Deploying Advanced Quality and Lean Tools to Achieve Zero Defects

5S + Safety

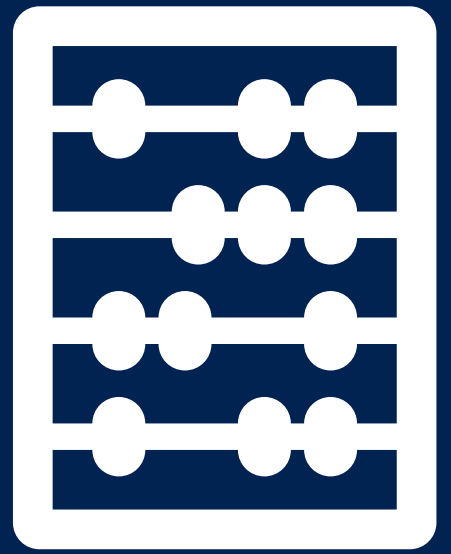
ADQT - Advanced Quality Team

LOCKHEED MARTIN

AQDT
Advanced Quality & Digital Technology
INNOVATION. PRECISION. INSIGHT

Agenda

- Training Timeline
- Training Objectives
- History of 6S:
  - Overview
  - 6S in Lean Manufacturing
- Where to Start?
- Three Types of Workplaces
- TIMIWOOD
- Benefits
- The steps of 6S
- Practical examples



Training Objectives

- Understand the fundamentals behind 6S, including:
  - Purpose
  - Relationship to lean
  - Benefits
- Explain the 6S standards
- Explain how to use 6S to organize a workplace

History

5S Lean was developed by Hiroyuki Hirano in post-war Japan, where it was famously utilized by Toyota. By integrating 5S principles into their already famous manufacturing framework named the Toyota Production System or TPS.

Toyota Motor Corporation first launched the 5S Methodology in Japan in the 1970. To streamline the Just-In-Time production process, they adopted this methodology.

5S originated in the manufacturing industry at Toyota and it has proven useful for manufacturers in many industries, not just the automotive industry.

Overview

Japanese	Translated	English	Definition
Seiri	Organize	Sort	Eliminate whatever is not needed by separating needed tools, parts, and instructions from unneeded materials.
Seiton	Orderliness	Set in Order	Organize whatever remains by neatly arranging and identifying parts and tools for ease of use.
Seiso	Cleanliness	Shine	Clean the work area by conducting a cleanup campaign.
Seiketsu	Standardize	Standardize	Schedule regular cleaning and maintenance by conducting *seiri*, *seiton*, and *seiso* daily.
Shitsuke	Discipline	Sustain	Make 5S a way of life by forming the habit of always following the first four S's

Safety – Preventing accidents and injuries while enhancing safety consciousness

6S in Lean Manufacturing

Lean Manufacturing is a way of thinking about productive systems with a focus on reducing the unnecessary — that is, eliminating wasted materials, effort, and time. This approach helps to improve overall productivity, quality, and profits. 6S fits naturally here, because it works toward a streamlined, organized, and clean workplace.

Some of the other tools under the Lean Manufacturing umbrella work particularly well in cooperation with 6S. For example:

Kaizen
Kanban
Total Productive Maintenance

The 6S System – a Key Lean Manufacturing Tool
at the Foundation of Continuous Improvement Initiatives

Where to Start?

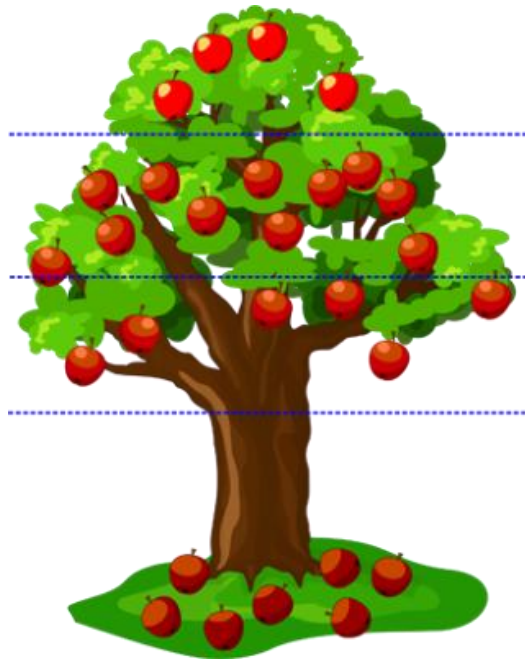
5S + Safety
1- Structure
- Work environment
- Procedures & Instructions
- Abnormalities visible

Kaizen
2- Overview & Insight
- Visual Management
- WIP Control
- CI culture

Lean
3- Stability
- Stable processes
- Eliminating waste
- Flow & pull

6 Sigma
4- Capability
- Reducing variation
- In-process control
- Statistical tools

DFSS
5- Robustness
- Robust processes
- Design for Six Sigma
- Quality Function Deployment



Three Types Of Workplaces

THIRD CLASS

People throw trash around and no one cleans it up

SECOND CLASS

People throw trash around and someone else cleans it up

Does This Happen In Our Homes?

WORLD CLASS

No one throws trash around and everyone works to keep things clean

Types of Waste - TIMIWOOD

Transportation

Inventory

Motion

Injury

Waiting

Over-processing

Over-production

Defects (Rework)

Types of Waste - TIMIWOOD

Transportation

- The movement of product, material or information that does not add value

Inventory

- Anything (material, parts, consumables) that is not being consumed in the process at that point in time

Motion

- Movement of people or equipment that does not add value

Injury

- Work related personnel injuries and poor ergonomics

Waiting

- The idle time that is created when material, information, people, or equipment is not ready before the next step can be performed

Over-processing

- Effort that adds no value from the customer's viewpoint or which adds no value to the product of service

Over-production

- Producing more than the customer needs right now

Defects (Rework)

- Work that contains errors, mistakes, or lacks something necessary which results in rework or inspection

Types of Waste - TIMIWOOD

Transportation

- Excessive Travel Distance of Material
- Items Needed Not Close At Hand

Inventory

- Material Not Easily Found
- No Floor Space
- Too Many Assets

Motion

- Inefficient Layout
- Item retrieval prolonged from disorganization

Injury

- Poor Ergonomics
- Injury Hazards

Waiting

- Waiting for someone to find the right item

Over-processing

- Searching and working through clutter

Over-production

- Doing work that was lost in the clutter

Defects (Rework)

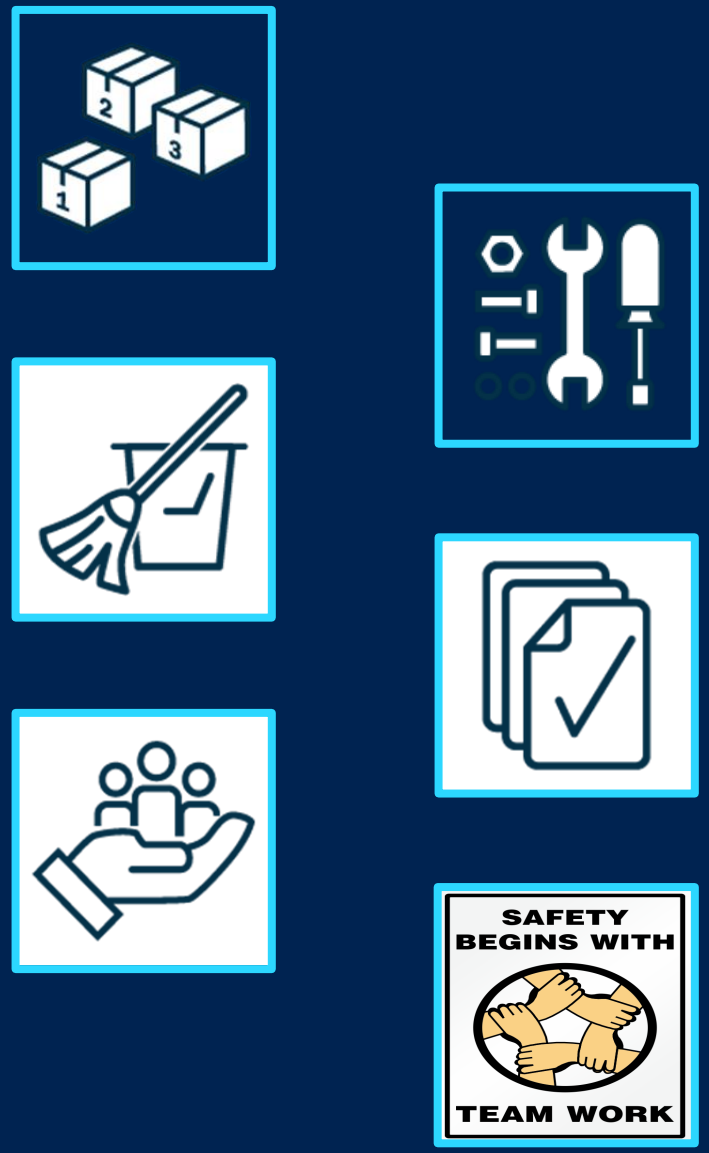
- Parts Touching Parts
- FOD Hazards

Benefits

- Better time usage
- Less wasted space
- Reduced injury rates
- Reduced equipment downtime
- Improved consistency and quality
- Heightened employee morale

The Steps of 6S

1. Sort (Organize)
2. Straighten (Set in Order)
3. Shine
4. Standardize
5. Sustain
6. Safety



1. Sort (Organize)

Eliminate that which is not needed

Step-by-step approach:

- Set up a schedule to target each area
- Remove unnecessary items in the workplace
- ***Red tag*** *unneeded items, record everything that is thrown out*
- Keep repaired items that will be needed
- Major housekeeping and cleaning is done by area
- Inspect the facility for problems, breakages, rust, scratches and grime
- List everything which needs repair
- Deal with causes of filth and grime
- Red tag grime areas and prioritize conditions for correction
- Perform management reviews of this and other steps

Steps of 6S

1. Sort (Organize)

Eliminate that which is not needed

Red-Tagging **Unknown Items**

If you find an item that you can't identify, or that has uncertain ownership, it's time to use a red tag. "Red-Tagging" temporarily attaches a highly-visible tag to the item, which notes where it was found and when. Then, red-tagged items from all work areas are collected in a single location: a "lost and found" for tools, materials, and equipment.

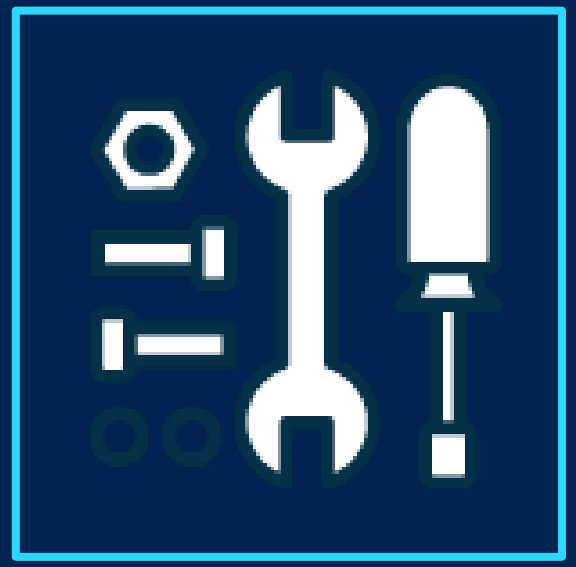
Reassigning Tagged Items

Items may wait in the red tag collection area for a long time. In that case, the original work area (where that item came from) doesn't seem to need it anymore. It may be useful elsewhere, though.

2. Straighten (Set in Order)

Organize what remains after sorting

- Have a place for everything and everything in its place to ensure neatness
- Analyze the existing conditions for tooling, equipment, inventory and supplies
- Decide where things go, and create a name and location for everything
- Decide how things should be put away, including the exact locations



2. Straighten (Set in Order)

Organize what remains after sorting

- Use labels, tool outlines, and color codes. Obey the rules. Determine everyday controls and out-of-stock conditions
- Define who does the reordering and reduce inventories
- Determine who has missing items or if they are lost
- Use aisle markings, placement for dollies, forklift, boxes. Establish pallet zones for work in process (WIP)

3. Shine

Clean and inspect the work area

- This is more than keeping things clean, it includes ways to keep things clean
- Establish a commitment to be responsible for all working conditions
- Clean everything in the workplace, including equipment
- Perform root cause analysis and remedy machinery and equipment problems
- Complete training on basics of equipment maintenance. Divide each area into zones and assign individual responsibilities
- Rotate difficult or unpleasant jobs
- Implement 3-minute, 5-minute and 10-minute 5S activities
- Use inspection checklists and perform white glove inspections

4. Standardize

Write standards for 6S

- Make 5S activities routine so that abnormal conditions show up
- Determine the important points to manage and where to look
- Maintain and monitor facilities to ensure a state of cleanliness
- Make abnormal conditions obvious with visual controls
- Set standards, determine necessary tools, and identify abnormalities
- Determine inspection methods
- Determine short-term countermeasures and long-term remedies
- Use visual management tools such as color coding, markings and labels
- Provide equipment markings, maps, and charts

5. Sustain

Consistently apply the 6S standards

- Commit to the 4 previous steps and continually improve on them
- Practice good work habits to maintain the other Ss
- Acquire self-discipline through the habit of repeating the 4 previous steps
- Establish standards for each of the 5S steps
- Establish and perform evaluations of each step
- Communicate the success of the 6S program and expand throughout entire organization

5. Sustain

Consistently apply the 6S standards

Sustaining a 5S program can mean different things in different workplaces, but there are some elements that are common in successful programs.

- **Management support**
- **Department tours**
- **Updated training**
- **Progress audits**
- **Performance evaluations**

Never “Once and Done” – Sustain is NOT the End of 5S

6. Safety

Safety begins with team work

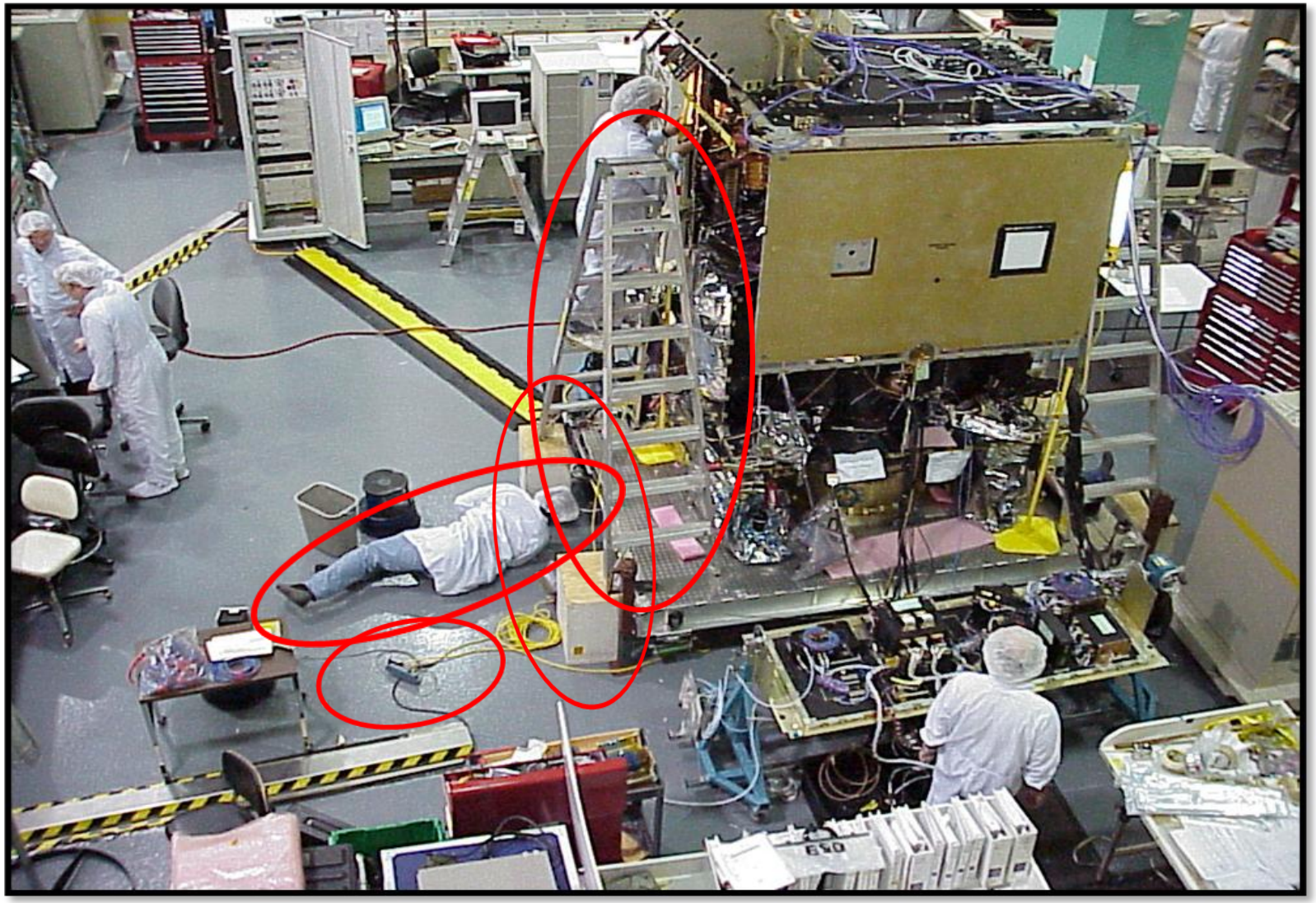
A Sixth “S” for Safety

When it comes to lean manufacturing and workplace improvement, 5S is one of the most widely known and used lean tools. It’s no surprise: 5S can increase workplace efficiency, reduce costs, and improve quality. But with many lean programs, it’s easy to focus only on those goals, and lose sight of the human factor.

Worker safety is critical. That’s why many facilities add another step to the 5S cycle, calling the result “6S” — with Safety.

Unlike the first five steps, Safety is not a sequential step

6.Safety – What is wrong with this picture?



- Extension cord plugged into another extension cord (also trip hazard)
- Tech under the ladder
- Ladder supported by wooden blocks
- Aluminum ladder in close proximity to payload (should be fiberglass)

Practical Examples

1. Sort (Organize)

Eliminate that which is not needed

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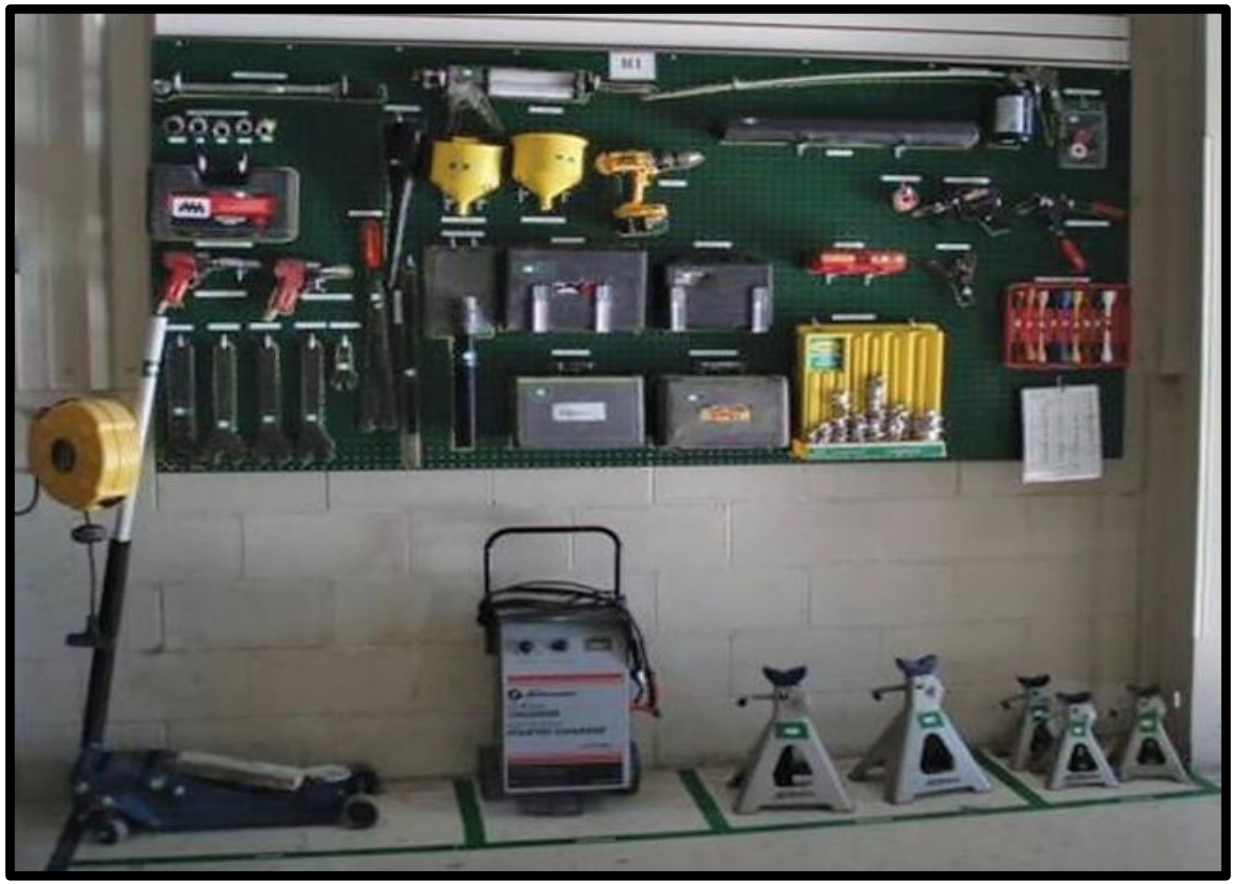
Eliminate that which is not needed

2. Straighten (Set in Order)

Organize what remains after sorting



2. Straighten (Set in Order)

Organize what remains after sorting

2. Straighten (Set in Order)

Organize what remains after sorting

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3. Shine

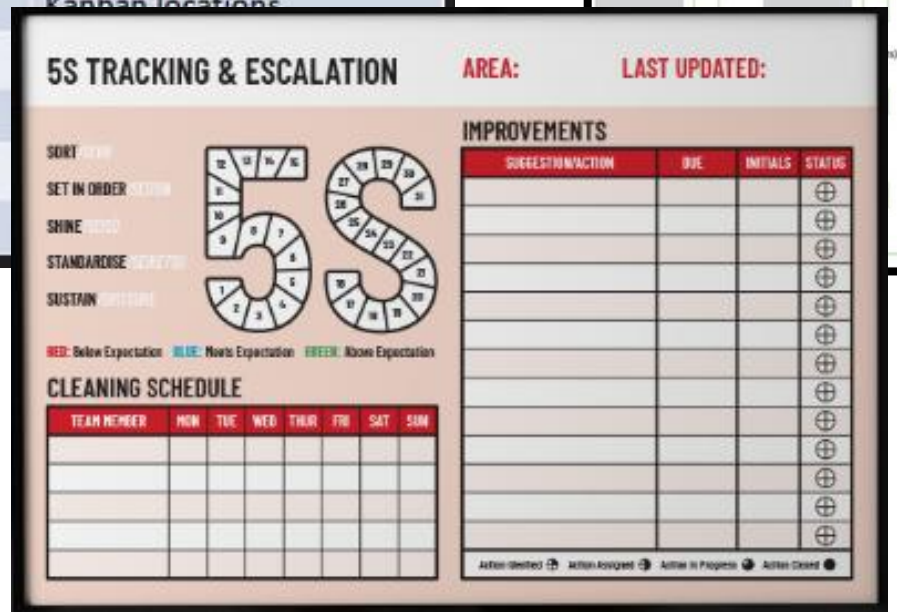
Clean and inspect the work area

4. Standardize

Write standards for 6S

5S Visual Standards

COLOR STANDARD	CATEGORY	DESCRIPTION
RED	HOLD/QUARANTINE	Rejects/Hold/Issues
YELLOW	WAREHOUSE MATERIALS	Outgoing/Incoming Materials/Palletizing Areas
GREEN	SIGNALS/TRIGGERS	Kanban locations
BLUE	TOOLS & ACCESSORIES	
BLACK/YELLOW	SAFETY/CAUTION	
BLACK/WHITE	ELECTRICAL	
RED/WHITE	WAREHOUSE LANES	



5S TRACKING & ESCALATION

AREA:

LAST UPDATED:

SORT

SET IN ORDER

SHINE

STANDARDISE

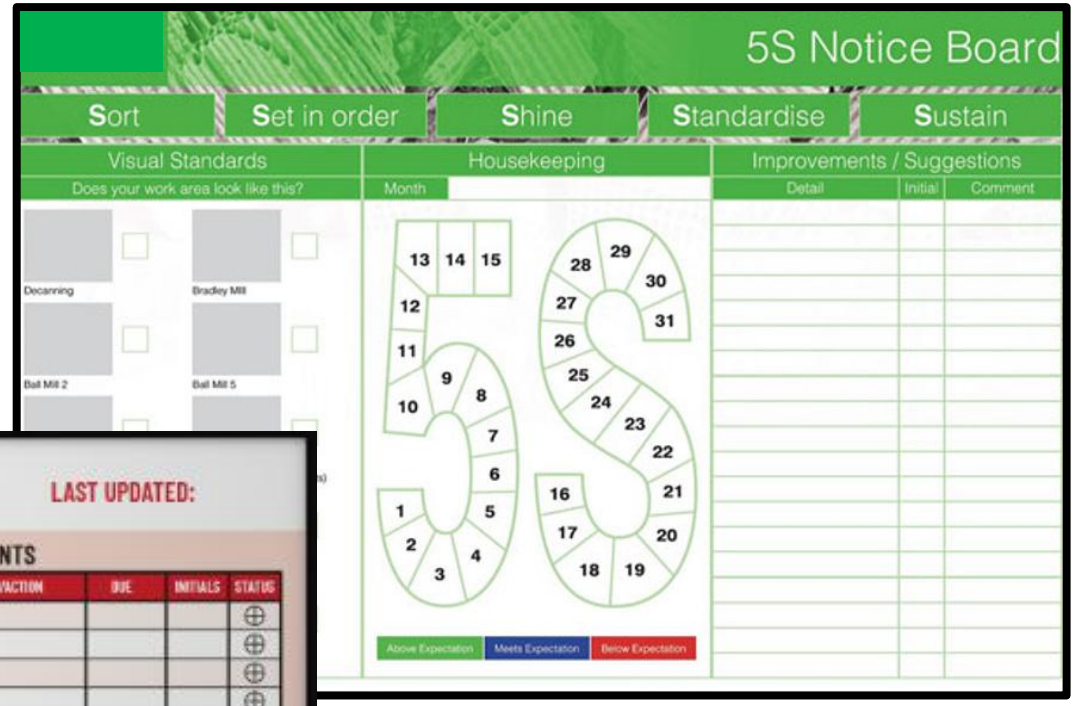
SUSTAIN

IMPROVEMENTS

SUGGESTION/ACTION	DUE	INITIALS	STATUS

CLEANING SCHEDULE

TEAM MEMBER	MON	TUE	WED	THUR	FRI	SAT	SUN



5S Notice Board

Sort | Set in order | Shine | Standardise | Sustain

Visual Standards

Does your work area look like this?

Housekeeping

Month

Improvements / Suggestions

Detail | Initial | Comment

Above Expectation | Meets Expectation | Below Expectation

5. Sustain

Consistently apply the 6S standards

Five S Workplace Checklist

Category	Item	Rating Level L0	L1	L2	L3	L4	Remarks
Sort (Organization)	Distinguish between what is needed and not needed						
	Unneeded equipment, tools furniture, and so on, are present						
	Unneeded items are on walls, bulletin boards, and so on						
	Items are present in aisles, stairways, corners, and so on						
	Unneeded inventory, supplies, arts, or materials are present						
	Safety Hazards (water, oil, chemical, machines) exist						
Set in Order (Orderliness)	A place for everything and everything in its place						
	Correct places for items are not obvious						
	Items are not in their places						
	Aisles, workstations, equipment locations are not indicated						
	Items are not put away immediately after use						
	Height and quantity limits are not indicated						
Shine (Cleanliness)	Cleaning and looking for ways to keep it clean and organized						
	Floors, walls, stairs and surfaces are not free od dirt, oil, and grease						
	Equipment is not keep clean and free of dirt, oil, and grease						
	Cleaning materials are not easily accessible						
	Lines, labels, signs, and so on are not clean and unbroken						
	Other cleaning problems of any kind are present						
Standardize (Adherence)	Maintain and monitor the first three categories						
	Necessary information is not visible						
	All standards are not known and visible						
	Checklist do not exist for cleaning and maintenance jobs						
	All quantities and limits are not easily recognized						
	How many items cant be located in 30 seconds?						
Sustain (Self-Discipline	Stick to the rules						
	How many workers have not had 5S training?						
	How many times , last week, was daily 5S not performed?						
	Number of times that personal belongings are not neatly stored						
	Number of times job aids are not available or up-to date						
	Number of times, last week, daily 5S inspections not performed						
	TOTAL						

Number of Problems	Rating Level
3 or more	Level 0 (L0)
3-4	Level 1 (L1)
2	Level 2 (L2)
1	Level 3 (L3))
None	Level 4 (L4)

5S Manufacturing Assessment

Work Area: **Key:** Use sheet to rate work area 5 times (note each date) 1 = "non-existent", - 3 = "average" and 5 = "excellent"

5S Phase	Definition	Standards To Be Met	Ratings					Next Steps
		Date of Assessment						
Sort (Seiri)	The right materials are available and anything unnecessary is removed	- Unused parts, tools and equipment removed						
		- There is nothing in the hallways impeding flow						
		- There is no excess inventory being stowed away						
		- There is no out of date signage on the walls						
Set in Order (Seiton)	There is place for everything and everything is in its place	- Shelving has clear labels or pictures for parts						
		- Floors are taped to indicate equipment locations						
		- Tool locations are marked or shadow-boarded						
		- Things are not put down, they are put away						
Shine (Seiso)	Everything is clean and in working order	- All equipment is clean and painted to show leaks						
		- Cables are bundled and there are no loose wires						
		- Cleaning tools and supplies are readily available						
		- All surfaces are dirt and grime free						
Standardize (Seiketsu)	Guidelines and practices are established to maintain first three steps	- 5S activities and locations are clearly outlined						
		- Audit forms and checklists are being used						
		- There is a 5S schedule & responsibilities are clear						
		- Quantities and limits are clearly marked						
Sustain (Shitsuke)	5S is a habit that people incorporate into their daily practice	- Leadership enforces daily 5S habits						
		- There is accountability for ongoing 5S practice						
		- 5S results are prominently displayed						
		- Employees are 5S-trained and recognized						
		Total Score	0	0	0	0	0	

Before and After 5S + Safety Implementation (Examples)

Before

After

Before and After 5S + Safety Implementation (Examples)

Before

After

Before and After 5S + Safety Implementation (Examples)

Before

After

Before and After 5S + Safety Implementation (Examples)

Before

After

Before and After 5S + Safety Implementation (Examples)

Before

After

Before and After 5S + Safety Implementation (Examples)

Before

After

Before and After 5S + Safety Implementation (Examples)

Before

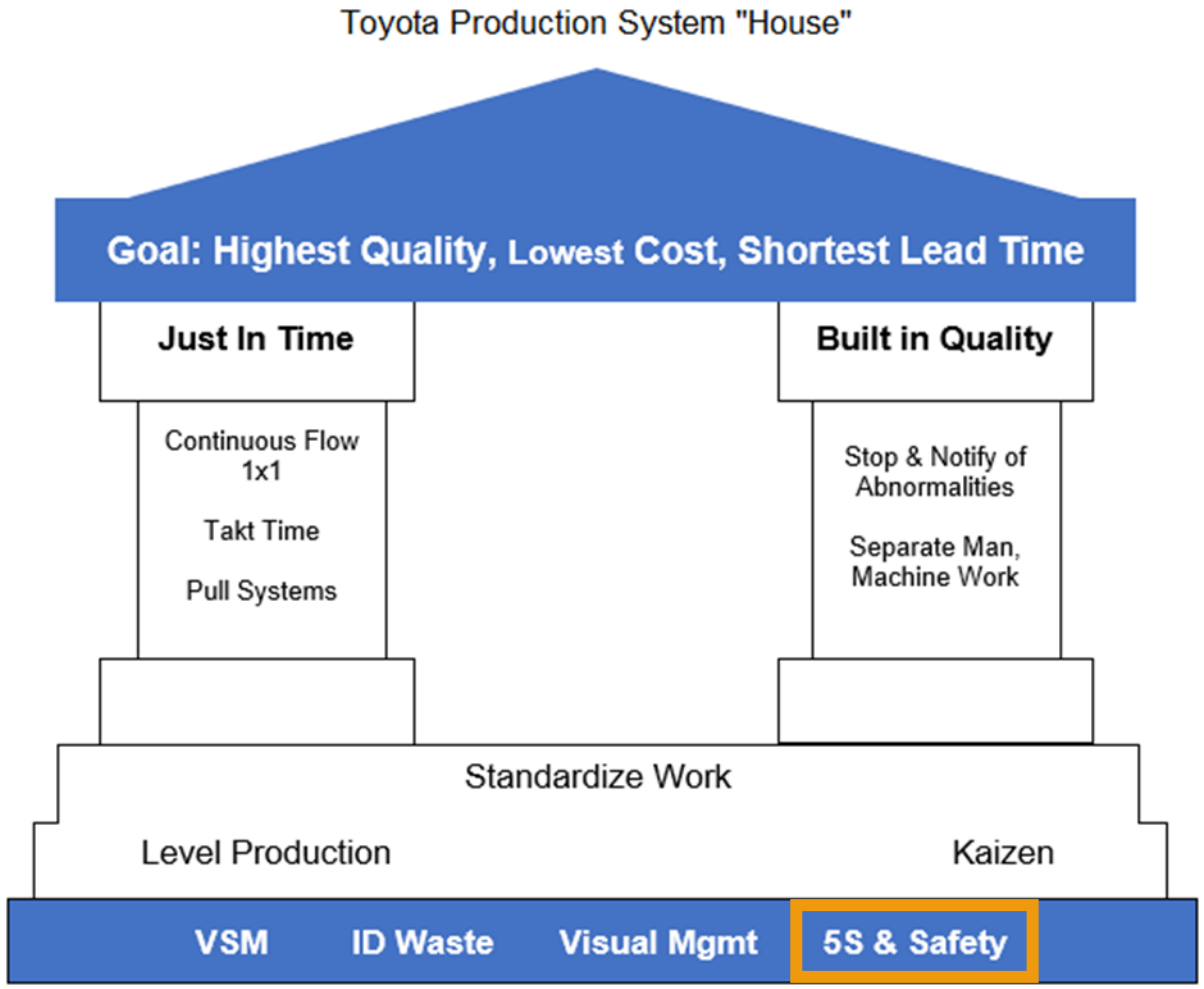
After

World Class Example

Summary

Tips for Implementing the 5S + Safety Method:

- Document each phase
- Develop clear instructions
- Measure your progress
- Implement regular check-ins
- Invest in software
- Install visual cues
- Have leadership offer support
- Be repetitious



Resources

- ASQ.org website,
  - https://asq.org/quality-resources/lean/five-s-tutorial
- Lean production website
  - https://www.leanproduction.com/5s/
- https://www.graphicproducts.com/articles/what-is-5s/
- The 5S Playbook: A Step-by-Step Guideline for the Lean Practitioner, by Chris Ortiz (Percipio Website)

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