Cause and Problem Statement/Effect as appropriate.
2. Use copy and paste to create additional causes or sub-causes.
3. The arrows with text are grouped. To ungroup use Excel's Draw > Ungroup tool.

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DEFINE | **MEASURE** | **ANALYZE** | **IMPROVE** | **CONTROL**

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In the last 4 days, our coffee maker produced 100% of the coffee with a terrible bitter taste, which my wife and I disliked.

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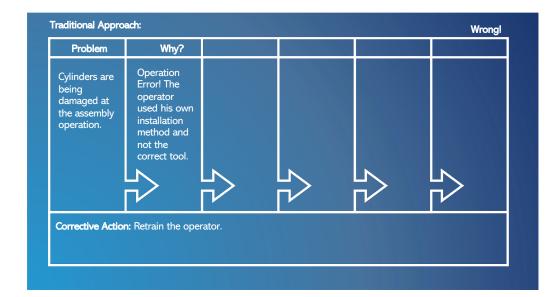
WHERE DO I START

CLUSTERING METHOG + N/3 METHOD

LEAN SOLUTIONS

Traditional Approach: Wrong!

Problem	Why?				
Cylinders are being damaged at the assembly operation.	Operation Error! The operator used his own installation method and not the correct tool.				

Corrective Action: Retrain the operator.
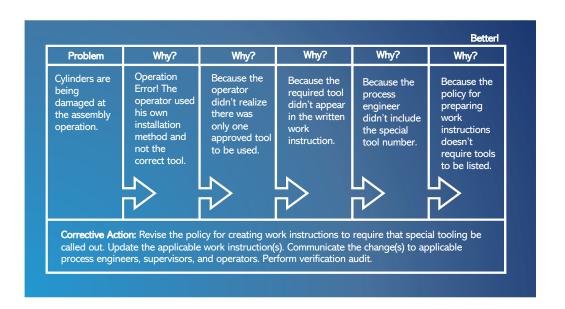
One of the most effective tools in determining root cause is to simply keep asking why something occurs/happened.

The traditional approach usually jumps to a quick conclusion which often results in repeat occurrences of the same or similar kind.

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

5 WHY ANALYSIS

On the other hand, continually asking 'why?' generally gets to the underlying root causes

Better!

Problem	Why?	Why?	Why?	Why?	Why?
Cylinders are being damaged at the assembly operation.	Operation Error! The operator used his own installation method and not the correct tool.	Because the operator didn't realize there was only one approved tool to be used.	Because the required tool didn't appear in the written work instruction.	Because the process engineer didn't include the special tool number.	Because the policy for preparing work instructions doesn't require tools to be listed.

Corrective Action: Revise the policy for creating work instructions to require that special tooling be called out. Update the applicable work instruction(s). Communicate the change(s) to applicable process engineers, supervisors, and operators. Perform verification audit.

DEFINE MEASURE ANALYZE IMPROVE CONTROL

LEAN SOLUTIONS

THEREFORE TEST

After you reach the potential root cause using the "5 why's", check the rationale using the "therefore test" to verify the resulting cause/effect relationship. Does it make sense?

Therefore	Therefore	Therefore	Therefore	Therefore	Issue
Cylinders are being damaged at the assembly operation.	Operation Error! The operator used his own installation method and not the correct tool.	Because the operator didn't realize there was only one approved tool to be used.	Because the required tool didn't appear in the written work instruction.	Because the process engineer didn't include the special tool number.	Because the policy for preparing work instructions doesn't require tools to be listed.

LEAN SOLUTIONS

5-Why Example

Space for additional "5 Why?" Analysis *(optional, continuing from front page section 4.D)*:

Cause Idea: ← Why this?	Cause Idea: ← Why this?	Cause Idea: ← Why this?
Answer → ← Why this?	Answer → ← Why this?	Answer → ← Why this?
Answer → Why this?	Answer → Why this?	Answer → Why this?
Answer → ← Why this?	Answer → ← Why this?	Answer → ← Why this?
Answer → ← Why this?	Answer → ← Why this?	Answer → ← Why this?
Root Cause: ☐ Verified	Root Cause: ☐ Verified	Root Cause: ☐ Verified

Cause Idea: ← Why this?	Cause Idea: ← Why this?	Cause Idea: ← Why this?
Answer → ← Why this?	Answer → ← Why this?	Answer → ← Why this?
Answer → Why this?	Answer → Why this?	Answer → Why this?
Answer → Why this?	Answer → Why this?	Answer → Why this?
Answer → ← Why this?	Answer → ← Why this?	Answer → ← Why this?
Root Cause: ☐ Verified	Root Cause: ☐ Verified	Root Cause: ☐ Verified

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

QUIZ 2:

1. How do you calculate Takt Time?
   - **EFFECTIVE WORKING TIME PER TIME PERIOD / CUSTOMER DEMAND PER TIME PERIOD**

2. What is the difference between special cause and common cause variation?
   - **COMMON CAUSE IS EXPECTED WHILE SPECIAL CAUSE IS UNEXPECTED.**

3. What is the goal of the measurement phase?
   - **EVALUATE THE "AS-IS" CAPABILITY OF THE PROCESS**

HOMEWORK REVIEW

(Open Computers and Log into your Portal)

END OF DAY 1

Lean & Six Sigma Training

Green Belt Certification

brought to you by:

CLASS SCHEDULE

Day 1
DEFINE
- Yellow Belt Class Refresh
- Introduction to DMAIC
- Project Management
    - Charters
    - SIPOC
    - Gantt Charts
- Structured Problem Solving (Steps 1-4)

MEASURE

Day 2
ANALYZE
- Green Belt Project Review
    - Problem Statement
    - Measures of Success
    - Timeline
    - Help Needed?
- Structured Problem Solving (Steps 5-10)
- Value Stream Mapping

IMPROVE
- Facilitating a Kaizen Event
- Impact/Effort Matrix (Affinity Diagram)

Day 3
CONTROL
- Green Belt Project Review
- Strategy Execution
- Hoshin Kanri
- Change Management
- Control and Sustainment

Day 4 (Six Sigma Green Belt Only)
MEASURE
- Six Sigma Statistics
- Measurement Systems Analysis
- Process Capability
- Correlation and Regression
- Introduction to DOE
- Hypothesis Testing

LEAN SOLUTIONS

PROJECT CHECK-IN'S

o What is your Problem Statement?
o What are your measures of success?
o What is your timeline? Milestones?

o Do you have any roadblocks?

o Do you need help with anything?

o What are your next steps?

LEAN SOLUTIONS

REMINDER: ANALYZE PHASE

The Analyze Phase is for determining the ROOT CAUSE of the problem that we are trying to solve and the optimal settings for our input variable (X) to produce the optimal values of our outputs (Y).

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

10 STEP PROBLEM SOLVING METHOD

PLAN the product or process improvement:
1. Describe the problem
2. Understand needs & requirements
3. Use a team approach
4. Identify potential causes
5. Collect & analyze data (to verify root cause)
6. Identify alternatives & select solution
7. Prepare a plan of action
8. Get leadership approval & support

DO the improvement:
9. Implement the solution

CHECK the results:
10. Measure, monitor & control
    your results

ACT on the results: Review and recognition

ACT | PLAN
CHECK | DO

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

STEP 5

COLLECT & ANALYZE DATA

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

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SOLUTIONS

QUALITY TOOLS

- Data Collection & Sampling
- Graphs
- Check Sheets
- Cause & Effect Diagrams
- Pareto Charts
- Histograms
- Control Charts
- Measurement Systems Analysis
- Failure Mode & Effects Analysis

DEFINE MEASURE ANALYZE IMPROVE CONTROL

LEAN SOLUTIONS

MANAGEMENT BY FACT

Carrying out work based on facts, rather than intuition or past experiences

Steps to gathering facts:
1. Observe thoroughly to understand facts (must go and see).
2. Decide which data should be taken.
3. Clarify how you are going to use the collected data.
4. Collect accurate data.
5. Analyze data with basic quality tools.
6. Examine the results to get correct information.
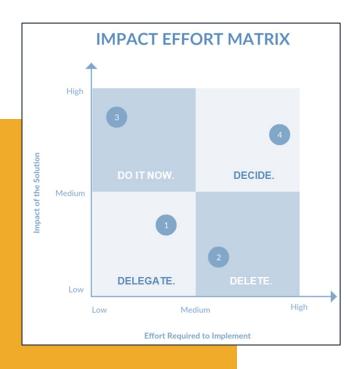
DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

STEP 6

IDENTIFY ALTERNATIVE
& SELECT SOLUTION

LEAN
SOLUTIONS

IMPACT
EFFORT MATRIX

o Brainstorm alternative solutions.

o Ensure that solutions address root causes.

o Impact / Effort matrix

o Perform trials or pilot tests.

o Don't get caught in "paralysis by analysis."

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STEP 7

PREPARE A PROJECT PLAN

LEAN SOLUTIONS

PREPARE A PROJECT PLAN

A Project Plan should answer the following questions:

1. Who?
2. What?
3. When?
4. Where?
5. How?
6. How Much?

Make preparations to present it to the appropriate decision makers:

1. Project management tools
   1. Cost vs Benefits Analysis
   2. Milestone Charts

DEFINE MEASURE ANALYZE IMPROVE CONTROL

LEAN SOLUTIONS

STEP 8

GET LEADERSHIP APPROVAL & SUPPORT

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

LEAN SOLUTIONS

GET GUIDANCE & SUPPORT FROM

LEADER, PROCESS OWNER, CUSTOMER, & OTHER STAKEHOLDERS. AVOID FALSE STARTS!

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

STEP 9

IMPLEMENT SOLUTION

DEFINE MEASURE ANALYZE IMPROVE CONTROL

LEAN SOLUTIONS

IMPLEMENT SOLUTION

o Brief all people involved about the plan so that they have ownership in its success.

o Use a detailed action plan to list the specific tasks required, who's responsible, due dates, expected results, and how effectiveness will be verified.

o Remember that even a great plan will fail if not executed properly.

o Ask the leadership team to help remove roadblocks as needed.

Project Management Tools
1. Milestone Charts (High Level)
2. Task Lists (Detail Level)

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STEP 10

MEASURE, MONITOR & CONTROL

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MONITOR, MEASURE & CONTROL

o Remember that just because you have executed your plan does not mean that the problem is solved.

o You must verify your results and continually or periodically monitor results.

o If performance deteriorates, you must repeat the 10 steps.

Quality Tools

o Graphs

o Histograms

o Control Charts

LEAN SOLUTIONS
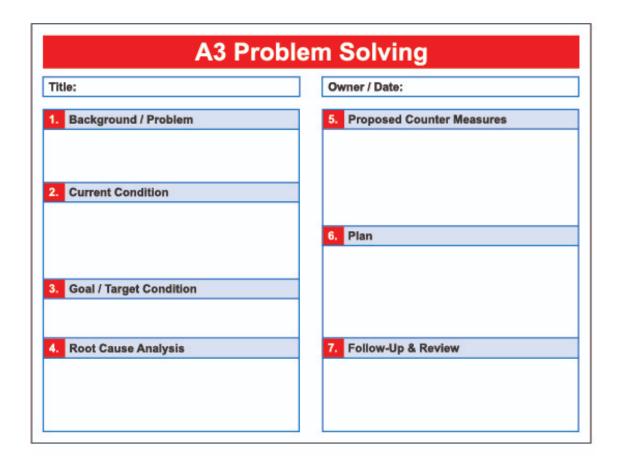
DOCUMENTING ACTIVITIES/RESULTS

Useful forms of documenting problem solving efforts:

o **A3 Report** – Primarily used as an internal communication device amongst team members and management.

o **Corrective Action Report (CAR)** – Primarily used as an external device when required to communicate problem resolution to customers.

o **10-Step One Page Form** – 11x17

LEAN SOLUTIONS

A3 REPORT

A3 REPORT

The A3 Report

To:_____
By:_____
Date:_____

Problem: "What problem are we trying to solve?"

Background
- Background of the problem
- Context required for full understanding
- Business Importance of the problem

Current Condition
- Diagram of current situation (or process).
- Highlight problem(s) with storm bursts.
- What about the system is not IDEAL.
- Extent of the problem(s), i.e., measures.

Cause Analysis
- List problem(s)
- Most likely direct (or root) cause:

  Why? Why? Why? Why? Why?

Target Condition
- Diagram of proposed new process
- Countermeasures noted as fluffy clouds
- Measurable targets (quantity, time)

Implementation Plan

What?	Who?	When?	Where?
Actions to be taken	Responsible person	Times, Dates	

Cost:

Check / Monitor / Control

Plan	Actual Results	
• How will you check the effects? • When will you check them?	• Date check done. • Results, compare to predicted.	

LEAN SOLUTIONS

QUIZ 3:

1. What is the purpose of the MEASURE Phase in DMAIC?
   - TO UNDERSTAND THE CURRENT STATE (AS-IS) OF THE PROCESS THAT CONTAINS THE PROBLEM.

2. Detailed Process Understanding is required in the Measure Phase ? Who are the People to involve to gain a better understanding of the process and problems ?
   - THE PEOPLE WHO WORK ON THE PROCESS. THE WORKERS AT THE GEMBA

3. Another name for an Ishikawa diagram is the _____ diagram.
   - FISH BONE

4. To ask your team '*Why does this happen ?*' more than once in order to understand the Root Cause is called the _____ method.
   - 5 WHYS

5. What is another name for the 80/20 Principle ?
   - PARETO PRINCIPLE

VALUE STREAM MAPPING

DEEPER DIVE!

INTRODUCTION

Definition: All the actions (both value added and non-value added) currently required to bring a product from raw material to customer.

o Shows the "Big Picture".

o Documents the path from customer to supplier and back.

LEAN SOLUTIONS

WHY IS THIS
AN ESSENTIAL TOOL?

o Helps you "see" the flow

o Identify the waste and its source

o Provides a common language

o Decisions about the flow become apparent

o Linkage between information flow and material flow

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

REDUCE
LEAD TIME

o Lead time is measured from the point where flow is initiated or triggered in a process until the product or service reaches the customer

o The aim is to reduce this timeframe by only producing in response to a pull from the customer (or the next process as customer) and eliminating the things that waste time and resources.

o LT reduction is often accomplished by eliminating queue times between processes

ORDER ———————→ **LEAD TIME** ———————→ CASH

"All we're trying to do is shorten the time line..."
Taiichi Ohno

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

CURRENT STATE VS MAP STEPS

o **Step 1:** Identify customer requirements and calculate takt time
- o Our customer is sometimes internal or external
- o Our customer is also the shareholder

o **Step 2:** (DATA BLOCKS) Identify Main Processes In Order
- o Each one will be different and unique to the area you are working with.
- o A data block is created when a person or area passes a product or service to the next step.

DEFINE MEASURE ANALYZE IMPROVE CONTROL

LEAN SOLUTIONS

CURRENT STATE VS MAP STEPS

o **Step 3:** Add arrows for the Flow of Information.

- o Straight arrows

- o Right Angles (NO diagonals)

- o Information flow arrows

o **Step 4:** Walk the Value Stream: Add inventory / delay queues. Note movement and inventory

- o What will be considered the WIP? What is considered inventory?
- o Inventory triangles should be noted between process blocks.
- o Stay customer centric here. A customer doesn't care if you have a price on a line item if they are waiting for a package…

LEAN SOLUTIONS

CURRENT STATE VS MAP STEPS

o **Step 5:** Walk the Value Stream - Populate the Data Boxes with Metrics

  o Identify Key Performance Indicators for the Value Stream.

  o For today => See Data Box

o **Step 6:** Summarize Value Stream Metrics - Calculate Lead Time Ladder

  o Lead time complete = lead time PLUS Inventory

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS
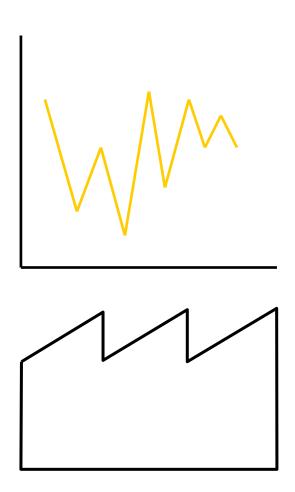
DATA INTEGRITY

There are four scenarios for data collection.

- Data exists

- Data can be gathered through observation of work

- Data can be collected through simulation of activities

- If you cannot observe or simulate the activity you may have to make an <u>educated</u> "estimate"

DEFINE MEASURE ANALYZE IMPROVE CONTROL

LEAN SOLUTIONS

CREATING THE CURRENT STATE VALUE STREAM MAP

Always Start With the Customer

o What capability /service do you provide?

o What are the boundaries of your map?

o What is the demand profile?

LEAN SOLUTIONS

TAKT TIME

$$\text{Takt Time} = \frac{\text{Time Available / Period}}{\text{Customer Demand / Period}}$$

Takt Time – The available production time divided by customer demand.

The first step in Standard Work development is understanding the customer requirements.

- o Defining the "right goods or services", is done in the design and development process.
- o The steps to transform the raw material or data to the customer defined value are captured as the work elements.
- o To provide goods and services "in the right quantity, at the right time", customer demand (takt time) must be understood.

LEAN SOLUTIONS

TAKT TIME EXAMPLE

Takt Time = Demand Rate

    o   Synchronizes pace of processing to match pace of customer need.

$$\text{Takt Time} = \frac{\underline{\text{Effective working time per time period}}}{\text{Customer requirement during the time period}}$$

$$= \frac{\underline{460 \text{ minutes / day}}}{46 \text{ quotes}} = 10 \text{ minutes per quote}$$

Ideally, one quote every 10 minutes must be processed

LEAN SOLUTIONS

Customer

18,400 pcs/mo
- 12,000 "L"
- 6400 "R"

Tray=20 pcs

2 Shifts

1 x
Daily

SHIPPING
Staging

LEAN
SOLUTIONS

Customer

18,400 pcs/mo
- 12,000 "L"
- 6400 "R"

Tray=20 pcs

2 Shifts

1 x
Daily

STAMPING		S.WELD #1		S.WELD#2		ASSEMBLY#1		ASSEMBLY#2		SHIPPING
200 Ton		1 Person		1 Person		1 Person		1 Person		Staging

STAMPING
200 Ton
C/T=1 second
C/O= 1 hour
Uptime=85%
Rework = 50%
27,600 sec.avail
EPE=2 weeks

S.WELD #1
1 Person
C/T=39 seconds
C/O=10 minutes
Uptime=100%
2 Shifts
27,600 sec.avail

S.WELD#2
1 Person
C/T=46 seconds
C/O=10 minutes
Uptime=80%
2 Shifts
27,600 sec.avail

ASSEMBLY#1
1 Person
C/T=62 seconds
C/O=0
Uptime=100%
2 Shifts
27,600 sec.avail

ASSEMBLY#2
1 Person
C/T=40 seconds
C/O=0
Uptime=100%
2 Shifts
27,600 sec.avail

SHIPPING
Staging

LEAN SOLUTIONS

Michigan Steel Co.

500 ft. coils

Customer

18,400 pcs/mo
- 12,000 "L"
- 6400 "R"

Tray=20 pcs

2 Shifts

Tues & Thurs

1 x Daily

Coils
2 days

STAMPING

200 Ton

C/T=1 second
C/O= 1 hour
Uptime=85%
Rework = 50%
27,600 sec.avail
EPE=2 weeks

4600L
2400R

S.WELD #1

1 Person

C/T=39 seconds
C/O=10 minutes
Uptime=100%
2 Shifts
27,600 sec.avail

1100L
600R

S.WELD#2

1 Person

C/T=46 seconds
C/O=10 minutes
Uptime=80%
2 Shifts
27,600 sec.avail

1600L
850R

ASSEMBLY#1

1 Person

C/T=62 seconds
C/O=0
Uptime=100%
2 Shifts
27,600 sec.avail

1200L
640R

ASSEMBLY#2

1 Person

C/T=40 seconds
C/O=0
Uptime=100%
2 Shifts
27,600 sec.avail

2700L
1440R

SHIPPING

Staging

Value Stream Map

Michigan Steel Co. — 500 ft. coils

6-Week Forecast → Production Control / MRP
Weekly Fax

90/60/30 day Forecasts ← Customer
Daily Orders

Customer:
18,400 pcs/mo
- 12,000 "L"
- 6400 "R"
Tray=20 pcs
2 Shifts

Weekly Schedule

Daily Ship Schedule

Tues & Thurs

1 x Daily

STAMPING	S.WELD #1	S.WELD#2	ASSEMBLY#1	ASSEMBLY#2	SHIPPING
200 Ton	1 Person	1 Person	1 Person	1 Person	Staging
C/T=1 second	C/T=39 seconds	C/T=46 seconds	C/T=62 seconds	C/T=40 seconds	
C/O=1 hour	C/O=10 minutes	C/O=10 minutes	C/O=0	C/O=0	
Uptime=85%	Uptime=100%	Uptime=80%	Uptime=100%	Uptime=100%	
Rework = 50%	2 Shifts	2 Shifts	2 Shifts	2 Shifts	
27,600 sec.avail	27,600 sec.avail	27,600 sec.avail	27,600 sec.avail	27,600 sec.avail	
EPE=2 weeks					

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

Michigan Steel Co.

500 ft. coils

6-Week Forecast

Weekly Fax

Production Control

MRP

90/60/30 day Forecasts

Daily Orders

Customer

18,400 pcs/mo
- 12,000 "L"
- 6400 "R"

Tray=20 pcs

2 Shifts

Weekly Schedule

Daily Ship Schedule

Tues & Thurs

1 x Daily

Coils
5 days

STAMPING	S.WELD #1	S.WELD#2	ASSEMBLY#1	ASSEMBLY#2	SHIPPING
200 Ton	1 Person	1 Person	1 Person	1 Person	Staging

STAMPING
C/T=1 second
C/O=1 hour
Uptime=85%
Rework = 50%
27,600 sec.avail
EPE=2 weeks

S.WELD #1
C/T=39 seconds
C/O=10 minutes
Uptime=100%
2 Shifts
27,600 sec.avail

S.WELD#2
C/T=46 seconds
C/O=10 minutes
Uptime=80%
2 Shifts
27,600 sec.avail

ASSEMBLY#1
C/T=62 seconds
C/O=0
Uptime=100%
2 Shifts
27,600 sec.avail

ASSEMBLY#2
C/T=40 seconds
C/O=0
Uptime=100%
2 Shifts
27,600 sec.avail

5 Days		7.6 Days		1.8 Days		2.7 Days		2 Days		4.5 Days
	1 Second		39 Seconds		46 Seconds		62 Seconds		40 Seconds	

Production Lead Time
23.6 Days

Value-Added Time
188 Seconds

CURRENT STATE MAP

Michigan Steel Co.

500 ft. coils

Production Control

MRP

Customer

6-Week Forecast

Weekly Fax

90/60/30 day Forecasts

Daily Orders

18,400 pcs/mo
- 12,000 "L"
- 6400 "R"

Tray=20 pcs

2 Shifts

Weekly Schedule

Daily Ship Schedule

Tues & Thurs

1 x Daily

Coils 5 days

STAMPING		S.WELD #1		S.WELD#2		ASSEMBLY#		ASSEMBLY#2		SHIPPING
200 Ton		1 Person		1 Person		1 Person		1 Person		Staging

STAMPING — 200 Ton
C/T=1 second
C/O= 1 hour
Uptime=85%
Rework = 50%
27,600 sec avai
EPE=2 weeks

4600L 2400 R

S.WELD #1 — 1 Person
C/T=39 seconds
C/O=10 minutes
Uptime=100%
2 Shifts
27,600 sec.avai

1100L 600R

S.WELD#2 — 1 Person
C/T=46 seconds
C/O=10 minutes
Uptime=80%
2 Shifts
27,600 sec.avai

1600L 850R

ASSEMBLY# — 1 Person
C/T=62 seconds
C/O=0
Uptime=100%
2 Shifts
27,600 sec.avai

1200L 640R

ASSEMBLY#2 — 1 Person
C/T=40 seconds
C/O=0
Uptime=100%
2 Shifts
27,600 sec.avai

2700L 1440 R

5 Days		7.6 Days		1.8 Days		2.7 Days		2 Days		4.5 Days
	1 Second		39 Seconds		46 Seconds		62 Seconds		40 Seconds	

Production Lead Time
23.6 Days

Value-Added Time
188 Seconds

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

CURRENT STATE MAP

Michigan Steel Co.

500 ft. coils

Production Control

MRP

Customer

90/60/30 day Forecasts

Daily Orders

18,400 pcs/mo
- 12,000 "L"
- 6400 "R"

Tray=20 pcs

2 Shifts

6-Week Forecast

Weekly Fax

Weekly Schedule

Large Batch Orders

Daily Ship Schedule

Multiple Schedule Points

Tues & Thurs

1 x Daily

Coils 5 days

STAMPING

200 Ton

C/T=1 second
C/O= 1 hour
Uptime=85%
Rework = 50%
27,600 sec avail
EPE=2 weeks

Excessive Rework

4600L 2300R

S.WELD #1

1 Person

C/T=39 seconds
C/O=10 minutes
Uptime=100%
2 Shifts
27,600 sec.avail

1100L 600R

Excessive Downtime

S.WELD#2

1 Person

C/T=46 seconds
C/O=10 minutes
Uptime=80%
2 Shifts
27,600 sec.avail

Imbalanced Processes

ASSEMBLY#1

1 Person

C/T=62 seconds
C/O=0
Uptime=100%
2 Shifts
27,600 sec.avail

Uncontrolled Inventory

ASSEMBLY#2

1 Person

C/T=40 seconds
C/O=0
Uptime=100%
2 Shifts
27,600 sec.avail

2700L 1440R

SHIPPING

Staging

Production Lead Time 23.6 Days

Value-Added Time 188 Seconds

5 Days		7.6 Days		1.8 Day		2.7 Days		2 Days		4.5 Days
	1 Second		39 Seconds		46 Seconds		62 Seconds		40 Seconds	

DEFINE **MEASURE** **ANALYZE** **IMPROVE** **CONTROL**

LEAN SOLUTIONS

VALUE STREAM SYMBOLS

MATERIAL FLOW

Process

Process Shared

Customer/Supplier

Inventory Box

INFORMATION FLOW

Manual info flow

Electric Info Flow

Signal Kanban

Kanban Post

GERNERAL

Kaizen Lightening Burst

Operator

Quality Problem

Safety Stock

DEFINE MEASURE ANALYZE IMPROVE CONTROL

LEAN SOLUTIONS

VALUE STREAM MAP EXAMPLE

VALUE STREAM MAP EXAMPLE

LEAN SOLUTIONS

VALUE STREAM MAP EXAMPLE

LEAN SOLUTIONS

LET'S CREATE ONE TOGETHER!

FACILITATING A KAIZEN EVENT

LEAN SOLUTIONS

WHAT IS
KAIZEN?

○ Kaizen is a Japanese word made up of two distinct characters:

○ Small changes for the better = Continuous Improvement

○ Managing daily improvement (part of Lean Management System)

○ Continuous Improvement Projects

LEAN SOLUTIONS

WHAT IS A
KAIZEN EVENT?

A Kaizen Event (different than Kaizen as a mindset) is a focused team activity with a specific, aggressive breakthrough objective aimed toward solving a well-defined problem.

You can expect to accomplish huge results in a very short time frame (usually 2-5 days).

Plan   Do

改 善

Change   Good

Huge results
In a
Short time
frame

LEAN SOLUTIONS

PRE KAIZEN WORK

KAIZEN SHORT FORM & CHECKLIST

Page 1 of 4:

Kaizen Short Form

KAIZEN INFORMATION

		Kaizen Pre-Work/ Data Collected	Check if Complete
Kaizen Title:			

Kaizen Description:

Kaizen Goals/Objectives:
1)

Kaizen Scope:

Kaizen Sponsor:	
Process Owner(s):	
Team Leader:	
Team Members:	
Kaizen Date(s)/Time:	
Kaizen Report Out Date:	

KAIZEN CHECKLIST

Pre Event Recommendations

- Establish measurable goals/objectives and success criteria for kaizen.
- Gather necessary current state data that quantifies the problem/pain being experienced
- Develop a SIPOC that defines the current state of the process (make sure to highlight opportunities as "starbursts").
- Define full team and ad hoc team members based on SIPOC customers and suppliers.
- Meet with Champions : Request for Resources & Calendar Invites

Event Execution

- Train Kaizen Team and Establish Ground Rules
- Identify Current State Condition calling out rework loops, hidden factories etc.
- Gather data on current state condition such as:
  - Takt time
  - Number of process steps
  - How much time does each step take (value added and non value added)
  - Value added percentage
  - Total lead time etc
- Define Opportunities for Improvement
- Select and Prioritize Improvements
- Create the Future State
- Design Improvements to Achieve the Future State
- Live Test with a Real-Time Process if Feasible
- Modify the Improvement Based on the Test Results and Feedback

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Page 2 of 4:

- Finalize the Improvement
- Gather data on future state condition such as:
  - Takt time
  - Number of process steps
  - How much time does each step take (value added and non value added)
  - Value added percentage
  - Total lead time etc
- Assign Process Ownership
- Define Process for Monitoring Process Performance
- Create the Sustainability Plan
- Complete the Kaizen Report
- Hold Management Presentation
- Schedule weekly status meetings (for a minimum of 4 weeks post – event) to track progress and determine if additional action is required

Post-Event Activity

- Observe Process and Measure Performance. Make real-time adjustments if necessary
- Train the Workforce on the New Process
- Thank Team and Communicate Results Throughout Organization
- Submit and/or Update Formal Documentation if Controlled Processes were Changed

Comments:

KAIZEN MATERIALS LIST

Calculator	Masking/Duct tape
Digital Camera	Stop Watch
Laptop	Blank Time Study forms
Projector and Speakers	Pencils/Pens/Markers/Dry Erase Markers
Training Materials	Erasors
Flip Charts with sticky backing (large 3M Post-Its)	Scissors
Ruler	Butcher Paper
Multi-colored Post-It Notes	Name Tents
Extension Cord	

Page 2 of 4   Rev 08.26.14

LEAN SOLUTIONS

WHAT'S IN A WEEK?

On-Site Kaizen Event Timeline

PLAN — DO — CHECK — ACT

Training Pre-Work	Current & Future Develop Future	Develop Future	Implement Future	Operationalize & Debrief
Executive Kick-Off			**Mock Up & Simulate** ✓PDCA ✓PDCA ✓PDCA	**Update/Create Standard Work** ✓Create documents ✓Develop Training Documents and standards
Welcome ✓ Introductions ✓ Expectations	**Current State Evaluation** ✓ Map Process Cont. ✓ 4 L's ✓ Review Time Study Data/Takt ✓ Determine number of Operators ✓ Identify Opportunities ✓ Problem Solve	**Future State Opportunities** ✓Develop Solutions ✓Implement Solutions	**Test** ✓PDCA ✓PDCA	**Train** ✓Train to Standard Work
Kaizen: Training ✓ Lean Intro ✓ Waste ✓ PDCA ✓ Standard Work		**Mock Up & Simulate** ✓PDCA ✓PDCA ✓PDCA	**Update/Create Standard Work** ✓Create documents ✓Develop Training Documents and standards	**Future State Evaluation** ✓Audit to Standard Work
Current State Documentation ✓ Scope Review ✓ Charter Review ✓ Approvals ✓ Map the Process ✓ Time Studies	Report: Review & Feedback	Report: Review & Feedback	Report: Review & Feedback	Final Report Out
Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**

EXAMPLE

DEFINE MEASURE ANALYZE IMPROVE CONTROL

LEAN SOLUTIONS

WHAT'S IN A WEEK?

Kaizen Event Timeline

DEFINE ——— PLAN ——— EXECUTE ——— CLOSE

Day 1	Day 2	Day 3
Training **Build Process Plans**	**Build Process Plans Continued**	**Build Process Plans Continued** **Present**

Day 1
- **Define Stage Gate: Training**
  - ✓ What is Stage-Gate?
  - ✓ The Stages
  - ✓ The Gates
- **Develop 'Discovery' Process**
  - ✓ Map Process
  - ✓ Develop Std Work
  - ✓ Gate Criteria
- **Develop 'Scoping' Process**
  - ✓ Map Process
  - ✓ Develop Std Work
  - ✓ Gate Criteria

Gate 1: Review & Feedback
- **Revise**

Day 2
- **Develop 'Business Case' Process**
  - ✓ Map Process
  - ✓ Develop Std Work
  - ✓ Gate Criteria
- **Develop 'Development' Process**
  - ✓ Map Process
  - ✓ Develop Std Work
  - ✓ Gate Criteria
- **Develop 'Test/Validation' Process**
  - ✓ Map Process
  - ✓ Develop Std Work
  - ✓ Gate Criteria

Gate 2: Review & Feedback
- **Revise**

Day 3
- **Develop 'Launch' Process**
  - ✓ Map Process
  - ✓ Develop Std Work
  - ✓ Gate Criteria
- **Complete Outstanding Tasks**

Gate 3: Review & Feedback
- **Revise**
- **Wrap-Up & Present Final Stage Gate Process**

DEFINE · MEASURE · ANALYZE · IMPROVE · CONTROL

LEAN SOLUTIONS

WHAT'S IN A WEEK?

Kaizen Event Timeline

PLAN — DO — CHECK — ACT

Training Pre-Work	Current & Future Develop Future	Develop Future	Implement Future	Operationalize & Debrief
Executive Kick-Off **Kaizen: Training** ✓ Motion Kaizen ✓ Waste ✓ PDCA ✓ Standard Work **Current State Documentation** ✓ Scope ✓ Charter ✓ Approvals ✓ Volumes & Schedule ✓ Time Studies ✓ Takt Time	**Current State Evaluation** ✓ Map Process ✓ Review Time Study Data/Takt ✓ Determine Number of Operators ✓ Identify Opportunities ✓ Problem Solve **Future State Opportunities** ✓ Develop Solutions	**Future State Opportunities Cont.** ✓ Develop Solutions **Mock Up & Simulate** ✓ PDCA ✓ PDCA ✓ PDCA	**Mock Up & Simulate** ✓ PDCA ✓ PDCA ✓ PDCA **Test** ✓ PDCA ✓ PDCA **Update/Create Standard Work** ✓ Create documents ✓ Develop Training Documents and standards	**Update/Create Standard Work** ✓ Create documents ✓ Develop Training Documents and standards **Train** ✓ Train to Standard Work **Future State Evaluation** ✓ Audit to Standard Work
	Report: Review & Feedback	Report: Review & Feedback		Final Report Out
Day 1		**Day 2**		**Day 3**

DEFINE MEASURE ANALYZE IMPROVE CONTROL

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METHODS USED
TO SCOPE THE EVENT

- Charter

- SIPOC

- Time Studies

- Videos

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CONTINUOUS IMPROVEMENT EVENT CHARTER

Event Description:
- Stainless Steel Double Operation Fluid End Flow Path

Event Boundaries - Starting point, ending point, any exclusions:
- From Ingot receipt for forging to shipping blocks to customer machine shops
- Target customer Best Flow & FTSI
- All processes in the flow path from forge shop to shipment of blocks in scope

Preliminary Objectives:
- The current fluid end demand is greater than we can supply at current lead times.
- With limited furnace capacity in the forge shop, and lead times extending to 18 weeks, our customers are developing alternative suppliers, limiting our opportunity to grow our volume of this business.

- SMART Targets
- Reduce the double op flow path from 18 weeks to 14 weeks, delivering 54 blocks per week in 5 days per operation.

Customer Requirements (TAKT Time):
Takt Time = (24 hrs*5 days)/(54 blocks/week) = 2hrs 12mins per block
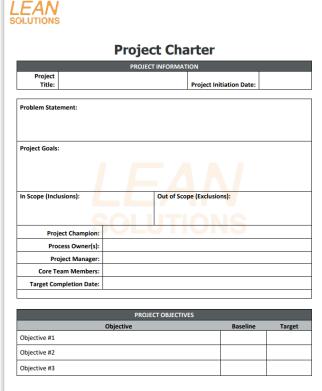
Event Dates:
- 12/5/22 – 12/9/22

Team Area: Shop Conf Room

Sponsor: Dave

Team Leader: Jay
Facilitator:
Team Members:
Jay, Sam, Liz, Rob, Greg, Marcus, James
Resources:
Engineering Team, Maintenance Team, & Production Teams
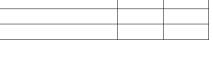
Process Information- Special considerations:
All data collection and process steps, cycle times, and throughput volumes to be collected during event

Current Situation – Problem or issue motivating event:
- Current final completed throughput ranges from 30 – 45 blocks per week. Not consistent, throughput surges up and down weekly
- Coordinating material movement by heat per heat treat load contributes to throughput inconsistency.

Project Charter

PROJECT INFORMATION			
Project Title:		**Project Initiation Date:**	

Problem Statement:

Project Goals:

In Scope (Inclusions):		Out of Scope (Exclusions):	

Project Champion:	
Process Owner(s):	
Project Manager:	
Core Team Members:	
Target Completion Date:	

PROJECT OBJECTIVES		
Objective	Baseline	Target
Objective #1		
Objective #2		
Objective #3		

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KAIZEN TOOLS

Kaizen Pre-Event Planning

Goals/Objectives

Examples:
Weak Goals: Map future state, improve current state, improve data, and reduce cost
Strong Goals: Reduce labor time by X%, reduce data/document errors by X%, reduce lead time by X%, improve product quality by X%, reduce lead time by X%, and reduce cost by X%.

Current State Data

Data should be quantifiable and depict the pain being felt. There should be a clear correlation between the data gathered and the kaizen goals. This data should be used as a gauge to test the effectiveness of the improvements made during the kaizen.

Process/Project Name:

Date:

SIPOC WORKSHEET

LEAN SOLUTIONS — brought to you by: PATRICK ADAMS

Prepared By:

Notes:

SUPPLIERS	INPUTS	PROCESSES	OUTPUTS	CUSTOMERS
Who supplies the process inputs?	What inputs are required?	What are the major steps in the process?	What are the process outputs?	Who receives the outputs?

DEFINE MEASURE ANALYZE IMPROVE CONTROL

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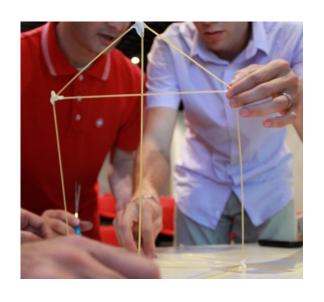
TRAIN ON LEAN & SIX SIGMA TOOLS

MARSHMALLOW CHALLENGE
BE HONEST, HOW WELL DID YOU WORK AS A TEAM?

The Challenge

Build the Tallest Free-Standing Structure

20 Sticks of spaghetti + 1 yard tape + 1 yard string + One marshmallow

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

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BALL TOSS

DEFINE | MEASURE | ANALYZE | IMPROVE | **CONTROL**

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METHODS USED
TO OBSERVE & GATHER DATA

- Time Studies

- Process Mapping or Flow Chart, Value Stream Mapping, Current State

- Gemba Walks, The 8 Wastes and Waste Walks

- Videos

DEFINE MEASURE ANALYZE IMPROVE CONTROL

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TIME
STUDIES

o Establishes a Baseline
o Measure's Improvements
o Internal/External Customers
o Break Down Each Component

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TIME OBSERVATION FORM

| Process Observed | Writing on Flipchart |
| Product/Service | CP-550-0382 |
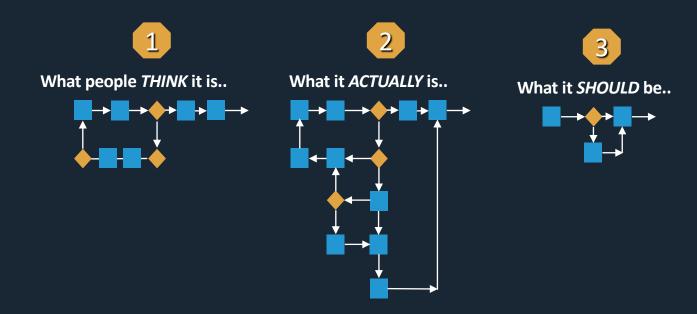
Observation Date/Time: March 14, 20YY/9:00:00 AM
Observer(s): Hank Ford

Page 1 of 1

No.	Component Task		1	2	3	4	5	6	7	8	9	10	Lowest Repeatable Component Task Time	Machine Cycle Time	Points Observed
1	Get up from chair	Cumulative	0:03	0:31	0:59	1:32	1:57	2:25	3:01	3:26			2		
		Task Time	3	2	2	2	2	3	2	2					
2	Walk to flipchart	Cumulative	0:09	0:38	1:04	1:37	2:03	2:31	3:06	3:32			5		
		Task Time	6	7	5	5	6	6	5	6					
3	Pick up marker	Cumulative	0:11	0:43	1:07	1:39	2:06	2:34	3:08	3:34			2		(cycle #2) dropped marker
		Task Time	2	5	3	2	3	3	2	2					
4	Write on flipchart	Cumulative	0:18	0:49	1:20	1:46	2:12	2:41	3:14	3:41			7		(3) made mistake, had to rewrite
		Task Time	7	6	13	7	6	7	6	7					
5	Put down marker	Cumulative	0:21	0:51	1:23	1:48	2:15	2:44	3:16	3:44			2		
		Task Time	3	2	3	2	3	3	2	3					
6	Walk back to chair	Cumulative	0:27	0:54	1:28	1:53	2:20	2:56	3:21	3:50			5		(2) sprinted back to chair, (6) stop and talked to team member
		Task Time	6	3	5	5	5	12	5	6					
7	Sit down in chair	Cumulative	0:29	0:57	1:30	1:55	2:22	2:59	3:24	3:52			2		
		Task Time	2	3	2	2	2	3	3	2					
		Cumulative													
		Task Time													

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PROCESS MAPPING

There are usually three views of a process:

1 — What people *THINK* it is..

2 — What it *ACTUALLY* is..

3 — What it *SHOULD* be..
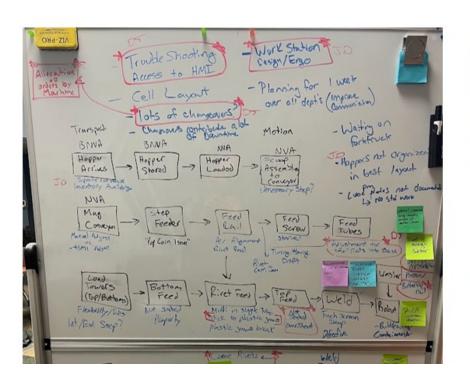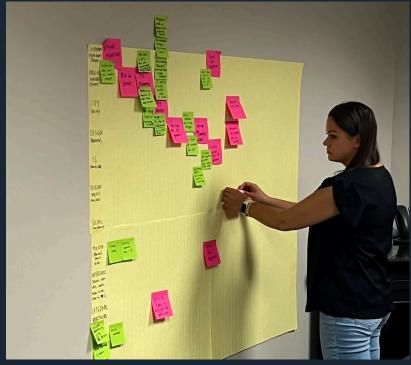
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METHODS USED
TO GATHER IDEAS & SUGGESTIONS

- Brainstorming

- Post-It Notes

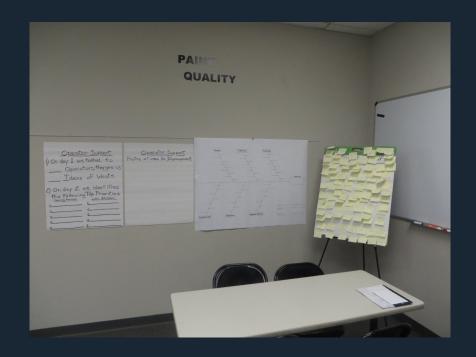- Fishbone, Cause and Effect, or Ishikawa Diagram

- 5 Whys

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TRADITIONAL KAIZEN

One Week Commitment

Lots Of Prep Work

Lots Of Ideas & Actions

METHODS USED
TO ANALYZE THE DATA

- Clustering, N/3

- Impact Effort Matrix

- A-3, Corrective Action Report (CAR), 10-Step Prob Solve

- Auditing Standard Work

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CLUSTERING
THE DATA & N/3

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IMPACT EFFORT MATRIX
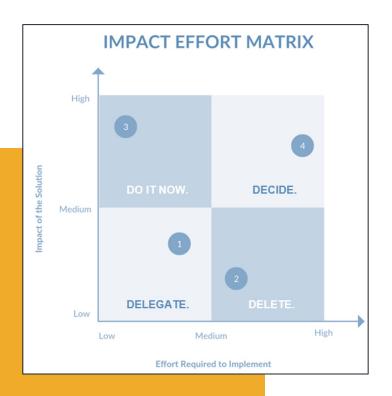
IMPACT
EFFORT MATRIX

- Brainstorm alternative solutions.
- Ensure that solutions address root causes.
- Impact / Effort matrix
- Perform trials or pilot tests.
- Don't get caught in "paralysis by analysis."

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METHODS USED
TO IMPLEMENT CHANGES

- Project Plan
- Brief Everyone
- Action Plan (Detail Level)
- Milestone Charts (High Level)

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PREPARE A PROJECT PLAN

A Project Plan should answer the following questions:
1. Who?
2. What?
3. When?
4. Where?
5. How?
6. How Much?

Make preparations to present it to the appropriate decision makers:
1. Project management tools
   1. Cost vs Benefits Analysis
   2. Milestone Charts

LEAN SOLUTIONS

IMPLEMENT SOLUTION

o Brief all people involved about the plan so that they have ownership in its success.

o Use a detailed action plan to list the specific tasks required, who's responsible, due dates, expected results, and how effectiveness will be verified.

o Remember that even a great plan will fail if not executed properly.

o Ask the leadership team to help remove roadblocks as needed.

Project Management Tools
1. Milestone Charts (High Level)
2. Task Lists (Detail Level)

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DIFFERENT TYPES
OF KAIZENS

- 5 Hour Kaizen
- Rapid Improvement Event
- Two Second Kaizen
- Virtual Kaizen

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TAKE IT TO THE GEMBA
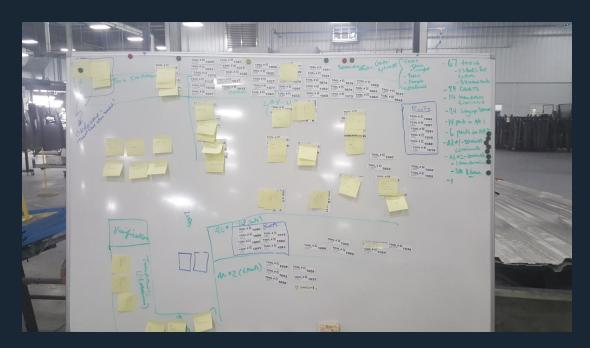
TAKIN IT TO THE ~~STREETS~~ OR GEMBA

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

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AUTO CLAVE QUICK KAIZEN

DEPLOYMENT CHAMPION - SUPERVISOR

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METHODS USED
FOR A VIRTUAL KAIZEN

- Virtual Facilitation Dos & Don'ts
- Virtual vs. In-Person Facilitation
- Engagement Tools & Techniques
- Virtual Simulation Experience

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RULES & EXPECTATION
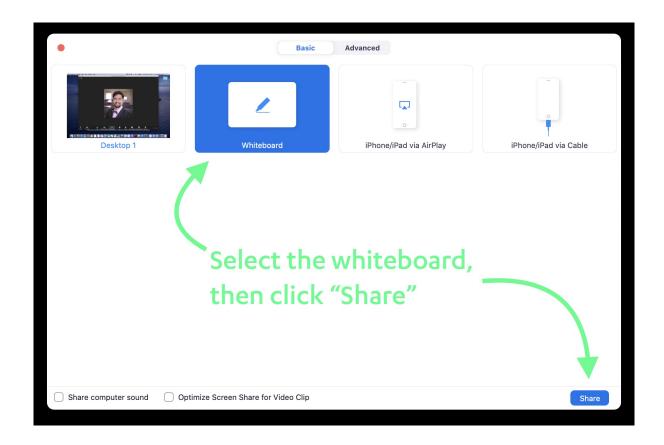
VIRTUAL DO'S & DON'T'S

DEFINE — MEASURE — ANALYZE — IMPROVE — CONTROL

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Select the whiteboard, then click "Share"

LIGHTING & BACKGROUND

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FUN INTERACTIVE ICEBREAKERS

o Creative Costumes

o Create a Team Name – T-Shirts

o How are you today?

o Two Truths and a Lie

o Fun Videos

© isinstoe_agency Instagram

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Step 1

Step 2

Step 3

Step 4

EXHAUSTED	CONFUSED	ECSTATIC	GUILTY	SUSPICIOUS
ANGRY	HYSTERICAL	FRUSTRATED	SAD	CONFIDENT
EMBARRASSED	HAPPY	MISCHIEVOUS	DISGUSTED	FRIGHTENED
ENRAGED	ASHAMED	CAUTIOUS	SMUG	DEPRESSED
OVERWHELMED	HOPEFUL	LONELY	LOVESTRUCK	JEALOUS

DEFINE   **MEASURE**   **ANALYZE**   **IMPROVE**   **CONTROL**

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Virtual Kaizen Event Timeline

PLAN	DO	CHECK		ACT
Training **Pre-Work**	**Current & Future** **Develop Future**	**Develop Future**	**Implement Future**	**Operationalize & Debrief**
Kaizen: Training ✓ Icebreaker (Menti) ✓ Lean Intro & Waste (Toast Video) - **10 Minute Break** - ✓ PDCA ✓ Standard Work ✓ Other Related Training - **10 Minute Break** - **Current State Documentation Review** ✓ Review Scope ✓ Review Kaizen Short Form ✓ Review Pre-Work ✓ Review SIPOC	**Current State Evaluation** ✓ Map Process (Creately or Google Docs) - **10 Minute Break** - ✓ Review Time Study Data/Takt ✓ Determine Number of Operators ✓ Identify Opportunities (Menti) - **10 Minute Break** - ✓ Problem Solving (Mura, Breakouts)	**Future State Opportunities** ✓Develop Solutions (Mural, Menti, Muro) - **10 Minute Break** - **Mock Up & Simulate** Note: May not be possible virtually. ✓PDCA ✓PDCA ✓PDCA	**Mock Up & Simulate** ✓PDCA ✓PDCA ✓PDCA **Test** ✓PDCA ✓PDCA **Update/Create Standard Work** ✓Create documents ✓Develop Training Documents and standards (Breakouts, Trello, Teams, Docs)	**Update/Create Standard Work** ✓Create documents ✓Develop Training Documents and standards **Future State Evaluation** If Possible Virtually: ✓Audit to Standard Work Final Report Out
3 Hours	**3-4 Hours**	**3-4 Hours**	**3-4 Hours**	**3 Hours**
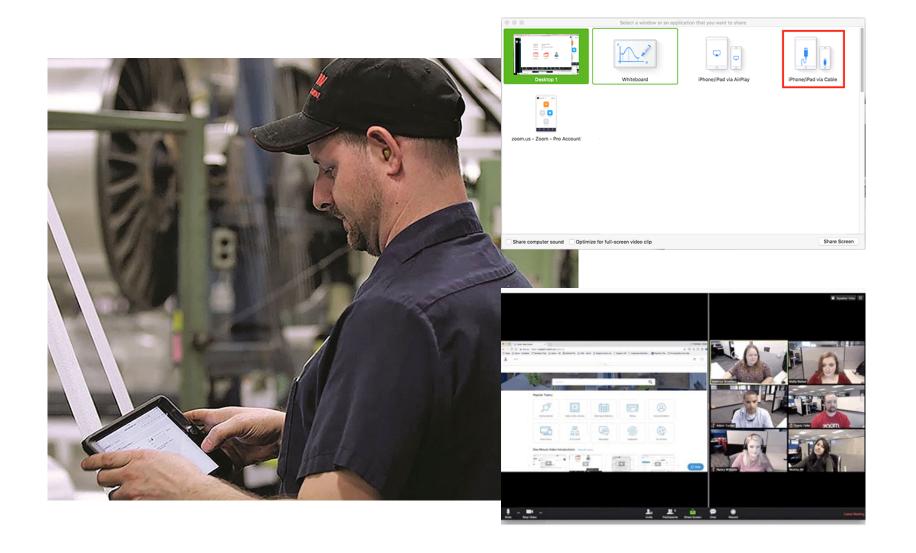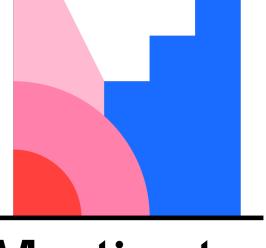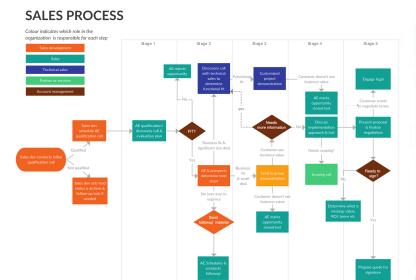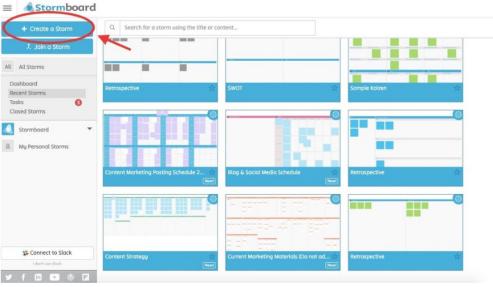
DEFINE MEASURE ANALYZE IMPROVE CONTROL

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GEMBA

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DEFINE MEASURE ANALYZE IMPROVE CONTROL

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SALES PROCESS

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

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LEAN
SOLUTIONS
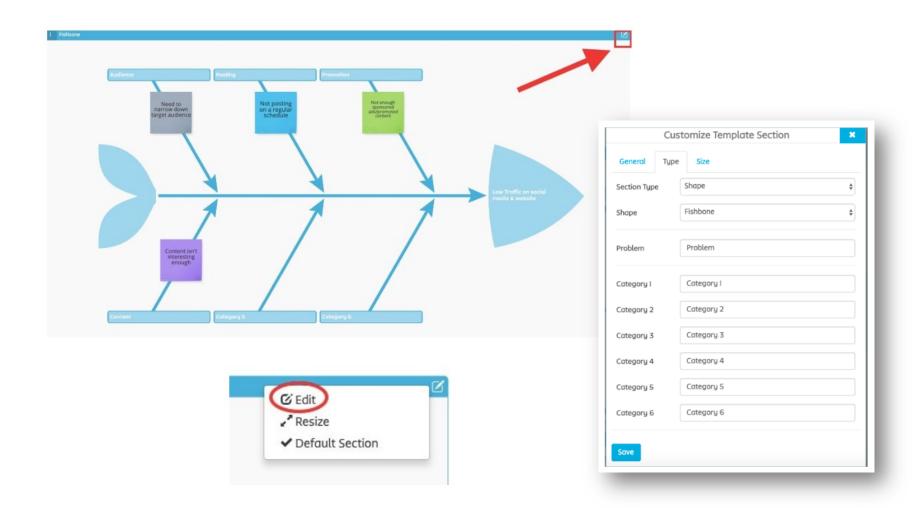
Affinity:
Electronic Sticky Notes

Multi Voting:
Using Chat and Emoji Icons

Impact Matrix:
In Excel Format with Sticky Notes

Step 1: Collected Ideas Using Electronic Sticky Notes

Step 2: Used Affinity to Organize

Step 3: Enter sticky notes from Affinity exercise into Chat function (MS Teams). Created Voting Rules. Silently voted using emojis located in chat function.

Voting Rules:
- Wait until all notes from Affinity have been typed into chat before voting.
- Only 4 Votes per person (Heart = All 4 Votes, Thumbs up = 3 Votes, etc.)
- Honor System
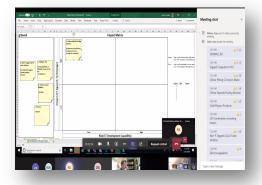
3 4 2 1
👍 ❤️ 😂 😮 😠

Chatting Margin in MS Teams

Step 4: Tallied up cotes in excel and selected top 15.

Step 5: Use Impact / Effort Matrix to funnel down best ideas to move forward with.

Virtual Kaizen Coach
2.08K subscribers
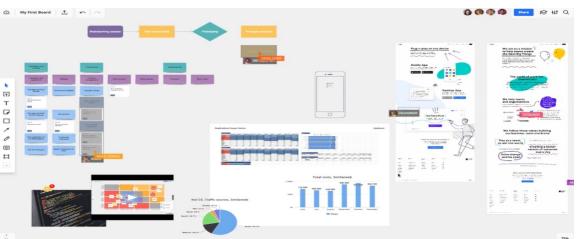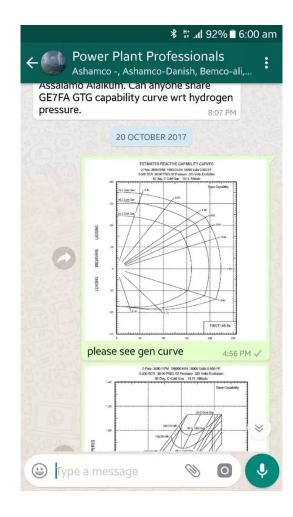
Chad Burroughs | MBA |CLSSBB
Virtual Kaizen Coach

| DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL |

LEAN SOLUTIONS

METHODS USED
TO MEASURE THE OUTCOME

- Be Consistent, Don't Fall Back To The Old Ways

- Be Visible

- Measure Team Satisfaction

- Follow Up With Team Concerns

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

LEAN SOLUTIONS

MONITOR, MEASURE & CONTROL

o Remember that just because you have executed your plan does not mean that the problem is solved.

o You must verify your results and continually or periodically monitor results.

o If performance deteriorates, you must repeat the process.

Quality Tools

o Graphs
o Histograms
o Control Charts

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

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METHODS USED
TO SUSTAIN THE GAINS

- Auditing The New Standard

- Add Monitoring To Your Leader Standard Work

- Visual Management Controls

- Schedule Next Kaizen Event

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QUIZ 4:

1. How do you calculate Takt Time?
   - **Effective working time per time period / Customer demand per time period**

2. What is the difference between special cause and common cause variation?
   - **Common cause is expected while Special cause is unexpected.**

3. What is the goal of the measurement phase?
   - **Evaluate the "As-Is" capability of the process**

HOMEWORK REVIEW

(Open Computers and Log into your Portal)

END OF DAY 2

LEAN SOLUTIONS ACADEMY

Lean & Six Sigma Training

Green Belt Certification

brought to you by:

PATRICK ADAMS CONSULTING

CLASS SCHEDULE

DEFINE

Day 1
- Yellow Belt Class Refresh
- Introduction to DMAIC
- Project Management
    - Charters
    - SIPOC
    - Gantt Charts
- Structured Problem Solving (Steps 1-4)

MEASURE

ANALYZE

IMPROVE

Day 2
- Green Belt Project Review
    - Problem Statement
    - Measures of Success
    - Timeline
    - Help Needed?
- Structured Problem Solving (Steps 5-10)
- Value Stream Mapping
- Facilitating a Kaizen Event
- Impact/Effort Matrix (Affinity Diagram)

CONTROL

Day 3
- Green Belt Project Review
- Strategy Execution
- Hoshin Kanri
- Change Management
- Control and Sustainment

MEASURE

Day 4 (Six Sigma Green Belt Only)
- Six Sigma Statistics
- Measurement Systems Analysis
- Process Capability
- Correlation and Regression
- Introduction to DOE
- Hypothesis Testing

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PROJECT CHECK-IN'S

o What is your Problem Statement?
o What are your measures of success?
o What is your timeline? Milestones?
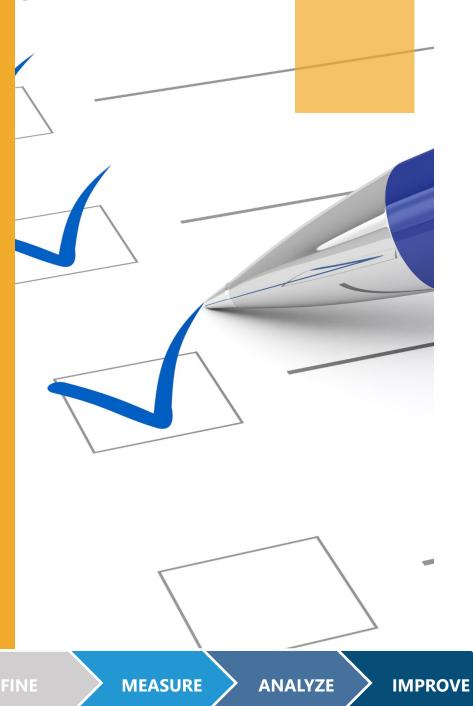
o Do you have any roadblocks? Do you need help with anything?

o What are your next steps?

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Process Improvement

+

Culture Improvement

+

Leadership Improvement

LEAN SOLUTIONS

STRATEGIC
OBJECTIVES
HOSHIN
KANRI

&

HOSHIN

Policy, Principle, Direction

KANRI

Supervision, Administration, Management

Classic Book: Akao, Y. (Ed.) (1991). *Hoshin Kanri: Policy Deployment for Successful TQM*. Productivity Press, Cambridge, MA.

DEFINE MEASURE ANALYZE IMPROVE CONTROL

LEAN SOLUTIONS

"*Hoshin Kanri* is a systematic annual process led by senior executives—and preceded by Strategic Management activities—for developing, deploying, and accomplishing policies (objectives + strategies) through coordinated organization-wide activities and the rigorous application of the PDCA cycle."

Paper: "*The Application of Policy Deployment in Indian Companies*" by Liedtke
Go to . . . www.strategicimprovementsystems.com and click on "RESEARCH"

DEFINE MEASURE ANALYZE IMPROVE CONTROL

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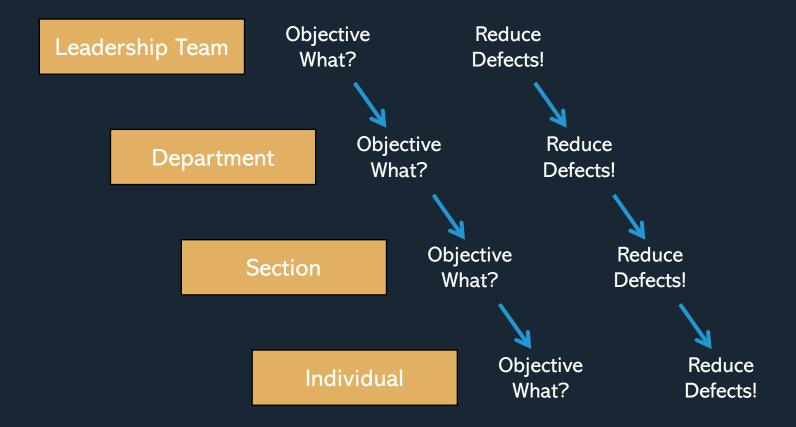
The 7-Step Hoshin Planning Cycle

1. Establish Organizational Vision

2. Develop 3-5 Year Strategic Plan

3. Develop Annual Objectives

4. Deploy to Depts

5. Implementation

6. Regular Reviews

7. Annual Review

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

HOSHIN PLANNING MATRIX (X-MATRIX)

Top-Level Improvement Priorities (rows, top section):
- Pilot culturally diverse idea incubators that drive ideation and disruption
- Increase customer engagement in product design
- Reduce customer complaints
- Increase customer loyalty
- Deploy Performance Excellence improvement methodologies
- Increase overall market share in SW territory
- Increase number of new interactive packing customer accounts
- Develop new distribution channels for new digital packaging

Annual Objectives (left columns):
- Achieve 25% market share of the new digital packaging service
- Develop at least 10 new products with a vitality index above 65%
- Grow total revenue by $75 million
- Reduce all process waste by 40% using sustainable improvement methodologies

Target to Improve (right columns):
- Increase active distribution channels by 6
- Achieve 20% of incremental revenue growth from new customer accounts
- Increase market share in the SW region by 15%
- Implement Performance Excellence in all 8 business units
- Reduce customer complaint calls by 50%
- Reduce PD Team turnover by 25%
- Increase customer second product conversions by 25%
- Increase number of customers with contracts longer than 5 years to 40%
- Establish three successful incubators
- Increase the number of ideas going into stage 2 (Feasibility) by 50%

3-5 Year Breakthrough Objectives (bottom rows):
- Achieve world-class quality production as certified by Malcolm Baldrige standards by the end of 2017
- Create an empowered culture of collaboration resulting in a 200% increase in new products launched by the end of 2018
- Achieve 50% market share of the new digital packaging service by the end of 2018
- Grow total revenue by $250 million with an EBITDA of 18% by the end of 2019

RESOURCES:
- Fred Burtelson (Chief Innovation Officer)
- Jim Gruber (VP of Quality)
- Dave Nies (VP of Marketing)
- Mark Miller (VP of Sales)
- Nancy Beckley (VP of Accounts)

- ● Primary Responsibility
- ○ Secondary Responsibility

Jack Speers (CEO)

DEFINE · MEASURE · ANALYZE · IMPROVE · CONTROL

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What is Culture?

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Different Business = Different Leadership System

WHAT DOES
A GOOD LEADER DO?

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WE HAVE
A PROBLEM…

- o 50% of people who leave their jobs do so to get away from bad leaders
- o 70% of employees are not engaged at work
- o A study of over 2,000 managers found that 51% are not engaged and 14% are actively disengaged.

Gallup Study: Amy Adkins

DEFINE MEASURE ANALYZE IMPROVE CONTROL

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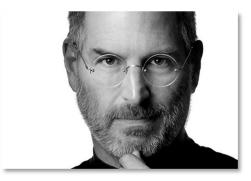
Defining Lean Leadership

LEAN SOLUTIONS

WHAT IS
LEADERSHIP?

Leadership is the art of motivating a group of people to act towards achieving a common goal.

LEADERSHIP
VS MANAGEMENT

Leadership is not management. Leadership should compliment management, not replace it.

Management	Leadership
Planning and Budgeting	Direction Setting
Organizing and Staffing	Aligning constituencies
Controlling and problem –solving	Motivating and Inspiring

DEFINE **MEASURE** **ANALYZE** **IMPROVE** **CONTROL**

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Traditional Leadership
- Leader plans
- Staff meets goals set by leader
- Leader produces metrics and feeds back when not met
- Rigid enforcement of rules and regulations
- Information controller
- Sole problem solver
- Technical expert
- Assignor of work
- Performance appraiser

Lean Leadership
- Direction setter
- Ensures team goals support vision
- Monitors and audits team's metrics
- Sets expectations
- Information conduit
- Facilitates 'root cause' analysis
- Technical resource
- Provider of forward workloads
- Appraises team performance to team goals

WHAT IS

LEAN LEADERSHIP?

Lean Leaders embrace and champion continuous improvement throughout their organization.

DEFINE MEASURE ANALYZE IMPROVE CONTROL

LEAN SOLUTIONS

5 LEAN
LEADERSHIP ACTIONS

1. Leaders must be Teachers
2. Build Tension, Not stress
3. Eliminate Fear and Comfort
4. Lead through visible participation, not proclamation
5. Build Lean into Personal Practices

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THE HEART OF A SERVANT

What is Servant Leadership?

Hard-to-Learn Characteristics
o Calling, Empathy, Healing, Stewardship

Learnable Skills
o Listening, Awareness, Persuasion, Foresight, Growth, Team Building

DEFINE MEASURE ANALYZE IMPROVE CONTROL

LEAN SOLUTIONS

7 CHARACTERISTICS OF
SUCCESSFUL COMPANY CULTURE

1. A purpose-driven company culture
2. Effective communication patterns
3. A culture of feedback
4. Embracing diversity
5. Teamwork
6. Engagement and loyalty
7. Growth and development

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

7 CHARACTERISTICS OF
SUCCESSFUL COMPANY CULTURE

1. A purpose-driven company culture

o Shift resources to achieve goals

o Inspiration driver for engagement

o Drive performance

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

LEAN SOLUTIONS

7 CHARACTERISTICS OF

SUCCESSFUL COMPANY CULTURE

2. Effective communication patterns

o Clarity

o Courtesy

o Proactivity

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7 CHARACTERISTICS OF
SUCCESSFUL COMPANY CULTURE

3. A culture of feedback

o Receptive to give and receive

o Internal and external

o Any aspect of organizational life

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

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SUCCESSFUL COMPANY CULTURE

4. Embracing diversity

o Tolerance and acceptance of others

o Aware about difference

o Evaluate impact of differences

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7 CHARACTERISTICS OF

SUCCESSFUL COMPANY CULTURE

5. Teamwork

o Mutual understanding

o Focus on team accomplishment

o Fast, better and more efficient

DEFINE MEASURE ANALYZE IMPROVE CONTROL

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7 CHARACTERISTICS OF

SUCCESSFUL COMPANY CULTURE

6. Engagement and loyalty

o Psychological meaningfulness
o Psychological safety
o Availability

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7 CHARACTERISTICS OF
SUCCESSFUL COMPANY CULTURE

7. Growth and development
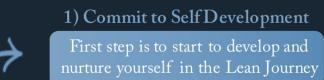
- Position-based growth
- Professional growth
- Financial growth

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LEADERSHIP
REQUIREMENTS

o The majority of people, if given leadership, respect, opportunities for satisfaction and worthwhile goals, will attempt to excel.

o As leaders, we need to have a set of beliefs, expectations, and direction, that focuses everyone in the organization on critical objectives in an effective manner.

DEFINE MEASURE ANALYZE IMPROVE CONTROL

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CHANGE
MANAGEMENT

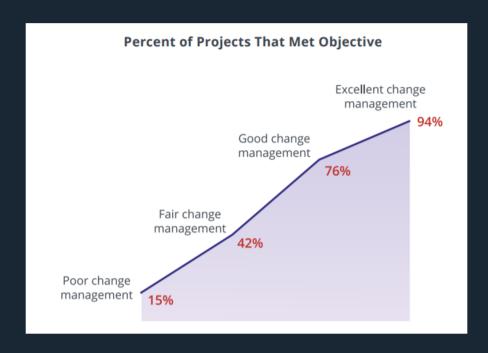LEAN SOLUTIONS

What is Change Management?

INTRODUCTION
TO CHANGE MANAGEMENT

o   Change Management is discipline that guides how we prepare, equip and support individuals to successfully adopt change in order to drive organizational success and outcomes

o   Change management is proactively managing the people side of change, to achieve the desired business results

o   Research shows that Change Management is the #1 success factor for any initiative

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

JUST HOW IMPORTANT
IS CHANGE MANAGEMENT TO YOUR PROJECTS?

Percent of Projects That Met Objective

- Poor change management — 15%
- Fair change management — 42%
- Good change management — 76%
- Excellent change management — 94%

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EFFECTIVE
CHANGE MANAGEMENT

- **Effectiveness = Quality of Change x Acceptance by your Stakeholders**

- If you have a Change with Quality at 90% and only 10% on Acceptance, then your EFFECTIVENESS = 9%

- Good acceptance of your change drives high effectiveness in Change Management

Q x A = E

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MANAGING THE CHANGE

Change Management is helping people become...

READY: Ensuring that people know what will happen, when it will happen, and how it will happen

WILLING: Gaining buy-in or at least acceptance of the change

ABLE: Providing the information and tools necessary for people to be successful in the new work environment
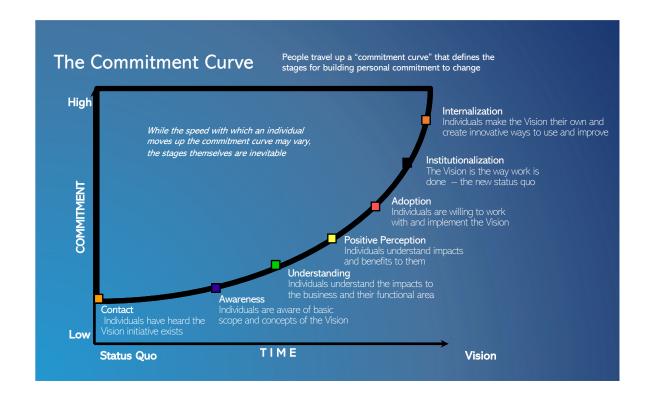
DEFINE MEASURE ANALYZE IMPROVE CONTROL

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UNDERSTANDING
THE CHANGE

The Commitment Curve

People travel up a "commitment curve" that defines the stages for building personal commitment to change

High

While the speed with which an individual moves up the commitment curve may vary, the stages themselves are inevitable

COMMITMENT

Internalization
Individuals make the Vision their own and create innovative ways to use and improve

Institutionalization
The Vision is the way work is done -- the new status quo

Adoption
Individuals are willing to work with and implement the Vision

Positive Perception
Individuals understand impacts and benefits to them

Understanding
Individuals understand the impacts to the business and their functional area

Awareness
Individuals are aware of basic scope and concepts of the Vision

Contact
Individuals have heard the Vision initiative exists

Low

Status Quo

T I M E

Vision

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

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PSYCHOLOGY OF CHANGE

Every change can be viewed from the perspective of a sender and a receiver

SENDER

Business issues &
need to change

RECIEVER

Personal implications & risk

What a sender says and what a receiver hears can be 2 different messages!

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

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PSYCHOLOGY OF CHANGE

EXPLAIN

o Why the change is necessary

o How the change affects them

o How the change impacts their group

o How this changes the day-to-day

PRACTICES
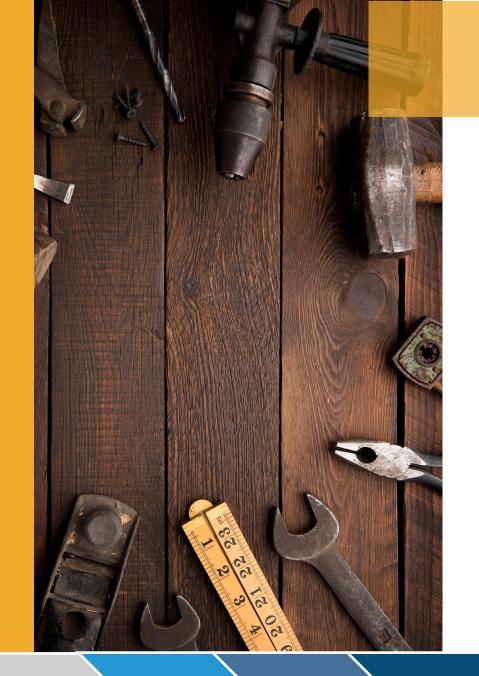
o Repeat key messages multiple times

o Use face-to-face communication

o Answer WIIFM (what's in it for me?)

o Use a question and answer format

SENDER

Immediate supervisors are the preferred senders of messages related to personal impact

DEFINE → **MEASURE** → **ANALYZE** → **IMPROVE** → **CONTROL**

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CHANGE MANAGEMENT & LEAN LEADERSHIP TOOLS

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL
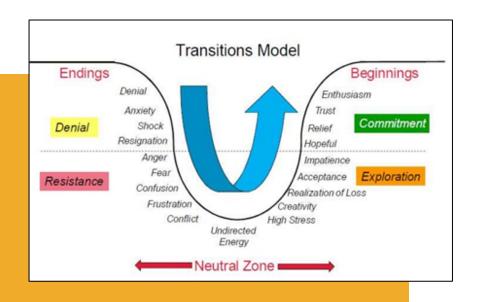
CHANGE
MANAGEMENT TOOLS

Taking charge of change

o   Transition Grid
o   Stop – Keep – Start
o   Decision Quadrant
o   Process Mapping
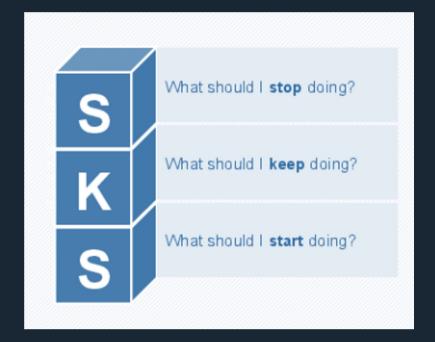o   ADKAR Analysis
o   Metrics and Data Collection

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TRANSITION GRID

Transitions Model

Endings — Denial, Anxiety, Shock, Resignation, Anger, Fear, Confusion, Frustration, Conflict, Undirected Energy

Beginnings — Enthusiasm, Trust, Relief, Hopeful, Impatience, Acceptance, Realization of Loss, Creativity, High Stress

Denial · Resistance · Commitment · Exploration

Neutral Zone

o Push problem solving / responsibility down the lowest levels via the work systems

o Work systems change behaviors, behaviors change attitudes, attitudes change values
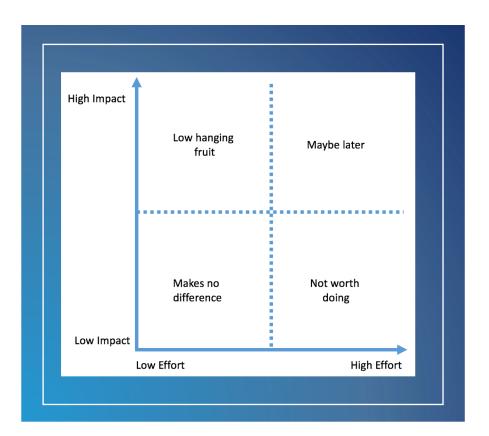
o Change Management Tool:
  o The Transition Grid

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STOP-KEEP-START

o Ask to realize, why change?

o Change Management Tool:

   o Start-Keep-Start (SKS)

o What does the data tell us?

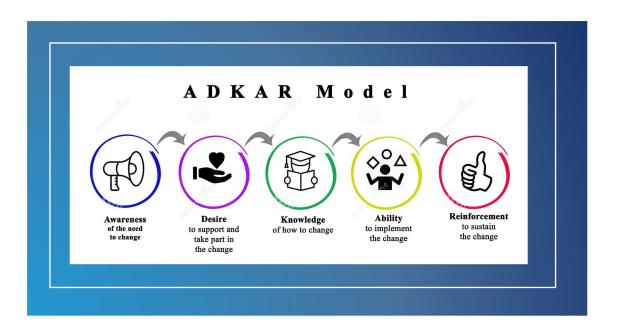S — What should I **stop** doing?

K — What should I **keep** doing?

S — What should I **start** doing?

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THE
DECISION QUADRANT

Many Variations
Use Low-Hanging Fruit
Modeled after Eisenhower
Matrix

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

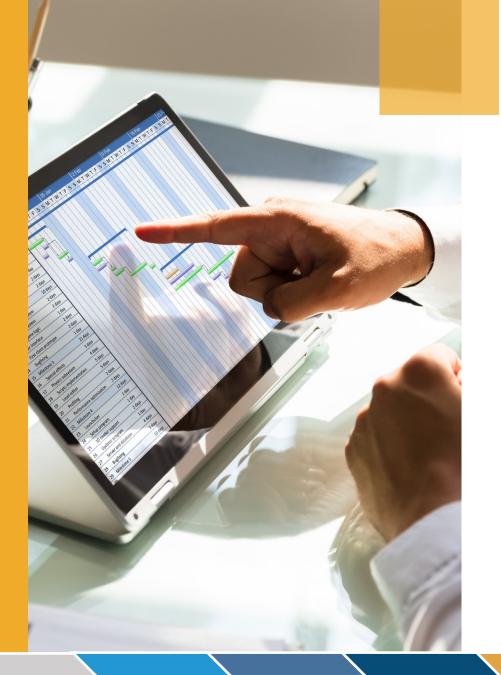LEAN SOLUTIONS

ADKAR

ANALYSIS

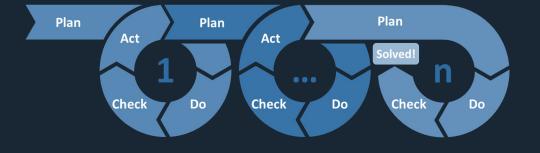How can we assist individuals to
make personal transitions?

METRICS
AND DATA COLLECTION

o Start with the end result in mind

o Carefully describe the evidence of that result
    o What would we see, feel, hear, or touch

o Identify the Measure(s)
    o Can we Count or Quantify

o Look at the Bigger Picture
    o Control, Influence, Consequences
    (good/bad)

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

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THE CHANGE LOOP

o Describe the desired state

o Share the future state

o Identify and eliminate barriers

o Work the PDCA cycle

o Leverage Lessons Learned

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

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LEADING CHANGE

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8 STEPS OF
LEADING CHANGE

Step 1: Establish a sense of urgency

Actions Needed:
- Potential Crisis
- Untapped Opportunities

Potential Pitfalls:
- Underestimating
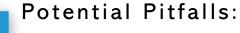- Paralyzed
- No Leadership

DEFINE MEASURE ANALYZE IMPROVE CONTROL

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8 STEPS OF
LEADING CHANGE

Step 2: Forming a powerful collation

Actions Needed:
- Assemble a Group
- Enough Power
- <u>Teamwork</u>

Potential Pitfalls:
- No Experience
- Team Leadership

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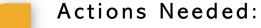
8 STEPS OF
LEADING CHANGE

Step 3: Creating a Vision

Actions Needed:
o Create a Vision
o Develop Strategies

Potential Pitfalls:
o Vision too Complicated
o You Got 5 Minutes

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8 STEPS OF
LEADING CHANGE

Step 4: Communicating the Vision

Actions Needed:
o Communication
o "Walk the Talk"

Potential Pitfalls:
o Under Communicating
o Inconsistent Actions
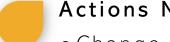
DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

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8 STEPS OF
LEADING CHANGE

**Step 5: Empowering Other
to Act on the Vision**

Actions Needed:
o Change Structures
o Recognize Contributions

Potential Pitfalls:
o Not Addressing the
Naysayers

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

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8 STEPS OF
LEADING CHANGE

Step 6: Planning For and Creating Short-Term Wins

Actions Needed:

o Define What is Success

o Short-Term Wins

o Recognize and Rewards

Potential Pitfalls:

o Not Recognizing Improvements

DEFINE | MEASURE | ANALYZE | IMPROVE | CONTROL

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8 STEPS OF
LEADING CHANGE

Step 7: Consolidating improvements and still producing more change

Actions Needed:

o Use Credibility

o Dedicated Employees

o New Projects

Potential Pitfalls:

o Declaring Victory too Soon

o Not Proving a New Process is Repeatable

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8 STEPS OF
LEADING CHANGE

Step 8: Anchor the new approaches in your organization

Actions Needed:
o Articulate Connections

o Improve Performance

Potential Pitfalls:
o Ignoring the New Normal and Values

o Promoting or Hiring Non-Believers

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CONTROL PHASE
LEAN SIX SIGMA CONTROL

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EXAMPLE OF CONTROLS

o Control Plan

o Control Chart

o Other Tracking Charts

o Standard Work

o Recurring and Documented Training

o Audit

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WHAT IS A CONTROL PLAN?

o A written summary describing systems used for monitoring/controlling process or product variation

o A Living document to be updated as new measurement systems and control methods are added for continuous improvement

o Often includes concise operator instructions (SOPs , SWIs, OCAPs)
   o OCAP = Out of Control Action Plan
   o SWI =Standard Work Instructions
   o SOP = Standard Operating Instruction

o Made in conjunction with the final project report
   o Lessons Learned
   o Actual Gains vs Planned Gains

DEFINE MEASURE ANALYZE IMPROVE CONTROL

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CONTROL PLAN ELEMENTS
4 Elements of a Control Plan

1. Training
2. Documentation
3. Monitoring
4. Response

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CONTROL PLAN

Control Plan

Item #	Subject	Control Description	Type(s)	Control Cycle(s)	Control Owner(s)	Status	References / Other
1	Maintain compliance to the new Operator SOP.	Train personnel on new SOP Track parts per hour & downtime/fault occurences/times and take action on largest issues. Respond to operator challenges of new design to sustain the improvements.	Training Fix & Train Monitoring	Daily Daily Weekly review at production mtg.	Dan Krueger Brian Buchanan John Stewart (supv.)	Training completed on _____ Spreadsheet tool provided Onging	SOP #12345 Fault Tracking Log
2	Maintain compliance to the new Lead/Setup SOP.	Train personnel on new SOP Track reasons for being pulled off route and take action on largest issues. Respond to lead challenges of new design to sustain the improvements.	Training Fix & Train Monitoring	One time Daily Weekly review at production mtg.	Dan Krueger Brian Buchanan John Stewart (supv.)	Training completed on _____ Spreadsheet tool provided Onging	SOP #12345 Tracking Log
3	Escalation Plan for Lead/Setup	Train personnel on new response plan	Training	One time	Dan Krueger	Training completed on _____	
4	Maintain compliance to the new Parking Lot SOP.	Train personnel on new SOP	Training	One time	Dan Krueger	Training completed on _____	
5							

Control Plan Approval and Acknowledgement
Process Owner(s) - Date
APPROVAL

Control Owner Action Acknowledgement
Name and Date
Name and Date
Name and Date
Name and Date

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QUIZ 5:

1. What is necessary for world class 'operational excellence'?
   - **Process Improvement + Culture Improvement + Leadership Improvement**

2. What is the first step in strategic planning (Hoshin Kanri) for an organization?
   - **Establish and agree on the Mission, Vision, and Goals**

HOMEWORK REVIEW

(Open Computers and Log into your Portal)

CONGRATULATIONS!

You have completed the Lean Green Belt course.

Good Luck in your Exam!

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