USMC Lean Six Sigma Yellow Belt Training

Introductions & Expectations

- What is your name?
- Where do you work?
- What are your expectations from this training?
- What is your experience with the CPI toolset?

Code of Conduct

- Everyone participates with equal voice.
- High level of participation needed for success.
- Single discussions (respect the speaker).
- *All* ideas welcome (what happens here stays here!)
- Respect our time together – return from breaks/lunch on time.
- Blackberries / Phones / electronics off or on vibrate.
- Handle outside business on breaks.
- Function as a team.
- **Have fun!**

Administration

- Classroom location
- Restrooms
- Lunch / Breaks
- Refreshments
- Starting / ending times
- Class evaluations
- Estimated completion time
- Parking Lot
- In case of fire muster at _____

Course Agenda

- Introduction
- Lean Module
- Six Sigma Module
- Wrap-Up

Course Goals

At the end of this course you will be able to:

- Understand Continuous Process Improvement (CPI) tools.
- Be an effective Team Member on CPI Events
- Define the various roles and responsibilities of the Yellow Belt.
- Advance the culture of CPI.
- Participate part time as a CPI team member and help to sustain the improvement gains.

CPI / LSS Program

- Lean Six Sigma (LSS) is widely accepted as the most effective Continuous Process Improvement (CPI) method.
- LSS is a proven problem solving methodology.
- Performance & Innovation (P&I) has experienced CPI support staff.

CPI Supports Warfighting and Readiness

- Enhances support to the warfighters by continuously improving key support processes resulting in:
  - Reduced Process Times (Time).
  - Improved Process Reliability (Quality).
  - Improved Safety and Workplace Quality of Life.
  - Ensuring Affordability (Cost).

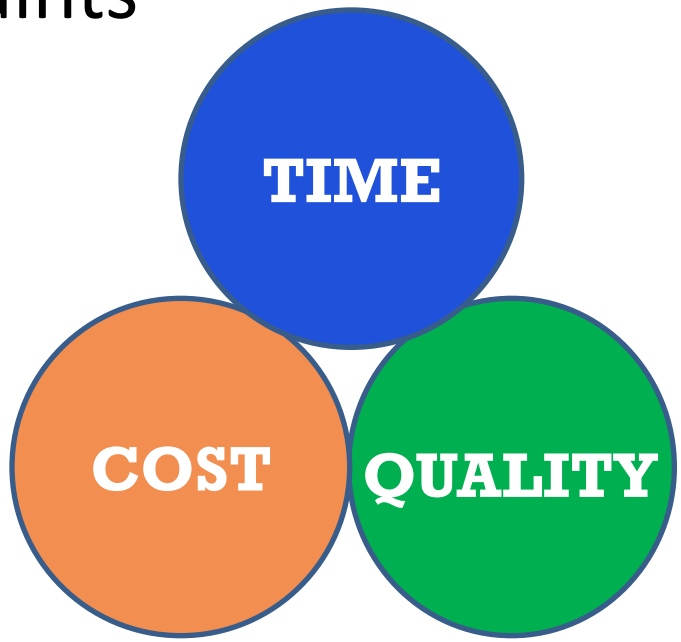
Why Use CPI?

"There are four purposes for continuous process improvement: easier, better, faster, cheaper – and they appear in that order of priority." – Shigeo Shingo

- **Easier** – Reduce frustrations for employees, work smarter; not harder.
- **Better** – Make a process more efficient / effective, improve quality.
- **Faster** – Reduce lead time to fulfill customer demand.
- **Cheaper** – Reduce cost to customer.

Triple Constraints of Projects

- Project Management Constraints
  - Quality (Better)
    - Clear and Specific
  - Time (Faster)
    - Amount of Time to complete process tasks
  - Cost (Cheaper)
    - Money and Effort

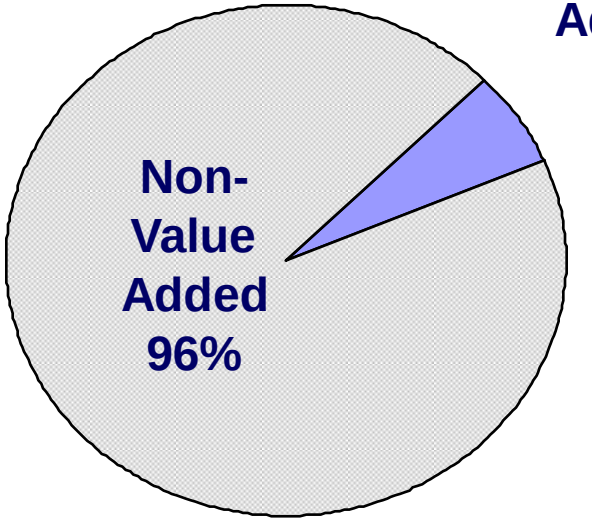


- Prioritizing Constraints
  - Should be based on the view of the customer.

Change in Focus

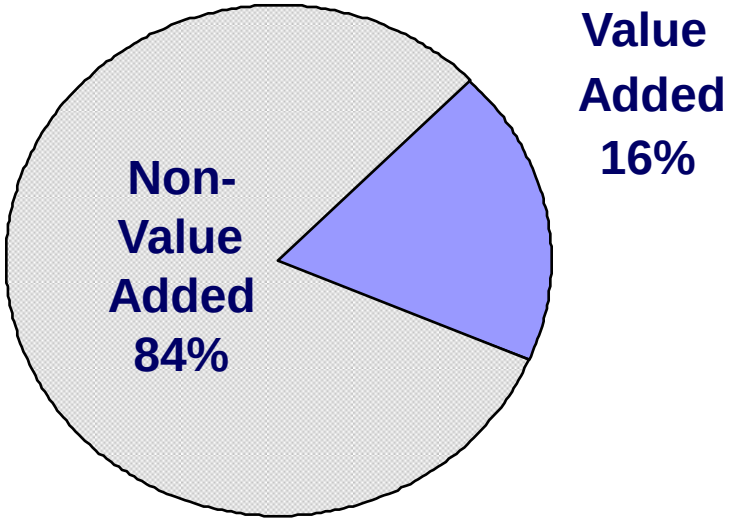
Transactional or Production Processes

80's



Before CPI

Today



After CPI

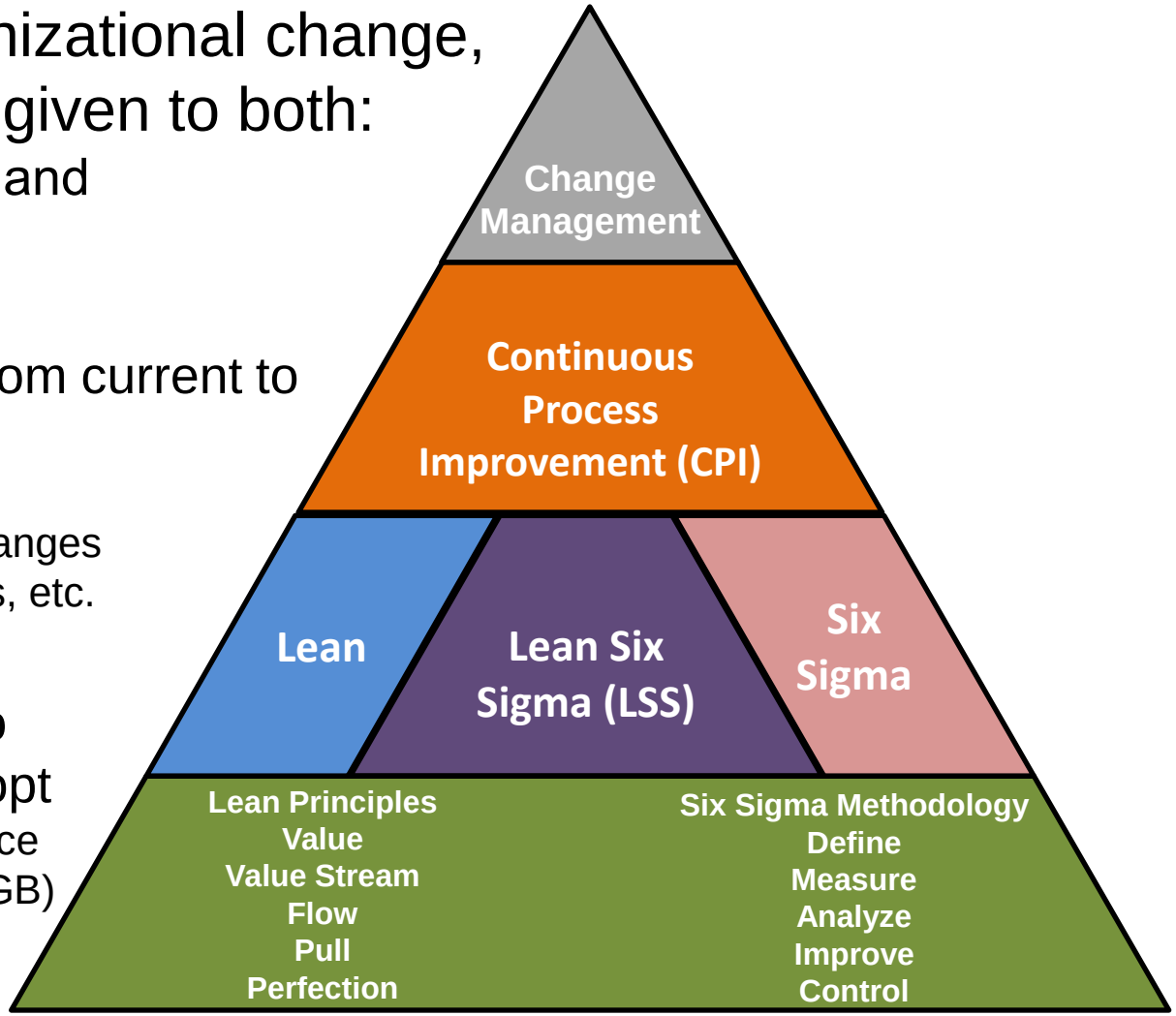
Change Management

- Change Management Purpose - improve the effectiveness and efficiency of the organization.
  - Process Improvement Culture Development.
  - Continuous quest for excellence.
- Change Principles
  - **Change is continuously occurring.**
  - Process required to manage change.
  - Ongoing process - not a stand alone project.

"It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change." – Charles Darwin

Change Management & CPI / LSS

- For successful organizational change, attention, should be given to both:
  - The “process” side, and
  - The “human” side
- **Process Side**
  - Activities to move from current to future state
    - Develop plans
    - Process or system changes
    - Infrastructure changes, etc.
- **Human Side**
  - Assist employees to understand and adopt
    - Alleviate staff resistance
    - Meet training needs (GB)
    - Secure buy-in



“It is not necessary to change. Survival is not mandatory.” - Edward Deming

Process Comparison

Best Business Practices

Program	Lean	Six Sigma
Theory	Remove waste	Reduce variation
Application guidelines	Specify customer value Identify value stream Achieve flow Establish pull systems Seek perfection	Define Measure Analyze Improve Control
Focus	Flow focused	Variation focused
Assumptions	Waste removal will improve business performance. Many small improvements are better than systems analysis.	A problem exists Figures and numbers are valued. System output improves if variation in all processes is reduced.
Primary effect	Reduced flow time	Uniform process output

Lean Six Sigma Defined

Lean

Eliminate Waste

Improve Flow

Six Sigma

Reduce Variation

Eliminate Defects

Lean Six Sigma

Together providing the customer with the best possible Value in Quality, Cost and Delivery

Team Member Responsibilities

- **As a Yellow Belt you're expected to:**
  - Act as an change agent for the organization you're a member of and not yourself.
  - Ensure communication is maintained with the groups you represent.
  - Participate in CPI events.
  - Become familiar with the basic CPI tools, LEAN and Six Sigma.
  - Assist in project reviews.
  - Function in teams between 2 and 8 members

Typical Command or Installation Level Infrastructure

Command Leadership

- Owns vision, direction, integration, business results.
- **Leads change, provide strategic direction.**
- 1-2 Days of Training.

Implementation Leader

- **Coordinates implementation of CPI efforts.**
- Communicates standards and guidelines.
- Develops supporting implementation plans.
- 1-2 Days of Training.

Project Sponsors

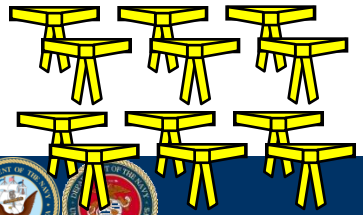
- **Process owners.**
- **Own financial results.**
- Coordinate / oversee Toll Gate Review Meetings, go/no go.
- Provide support & help remove barriers to success.
- Implement improvement solutions & sustain results.
- 2 Days of Training.

Master Black Belt(s)
Black Belt(s)

- **Lead Complex projects.**
- "Go To" subject matter experts.
- Transition results ownership and improvement solution to Sponsor.
- Mentors lower level belts.
- 5 Weeks of Training.

Green Belts

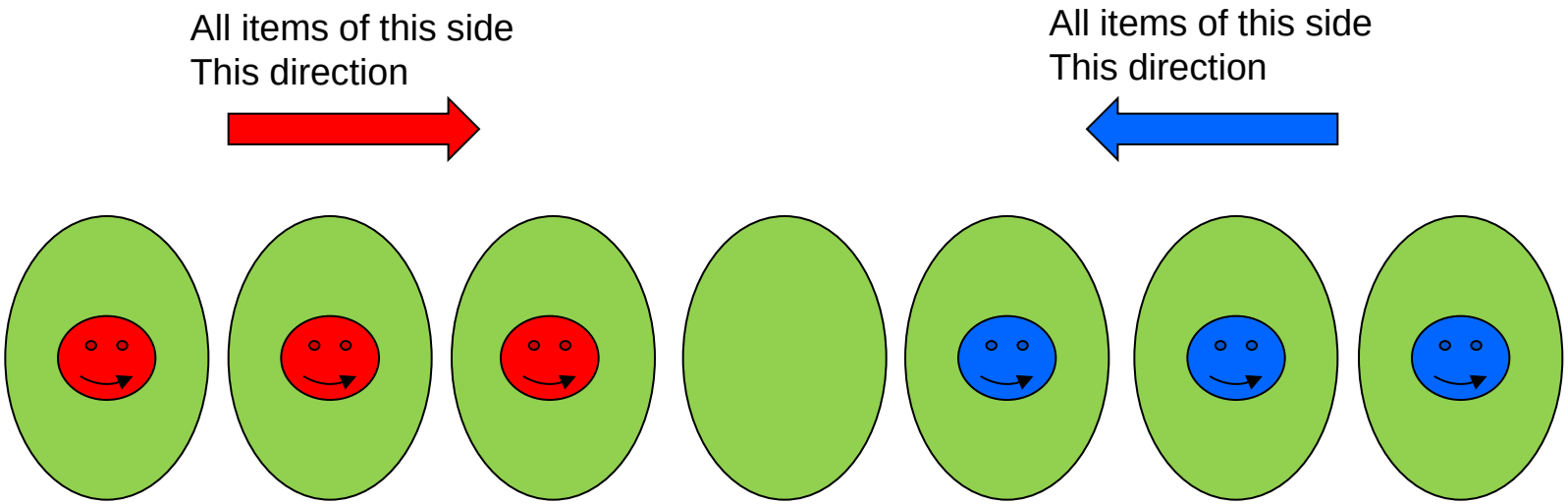
- **Focus on Rapid Improvement Events.**
- May participate on Black Belt teams.
- Close to business process.
- May assist Project Sponsor in implementing improvement solution.
- 1 Week of Training.



Yellow Belts

- **Team members who assist in executing projects/RIEs**
- Collect data.
- Sustain results.
- Leverage/replicate opportunities.
- 1 day of Training.

Morning Exercise – Traffic Jam



Traffic Jam Rules

- All ☺ must move; “0” cannot be moved.
- A ☺ may only move forward to an empty “0”.
- Only one ☺ can occupy a “0” at any time.
- No ☺ may move backward at any time.
- An ☺ may jump a single ☺ traveling the opposite direction provided an empty “0” exists immediately beyond the ☺ being jumped.
- A ☺ may not jump a ☺ traveling the same direction.
- Once your team has accomplished the task, you must be able to repeat it for an instructor.

Are there any comments or questions?

Yellow Belt Training
Lean Module

Learning Objectives

At the end of this lesson you will be able to:

- Understand the basic principles of Lean Thinking.
- Be familiar with the basic Lean tools.
- Be prepared to apply the basic Lean tools in your own work area and / or as you work with your project or RIE team.

Overview

- Lean Principles
- Types of waste within processes.
  - TIMWOOD and U
- Basic lean methods of process improvement.
  - Value Stream Mapping
  - Little's law
  - Mistake proofing
  - 5S + 1
  - Visual controls
  - Right Sizing
  - Standard Work
  - TAKT Time

History of Lean

- Roots of Lean go back to early 1900's.
- Henry Ford: continuous flow production, waste elimination.
- Kiichiro Toyoda and Taiichi Ohno: low inventories, flexibility.
- U.S. supermarkets: pull systems.
- Shigeo Shingo: mistake proofing, reduced set up times.
- Toyota Production System.
- MIT Prof. James Womack brings Lean back to U.S.

What is Lean?

Tools and Methodology to:

Eliminate Waste

WAR ON WASTE!

Improve Flow

By using:

Just-in-Time

Batch Reduction

Pull/Kanban

Standard Work

Value Stream Mapping

Lean Toolbox

Set Up Reduction

Visual Controls

5S + 1

Poka-Yoke

Cellular Flow

Lean Defined

"Becoming 'lean' is a process of eliminating **waste** with a goal of creating **value**."

Source: *Lean Enterprise Value: Insights from MIT's Lean Aerospace Initiative* by Earl Murman, Thomas Allen, Kirkor Bozdogan, Joel Cutcher-Gershenfed, Hugh McManus, Deborah Nightingale, Eric Rebentisch, Tom Shields, Fred Stahl, Myles Walton, Joyce Warmkessel, Stanley Weiss, Shela Wdnall, (Pagrave, 2002)

Lean Principles – Womack & Jones 1996

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Value

- Critical starting point for Lean.
- **Can only ultimately be defined by the customer**.
  - NO two customers define Value identically.
- Critical questions we must ask ourselves.
  - Do we truly understand Value from our customer's perspective?
  - Are we truly focused on providing that Value?
  - What are the barriers & obstacles preventing us from focusing on and providing that Value?

$$Value = \frac{Features \ x \ Performanc \ e \ x \ Quality}{Cost \ x \ Time}$$

Value Added, Business Value, Non Value Added

Value Added

The customer wants it (and is willing to pay for it) and,

It changes form, fit, or function of a product or service and,

It is done right the first time.

Business Value

No value is created but customer is willing to pay for it.

Required by Law / Statute / Unchangeable Policy.

Non-Value Added - Waste

Consumes resources but creates no value in the eyes of the customer.

If you can't get rid of the activity, reduce it.

Definitions of Waste (Muda)

Those Elements of a process that **Do Not Increase the Value** of a Product ***as Perceived by the Customer***, but **increases Cost and Process times.**

Anything other than the **minimum** amount of **equipment, materials, parts, space, and worker's time** which are absolutely essential to **add value** to the product.

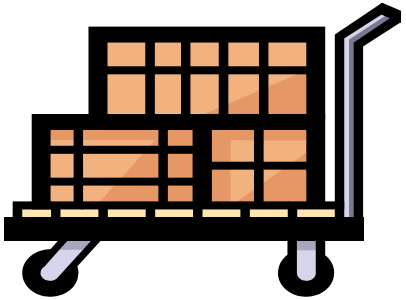
8 Types of Waste

Identify and **Eliminate** these Wastes:

Types of Waste:

T	Transportation
I	Inventory (Excess)
M	Motion
W	Waiting
O	Over-Production
O	Over-Processing
D	Defects
&	
U	Under Utilization of people

Transportation



Waste caused by unnecessary movement of material or product.

Primary Causes:

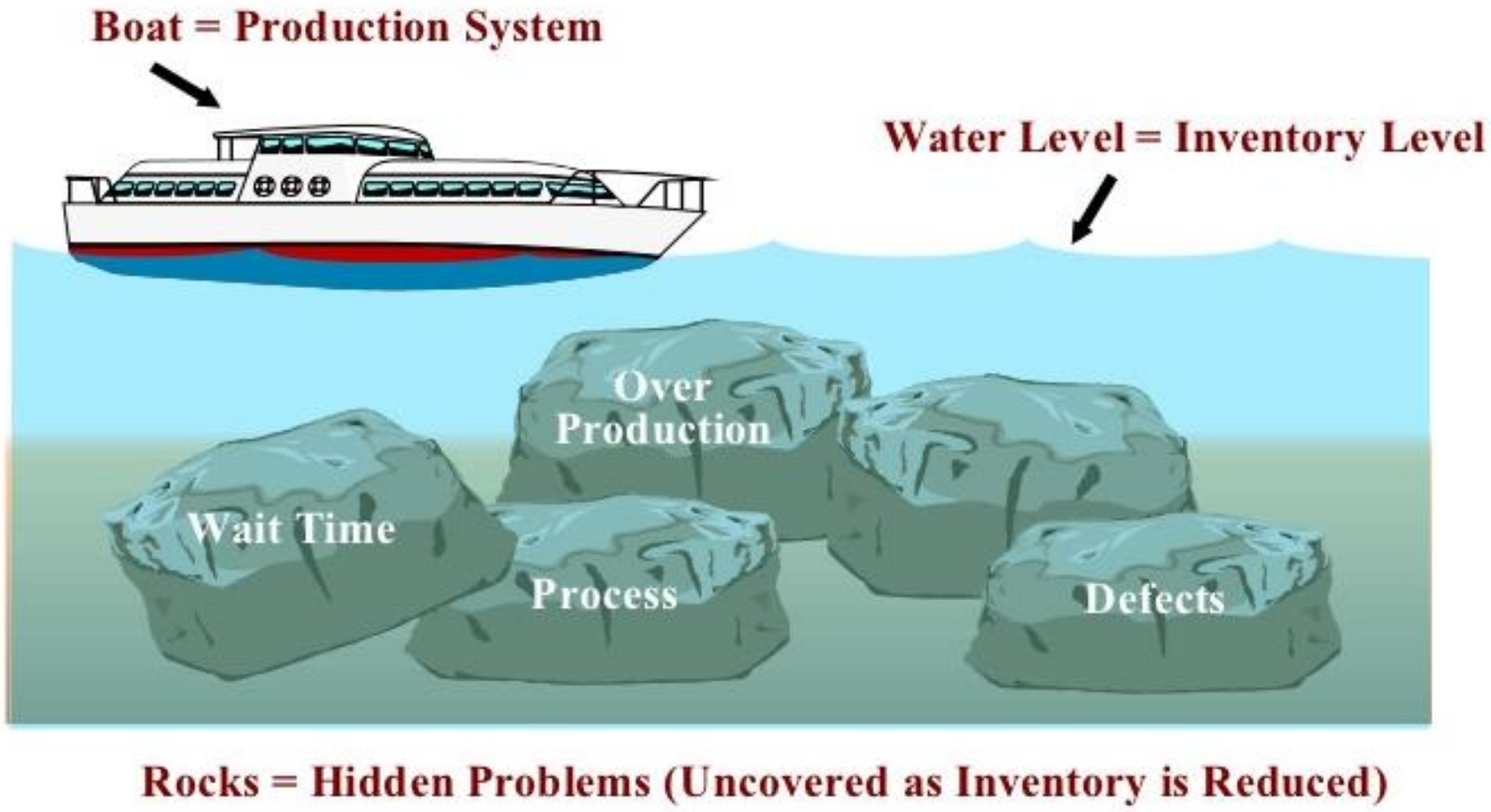
- Inefficient Facility Layout
- Process Islands vs. Continuous Flow
- Batch (Push) Mentality
- Lack of Right-Sizing
- Long Setup Times
- Lack of Multi-Skilled Workers

Inventory

Waste of materials, parts and assembled goods, when purchased or produced in advance of customer requirements.

- **Increases Cycle Time & Process Lead Time.**

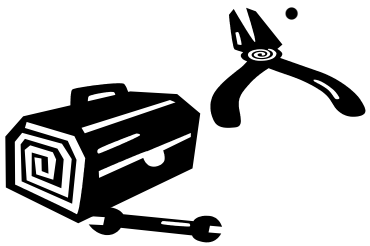
Inventory Hides Problems!



Motion

- Waste caused by non-value added movement of workers and / or production machines.

- Primary Causes:
  - Inefficient workplace layouts.
  - Inefficient tools and / or fixtures.
  - Lack of Standard Work causing inconsistency.
  - Batch movement of product.



Waiting

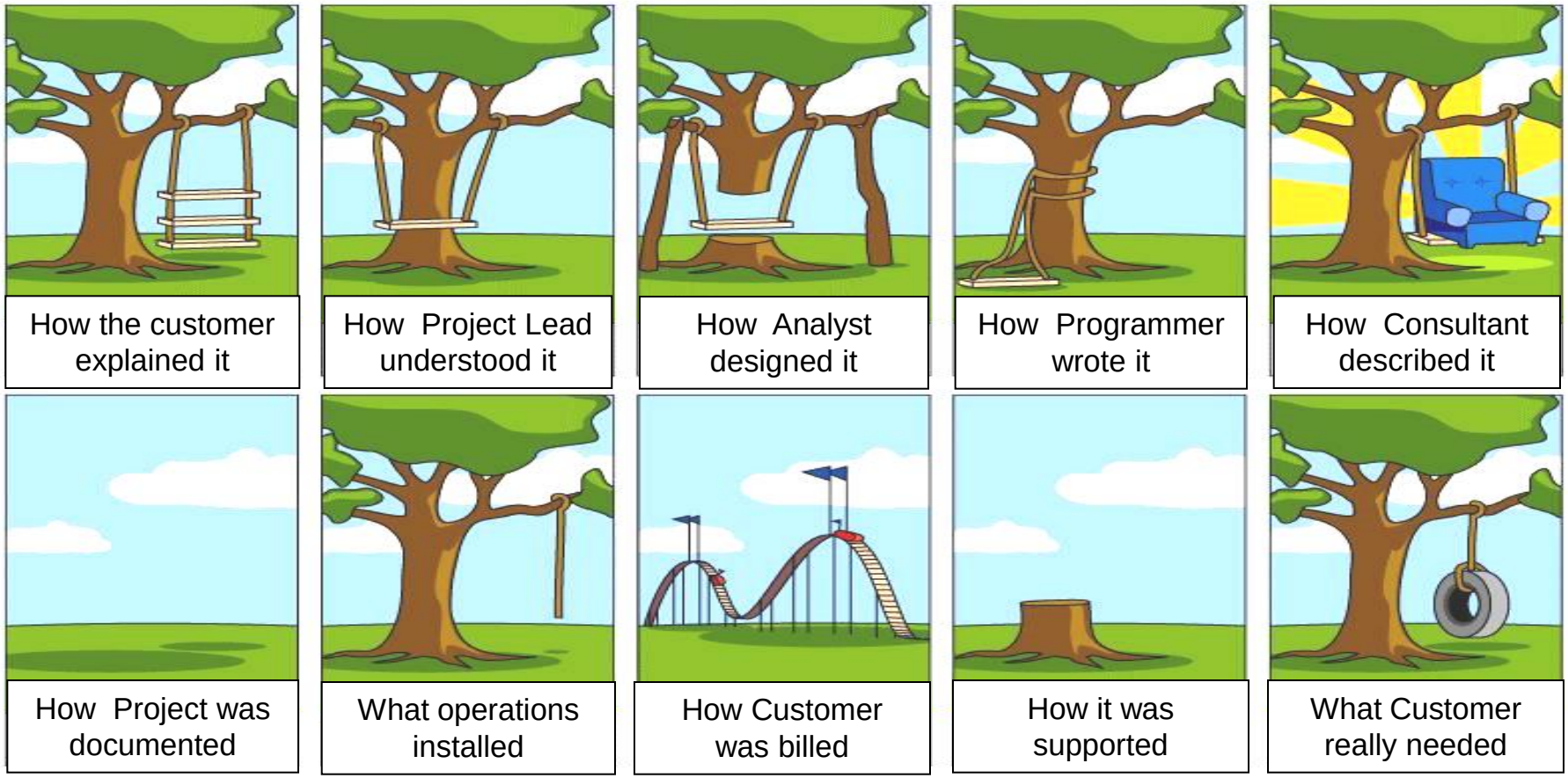
The Waste of Waiting occurs whenever the hands of an employee are idle.

Over production

Waste caused by producing more than the customer needs (Push). This type of waste leads to excessive inventories.

Over Processing

The Waste of Unnecessary or Non-Optimized Processes and/or Operations.



"There is nothing so useless as doing efficiently that which should not be done at all." *Peter Drucker*

Defects / Rework

Waste that occurs when a process, product, or data does not conform to proper specifications. The result could cause product rework, scrap, or the escape of a defect to the customer.

What Causes Defects?

- Poor procedures or standards.
- Non-conforming materials.
- Worn or out of tolerance tooling.
- Human mistakes.

Under utilization of employees

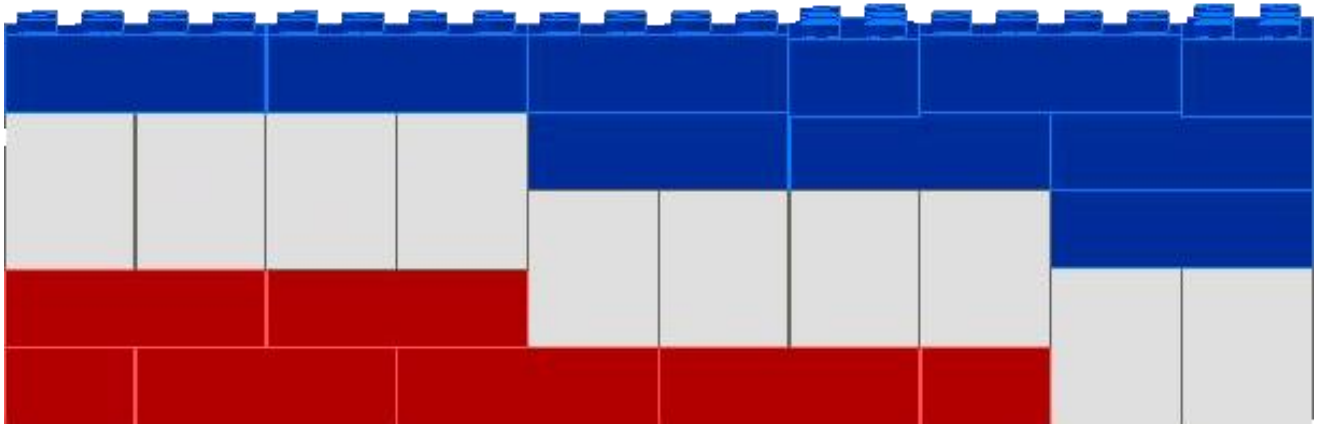
ULTIMATE WASTE

Waste of a person's time

8 Wastes - Examples

Type of Waste	Physical Process	Transactional Example
Transporting	Parts Moving to Warehouse and Back	Data Handoffs
Inventory	Excessive Work-in-Process	Backlog of Design or Tooling Changes
Motion	Retrieving Parts, Tools, Information	Poor Office Lay-Out
Waiting	Out of supplies, Lack of Information	Meetings, Approval, System Down Time
Over-Processing	Performing Unneeded Operations	Approvals (Too Many Sign-offs)
Over-Production	Working Ahead of Schedule	Printing Paper Too Soon
Defects	Scrap or Rework	Drawing or Planning Errors, Rework
Under utilization of employees	More people involved than required to perform physical or transactional tasks.	

Yellow Belt



8 Types of Waste Exercise

8 Types of Wastes Exercise

- Break into teams.
- Identify the 8 Types of Wastes.
- Brainstorm 3 examples of waste in your work areas.
- Be prepared to share your examples with the class.

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Value Stream Analysis

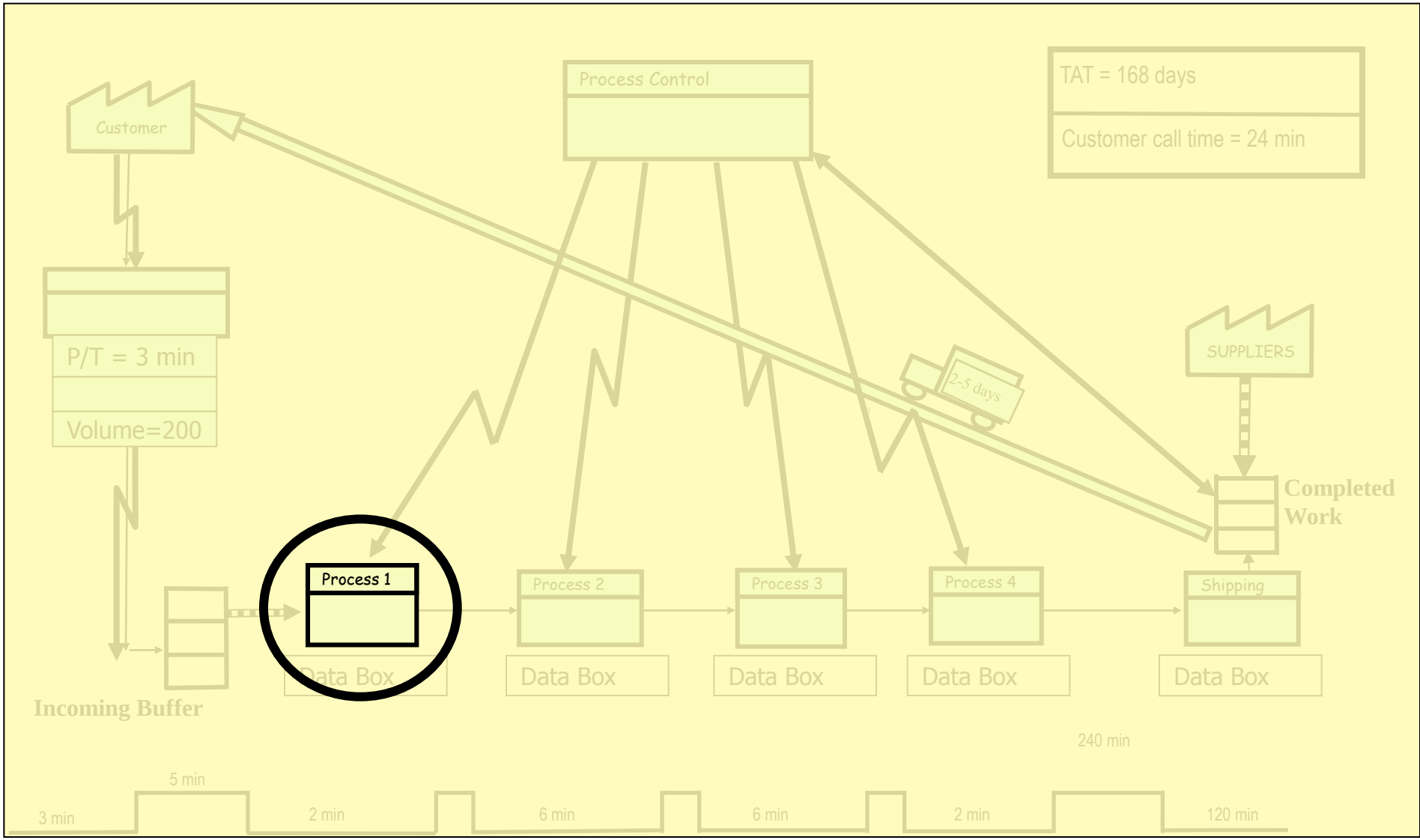
- A “VISUAL” planning tool used to identify non-value added activity (NVA) and develop plans to eliminate the waste.

- Value Stream Analysis is the key to all improvement activities.

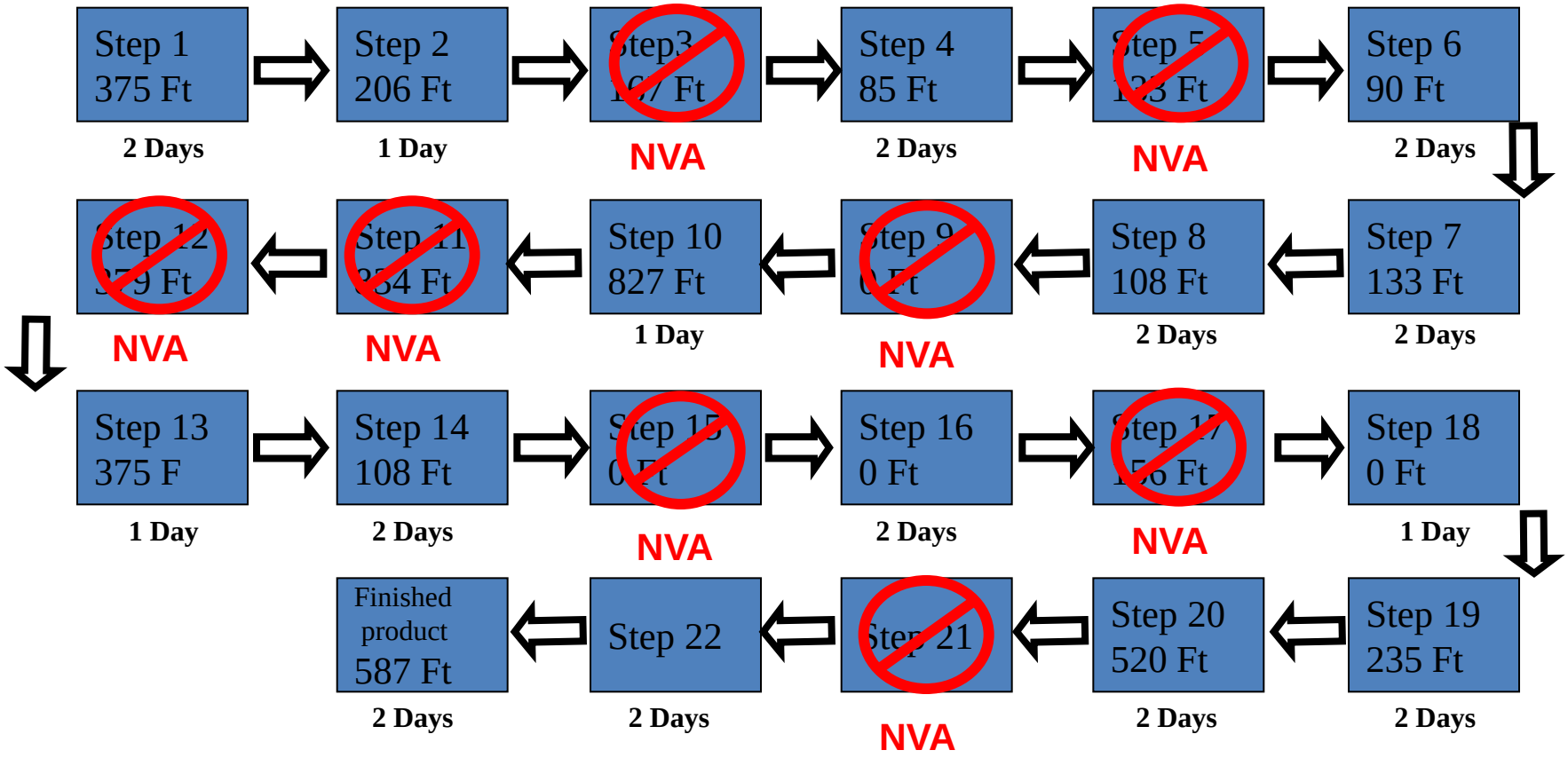
- Includes the entire set of activities running from requirement to finished product for a specific product or service.

- Seeks to optimize the whole from the standpoint of the final customer.

Value Stream Map (VSM)



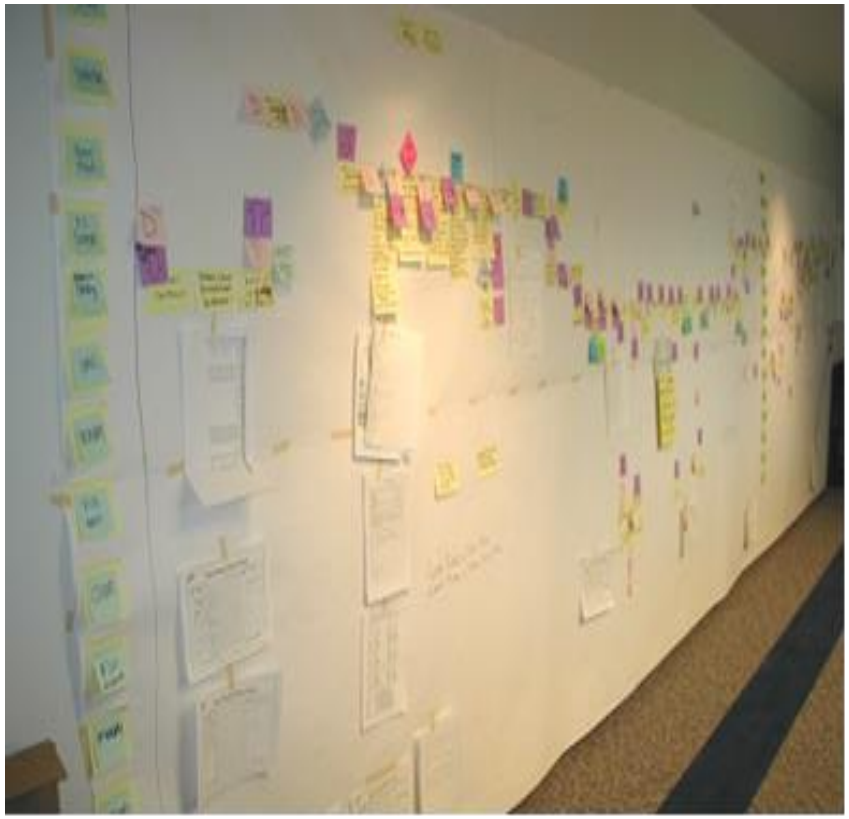
VSM for Process 1 (Process Flow Map)



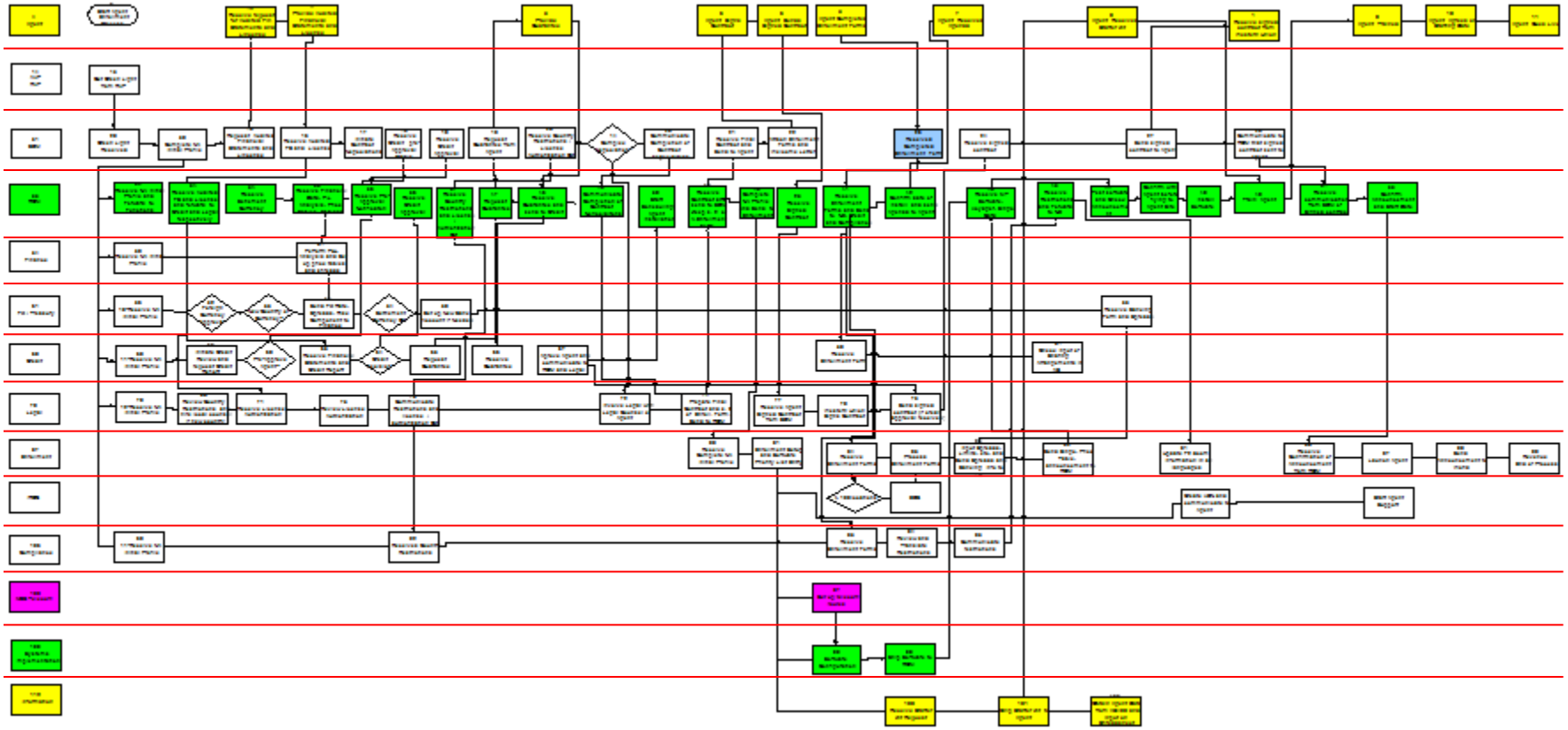
AS-IS METRICS
- 23 PROCESS STEPS
- 35 Queues
- 8 NVA STEPS
- TAT = 43 DAYS
- TOTAL DISTANCE = 5242 Ft

TO-BE METRICS
- *15 PROCESS STEPS*
- *23 Queues*
- *0 NVA STEPS*
- *TAT= 12 DAYS*
- *TOTAL DISTANCE=1528 Ft*

Value Stream Map - Examples



Process Map – Swim Lanes



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What is Flow?

The continuous, progressive adding of Value in the eyes of the customer.

- Starts at receipt of customer request.
- Ends at delivery to customer.

- Flow utilizes the fewest number of steps with no interruptions.
- Eliminates waste.

People always working on the product and the product always being worked on.

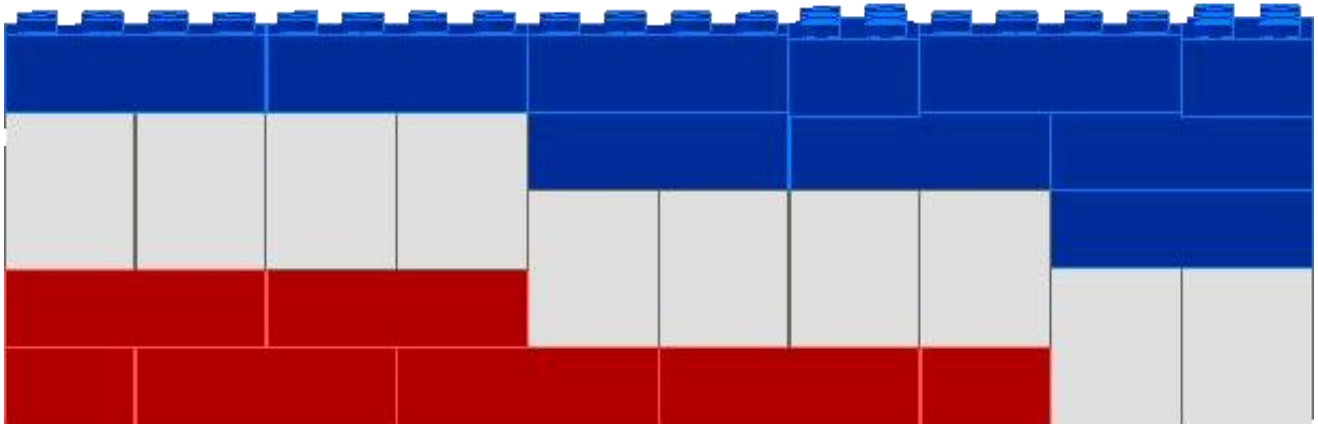
Toyota Production System

- Taiichi Ohno / Shigeo Shingo found the real challenge was to create continuous flow in "small-lot" production.
- Ohno achieved small lot continuous flow by:
    - Aligning equipment & resources to the Value Stream.
    - Physically locating machines close together.
    - Driving down batch sizes.
        - Single Minute Exchange of Die (SMED).
        - Splitting and right-sizing of operations.
    - Cross Training.
    - Simple production control processes – Pull / Kanban.
    - Aggressive root cause analysis.
    - Application of Lean tools such as Kitting, Point of Use Systems (POUS), and visual controls.

Batch and Queue

- Production of large lots of identical items to meet anticipated demand.
  - Production is to schedule, not to demand.
- Makes great efficiencies possible for equipment amortized over large quantities.
- Increases inventory and cycle times.
- Choices limited to those favored by the many.
- Examples of Batching
  - Waiting for a table at a restaurant (Table for 4).
  - Waiting at the doctor's or dentist's office.
  - On the telephone when on hold.
  - Waiting at home for the cable company.
  - Creating a grocery list.

Yellow Belt



The Lean Penny Game

The Lean Penny Game

- Goal: Move all the coins through all the station.
- Task: Each station does their work by flipping each coin over.
- Measurements: Time measurements will be collected when the first and last batch is delivered to the customer for each round.

Station Tasks

- Round 1: All stations flip coins using their left hand in batches of 20.
- Round 2: All stations flip coins using their left hand in batches of 5.
- Round 3: All stations flip coins using both hands in batches of 5.
- Round 4: All stations flip coins using both hands in single piece flow.

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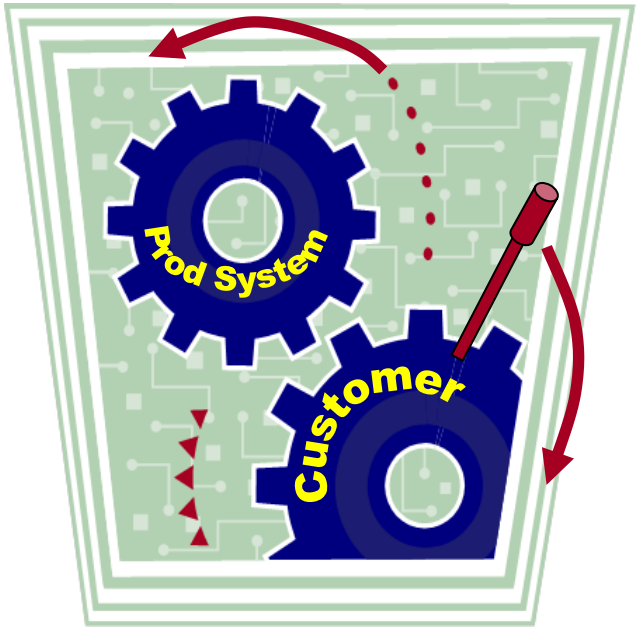
Push vs. Pull

Push:

Work is pushed into the system or process based on forecasts or schedules.

Pull:

A customer-driven system that produces and moves a product/service *only* when the customer needs it.



Let Customers Pull Value

- Pull - A customer-driven system that produces and moves a product / service *only* when the customer needs it.
- Push - Work is pushed into the system or process based on forecasts or schedules.
- No one upstream produces a good or service until the downstream customer asks for it.
- Replaces *"Ready or not here I come"* with *"OK, Now I'm ready".*

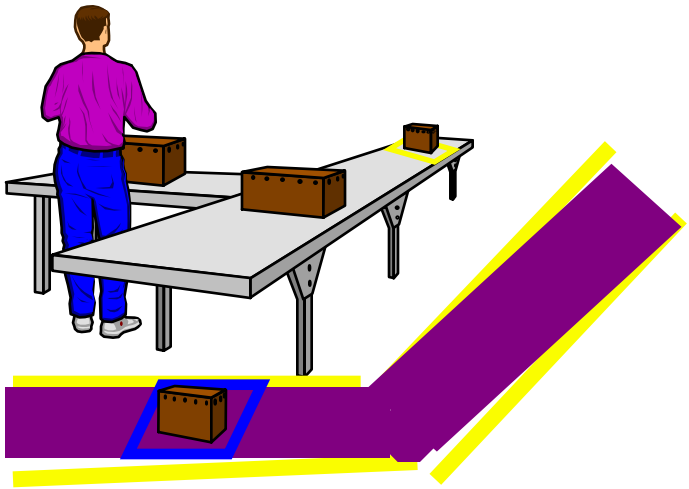
Pull Systems

Pull

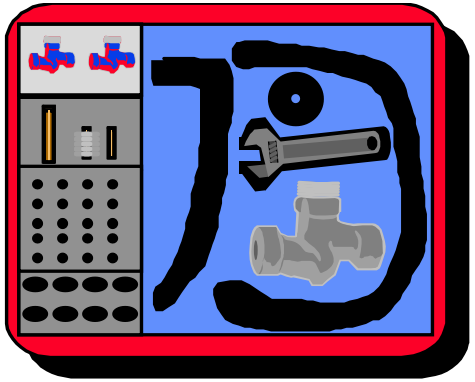
- **Elements**
  - Upstream Supplier
  - Downstream Customer
  - Visual Trigger (Kanban)
- **Sequenced**
  - Use First In First Out (FIFO) lanes
- **Replenished**
  - Create supermarkets

Types of Pull Signals (Kanbans)

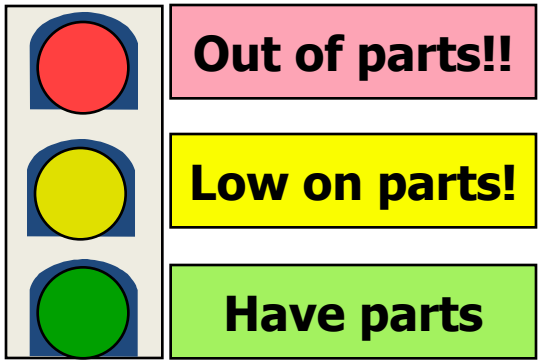
Square on Floor



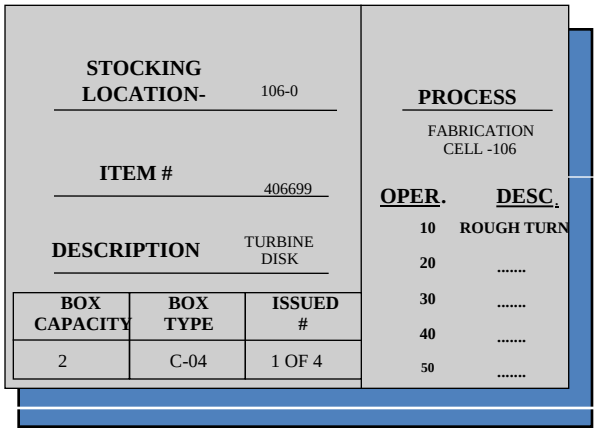
Containers (Kits)



Lights



Cards



Pull System Example

Reordering Office Coffee

Step One: Remove Empty Box

Step Two: Locate New Box

Step Three: Pull Kanban

Step Four: Replace Box

To-Be Ordered

Awaiting Delivery

Step Five: Place Kanban in Reorder Pouch

Step Six: Replace Stock

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Pursue Perfection

- Begins with understanding Lean Principles & visualizing the “perfect” process at the outset.
- No matter how much you improve a process to make it leaner, there are always ways to continue to remove waste by eliminating effort, time, space and errors.
- Achieving the “Lot Size of 1”.
- Achieving Continuous Flow.
- Achieving a CPI Culture.

It's Cultural

"One Million – That's how many ideas Toyota ***implements*** each year. Do the math: **3,000 ideas a day.** That number, more than anything else, explains why Toyota appears to be in a league of their own, while their competitors remain caught in a cross-fire of cost-cutting".

Here's the thing: it's not about the cars. It's about ideas. And the people with those ideas. **But not just any ideas. Mostly tiny ones**, but effective ones none-the-less – elegant solutions to real world problems. Not grand slam homeruns, but groundball singles implemented all across the company by associates **that view their role not to be simply doing the work, but taking it to the next level…every day, in some little way.** *Good enough never is.*

When an entire organization thinks like that, it becomes unstoppable.

Lean Tools

Continuous Improvement

Batch Reduction

Layout

Set Up Reduction

Mistake Proofing

Visual Controls

Pull/Kanban

5S + 1

Value Stream Mapping

Point of Use Systems

Standard Work

Cellular Flow

5S: A Tool to Achieve the Future State

- **5S** is a process and method for creating and maintaining an organized, clean, and high-performance workplace.
- **5S** enables anyone to distinguish between normal and abnormal conditions at a glance.
- **5S** is the foundation for continuous improvement, zero defects, cost reduction, and a more productive work space.
- **5S** is a systematic way to improve the workplace, our processes and our products through employee involvement.

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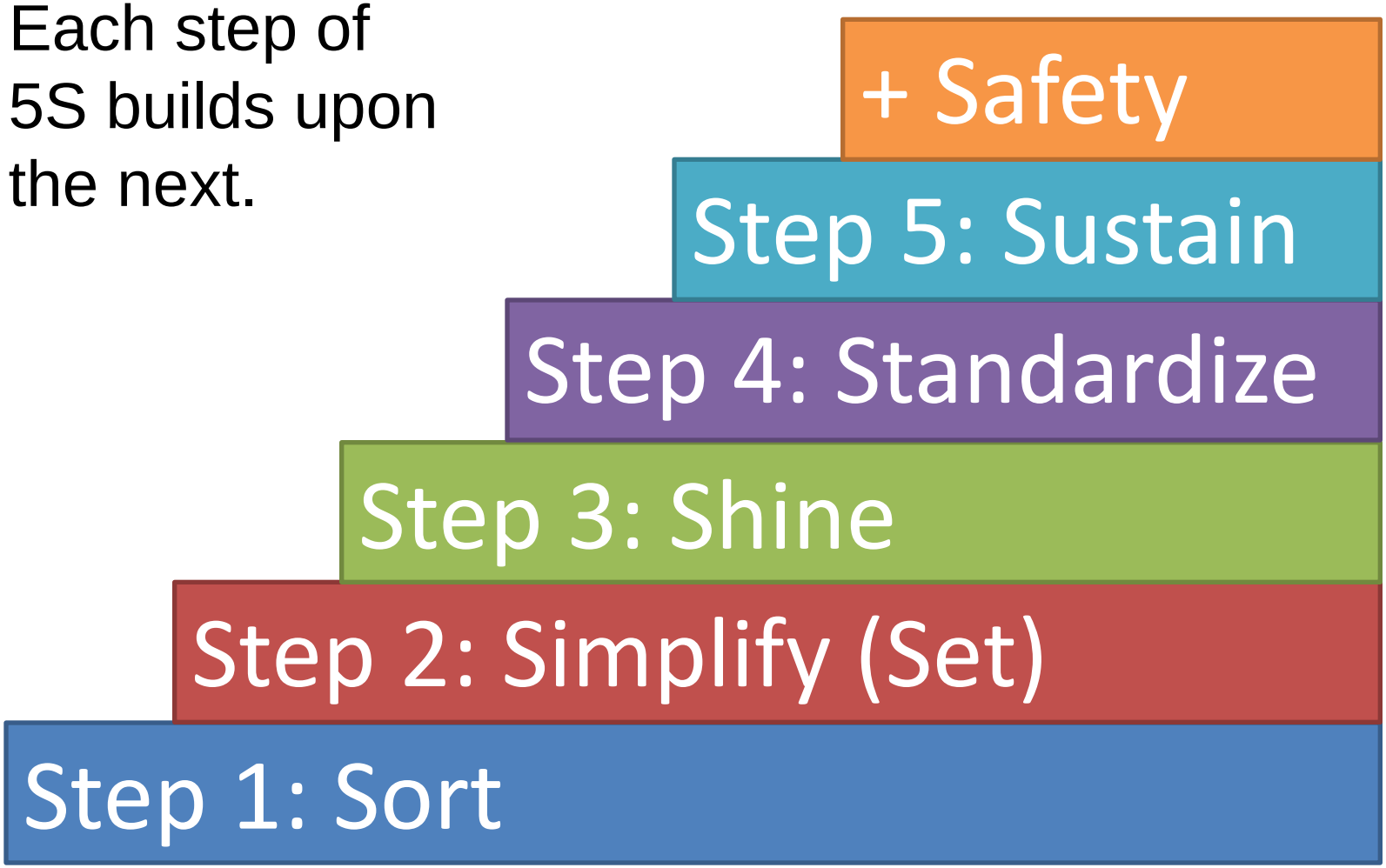
5S + 1

- Each step of 5S builds upon the next.



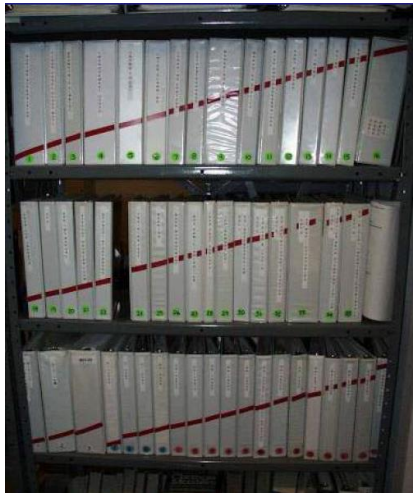
Sort (Seiri)

- **Establish criteria** for determining what is and is not needed in the area based on:
  - Usefulness of the item / equipment.
  - Frequency of use.
  - Quantity needed.
- **Red Tag evaluation.**
  - Keep in existing area.
  - Move to different spot within area.
  - Hold in red tag area.
  - Get rid of it.

Ask the people who use the material / equipment for help – We don't want to throw anything out that we actually need!

Simplify or Set (Seiton)

- **Determine the location for needed items and how they should be kept.**
  - Consider how to store tools and jigs.
  - Consider principles of motion waste.



- **Identify best locations**.
  - Labels, signboards, maps, shadows.
  - 5S Map: shows location of equipment in the area .
  - Color-Code Strategy: distinguish use of tools / parts by color.
  - Outlining work areas and locations.

Creating a place for everything and everything in its place!
Make it obvious at a glance!

Shine (Seiso)

- **Determine Target** *What needs to be cleaned?*
- **Determine Assignments** *Who is responsible?*
- **Determine Methods** *How will it be done?*
- **Determine Tools** *What is needed?*
- **Implement Shine** Everyone's responsibility.

Create and maintain a neat and clean environment.
Make it a habit!

Standardize (Seiketsu)

- Establish guidelines for sort, straighten, and shine conditions.
- Bring the condition of the area up to those standards.
- Make the standard guidelines visible.
- Maintain and monitor first 3S's.
- Assign responsibilities and monitor through self audit and evaluation.

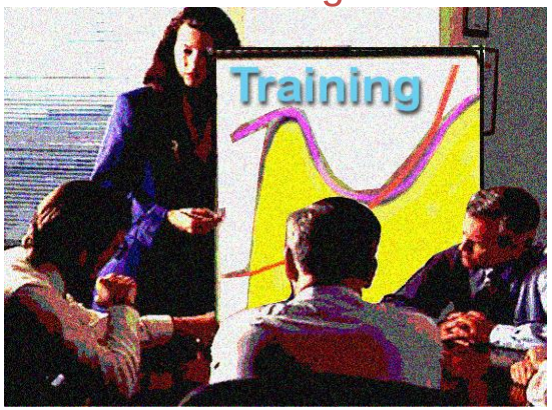
Create a consistent way to carry out tasks and procedures.

Sustain (Shitsuke)

- Development of new awareness and skills.
- Support from management.
- Ongoing, company wide communication.
- Making 5S standards part of daily work.
- Total employee involvement.
- Implement Sustainment Checklist.

Managers Committed

Training



"Buy-in" from all workers

Common Sense is Good Sense

Safety

- Include Safety in all your Improvement Projects.

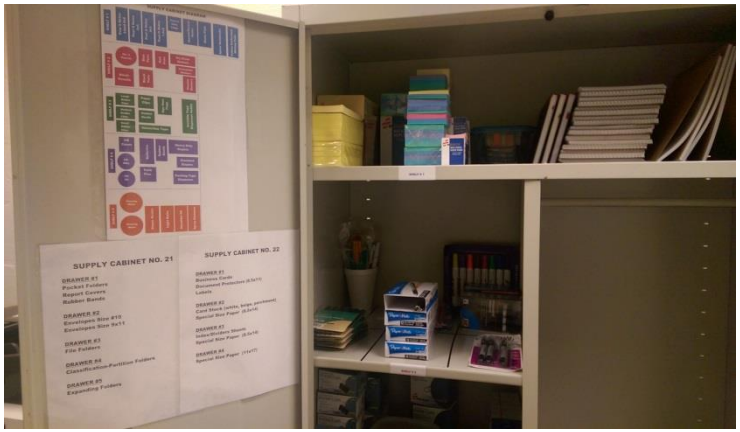
Can you identify the safety issues?

5S Example


Before Starting 5-S
After 5-S
Operators claim a 50% improvement in overall efficiency

5S Example – P&I Supply Cabinet

BEFORE



AFTER

Five Levels of Excellence

	Sort	Simplify	Systematic Cleaning	Standardize	Sustain
Level 5 Focus on Prevention	Employees are continually seeking improvement opportunities.	A dependable, documented method has been developed to provide continual evaluation, and a process is in place to implement improvements.	Area employees have devised a dependable, documented method of preventive cleaning and maintenance.	Everyone is continually seeking the elimination of waste with changes documented and information shared.	There is a general appearance of a confident understanding of, and adherence to the 5S principles.
Level 4 Focus on Consistency	A dependable, documented method has been established to keep the work area free of unnecessary items.	A dependable, documented method has been established to recognize in a visual sweep if items are out of place or exceed quantity limits.	5S agreements are understood and practiced continually.	Substantial process documentation is available and followed.	Follow-through with 5S agreements and safety practices is evident.
Level 3 Make it visual	Unnecessary items have been removed from the workplace.	Designated locations are marked to make organization more visible.	Work and break areas and machinery are cleaned on a daily basis. Visual controls have been established and marked.	Working environment changes are being documented. Visual control agreements for labeling and quantity levels have been established.	5S agreements and safety practices have been developed and are utilized.
Level 2 Focus on Basics	Necessary and unnecessary items are separated.	A designated location has been established for items.	Work and break areas are cleaned on a regular, scheduled basis. Key items to check have been identified.	Methods are being improved but changes haven't been documented.	A recognizable effort has been made to improve the condition of the workplace.
Level 1 Just Beginning	Needed and not needed items are mixed throughout the work place.	Items are randomly located throughout the workplace.	Work place areas are dirty, disorganized and key items not marked or identified.	Work place methods are not consistently followed and are undocumented.	Work place checks are randomly performed and there is no visual measurement of 5S performance.

5S Scorecard

Item No.	Description	Rating Scale: 0-5 (0 = No 5S Evident, 5 = Out of the Box)	Score (0-5)
1	Unnecessary items are not stored in the area	5 – No unnecessary items are in the work area 1 – Personal items are mixed with and may interfere with accomplishment of required work	
2	Storage of cleaning material	5 – All required cleaning material is stored, visually marked, readily available 1- Cleaning material is shared between multiple work areas	
3	General tidiness of work area	5 – Work area is kept clean at all times 1 – Work area is cleaned once a shift	
4	Bulletin Boards	5 – Bulletin Boards are current and have no outdated material on them 1 – Bulletin Boards have outdated or torn or soiled material on them	
5	Emergency Exits	5 – Emergency Exits marked and exit plans posted 1 – Emergency Exits not clearly marked or exit plans outdated, missing or soiled	
6	Process layout	5 – General items carts, movable fixtures, etc required to perform work are labeled, have assigned places and are stored in those places when not in actual work 1 – No apparent storage location for movable items	
7	Aisle marked	5- Aisle clearly marked 1- Aisle are not marked or markings are worn-out	
8	Aisle maintained	5- Aisle are kept clean and free of clutter, use for transportation of material or personnel and not as a storage place 1- Aisle are not kept clean or used as extended work area	
9	Storage of tools	5 – All tools have clearly marked locations with positive control 1 – Not all tools have clearly marked locations limited control over access	
10	Storage of technical manuals	5 – Technical manual or publications are stored close to normal point of use and in a manner that quickly allows for inventory at anytime 1 – Technical manuals or publications are not stored close to point of use and/or required more than 30 seconds to verify all are present	
11	Equipment / Tooling cleanliness	5 – Equipment / Tooling are kept clean at all times 1 – Equipment / Tooling are not cleaned after each use or maintenance cycle	
12	Equipment / Tooling maintenance	5 – Periodic maintenance requirements are clearly understood, and a means of recording maintenance actions is utilized 1 – Periodic maintenance requirements are not know by the user	
13	Equipment / Tooling Controls ID	5 – Operating restrictions or instructions if required are clearly marked all operators are licensed 1 – Operating restrictions are not posted unlicensed operators are using items	
14	Shelves, Benches, Desks Arrangement	5 – Work area is organized in a manner that allows for flow and are clearly marked as to work performed in the area 1 - Work area is not organized in a manner that promotes flow	
15	Shelves, Benches, Desks Control	5 – Kept clear of unnecessary materials 1 – Work surfaces are clutter or have items not required for maintenance	
16	5S Control and Sustainment Plan	5- Visual controls are in place to facilitate maintaining organization Check sheets are available and utilizes to maintain 5S process 1- Visual controls or check sheets are not available or used or maintained	

The 5S Numbers Game

A fun and exciting way to present the 5S concepts to our team!

5S supply