



Engineered Space Optimization

# LEAN MANUFACTURING STORAGE GUIDEBOOK

# WHAT IS LEAN MANUFACTURING?

Lean manufacturing is an amalgamation of manufacturing methods that focus on eliminating non-value added activities and delivering high-quality products on time at the lowest cost and with the highest efficiency.

Since the beginning of the 21st century, UNEX Manufacturing has been laser-focused on developing and engineering solutions that add lean principles to our customers' manufacturing processes. From workstations to flow racks, UNEX has created multiple customized solutions that eliminate waste while increasing efficiency. The reduction of waste leads to quality products, low production costs, and, most importantly, delighted customers.

This guidebook will discuss several lean principles like the 5S philosophy, one-piece flow, and manufacturing supermarkets.

We will also highlight UNEX solutions that help you successfully implement these strategies.

# What is 5S?

5S is a workplace organization method: Seiri (整理), Seiton (整頓), Seisō (清掃), Seiketsu (清潔), and Shitsuke (躰). Translated as “Sort,” “Set In order,” “Shine,” “Standardize,” and “Sustain.” The 5S method organizes a workspace for efficiency and effectiveness by identifying, storing, maintaining, and sustaining a system. The decision-making process usually comes from a dialogue about standardization, which builds understanding among employees of how they should work.



# How To Implement a 5S Program for Your Workstation

The **5S philosophy** outlined below will guide you through implementing the program on your workstation. While reading this guide, visualize your workstation and apply the principles to your operation.

## 1 Seiri Sort

To begin, remove all items from the work area. Inspect all equipment and identify all materials critical to the function performed in a particular area. Eliminate duplicates, unnecessary things, infrequently used items, and trash. Dispose or store the unnecessary items out of the workstation area.

## 2 Seiton Set

For this step, organize the workstation area. Assign positions for all equipment, WIP, and raw materials, keeping in mind: ease of reach, identification, proximity to use. The idea is to maximize the efficiency of your layout. Think about how you perform your job and how tweaking your equipment's location could make you more productive.

## 3 Seisō Shine

This step is all about cleaning. Clean the floors, the walls, and the equipment and store all items in their designated areas. Do not put off cleaning until the idle time is available; Shine should be a part of your daily tasks.

## 4 Seiketsu Standardize

Develop standardized work procedures for the prior 3 S's. Ensure all workers understand their responsibilities and are empowered to perform all tasks. Assign an area in your facility to store non-essential equipment identified in Sort and apply the 5S philosophy to that area.

## 5 Shitsuke Sustain

Finally, Sustain. Sustaining is the never-ending step to ensure the previous 4S's implementation, and you don't slip back into your old ways. Commit to performing these steps every shift. Sustain guarantees that problems are alleviated quickly, and your workstation compensates for production changes. Continuous improvement!

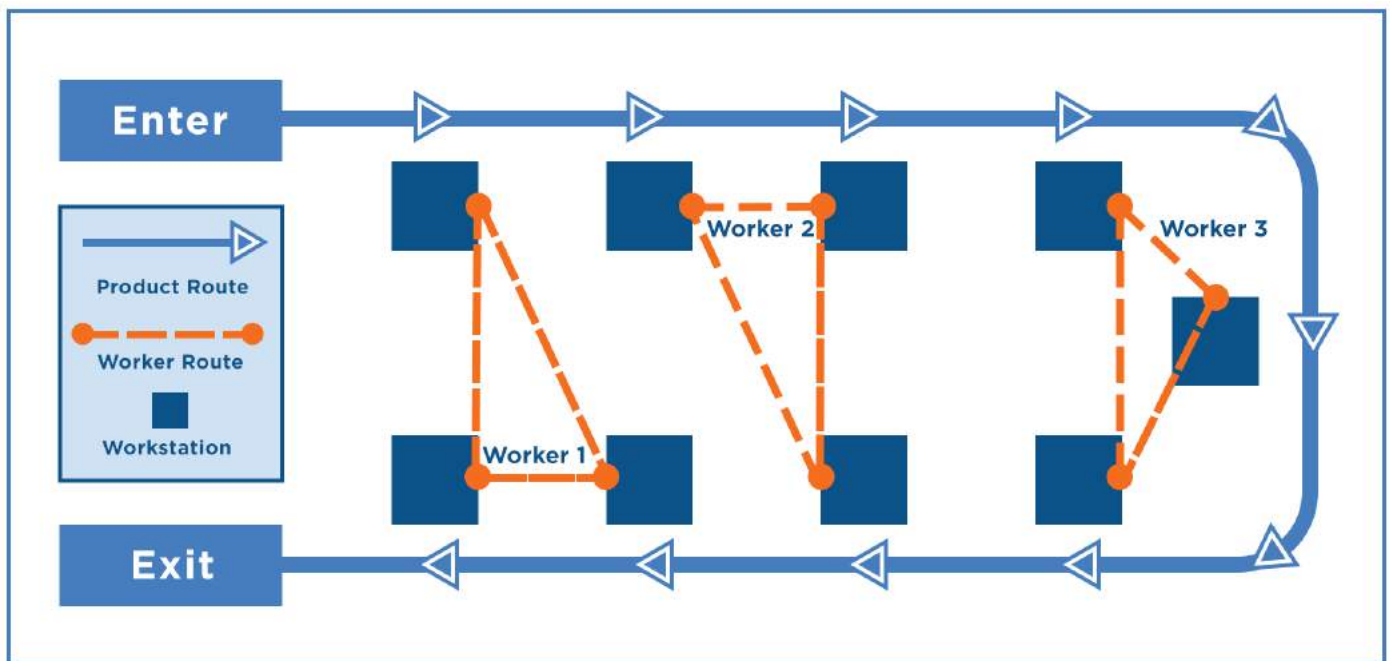


When complete, the result is a safe, lean, and clean workstation with optimized workflow, so problems become easily identified. Missing tools, empty flow racks, safety hazards, and overproduction will be apparent. You'll also be happier, working in an environment that you've taken ownership of, optimized, and made your job exponentially easier.

# How To Implement One-Piece Flows With Cell Manufacturing

One-piece flow, the opposite of batch processing, is the movement of a single product through the manufacturing process. One-piece flow redirects the workforce away from non-value added activities (waste) and focuses on the manufacturing process. With batch processing, large amounts of wastes exist in waiting, transporting, and storage of inventory. Workers maximize their output at the expense of downstream processes and increased WIP (work in process).

With one-piece flow, the **work in progress (WIP)** drastically reduces, minimizing exposure to defects in the manufacturing process and quicker reaction to fluctuating customer demands. One-piece flow creates a smoother production process, with steady workloads and shorter lead times.



Implementing one-piece flow with U-shaped manufacturing cells is a great way to eliminate waste in most manufacturing environments with moderate amounts of variability in production size and product mix. One-piece flow can have a tremendous impact on manufacturing lead times, production delays, inventory levels, and storage space requirements.



Cellular manufacturing is a system where manufacturing is split from one large line into smaller groups or cells, where one person can perform multiple functions within that cell. Products are transferred between stations by conveyor configured in various shapes (U, J, or L shaped cells), with flowracks feeding parts into the stations from the perimeter.

# Transitioning to a Manufacturing Cell

Some of the key concepts to understand when transitioning to a manufacturing cell are line balancing, ergonomics, and right-sizing.



## Line Balancing

The work performed at each station must have equivalent cycle times to keep the process smooth. Rebalancing what work is performed at a station to ensure that manufacturing is following the beat of the drum (takt time) is called "Line Balancing."



## Ergonomics

The benefits of a U-shaped cell are many. The "U" shape reduces movements, allowing the operation to move from station to station and finish at the beginning, ready to work on the next piece. Allowing the operator to perform multiple functions improves ergonomics as the job becomes less repetitive. Quality also improves as the operator becomes more familiar with parts throughout multiple station interactions.



## Right Sizing

Right-sizing an operation to meet customer demand instead of minimizing part cost is an essential technique to cellular manufacturing's success. Reducing output at the expense of part cost helps eliminate WIP, wasted space to store it, and having to walk around it.



From a space saving perspective, moving production away from the main line will allow the operations to take place in a less costly part of the operation, saving space and money.

## Set-Up Tips

- Always flow product in the same direction, counterclockwise.
- Cross-train employees to perform all or most functions within the cell to increase responsibility, quality, and traceability.
- Use a U shaped cell to minimize the distance between the beginning and the end of the process.
- Use First-In, First-Out (FIFO) to shorten lead times, reduce errors, and improve order accuracy.
- Position workstations as close together as possible to eliminate wasted space but not so close as to hinder maintenance or create discomfort for employees.
- Create a system for flowing sub-parts into the system in an optimal manner, considering ergonomics.
- Keep the path of flow within the cell clear and unhindered.

# Manufacturing Supermarkets

A manufacturing supermarket is intermediary storage on the production floor. It aims to reduce transportation waste by placing bulk storage of parts as close to the lineside as possible, without being lineside. A manufacturing supermarket mimics the functionality of a retail supermarket. Your factory workers pull components from shelves as needed for manufacturing. It works by creating miniature stock locations close to your assembly lines, allowing the lines to be replenished quickly and easily by tugger or manual carts, eliminating the need for fork truck traffic in personnel areas.



## The History of the Manufacturing Supermarket

In the 1950s, Toyota sent a delegation to the United States to study and replicate America's mass-production techniques. However, inspiration struck not in a manufacturing facility, but a Piggly Wiggly supermarket. At the grocery store, the delegation saw customers serving themselves from shelves. Workers replenish the shelves as needed. It seems pretty mundane, right? However, what we see as a standard operating procedure at any grocery store in America was a revelation to the Toyota team. They saw a system where demand dictates the amount of product stocked on the shelves. Replenishment happens from a nearby storage room without needing to order more product or put the entire inventory on the shelf.

How does this translate to manufacturing? Toyota realized that to reduce waste, they needed to store just enough of a part or material in a near-lineside position to meet the operation's demand - to condense their assembly line. If they placed their entire inventory of a part on the line, they would dramatically increase travel time to the next step in the assembly line. This travel time results in a lot of waste. The additional wasteful nonvalue activity would occur if they had to travel across the facility to restock a part on the line. The solution was to create a "storage room" as close to the assembly line as possible.

And so the manufacturing supermarket was born. Toyota created a process where intermediary storage replenishes lineside storage. Placing the storage area as close to the assembly line as possible drastically reduces wastes, such as overproduction, waiting, transportation, and motion. Think of it as a miniature distribution center within a short distance of your manufacturing processes. Instead of having to ship in more parts or crowd your assembly line, you can replenish your lineside storage as needed throughout the shift from your dedicated miniature DC.

## Setup Tips



Utilize engineered structures that address your unique storage needs.



Implement solutions that flow and store totes, boxes, and loose parts of all shapes and sizes.



Create tilted angle trays and knuckle tracks to deliver the most efficient and safe pick for your workers.

# How can UNEX help you achieve success in Lean Manufacturing?



## Modular Mobile Carts



Mobilize your staging and picking processes with FlowCell. Standard caster footplates allow any design to be mobile. Relocate inventory for easy line rebalancing. Relocate flow racks for 5S sweeping.

flow//cell



## Single Lane Cell



Improve organization and ergonomics for assembly. Narrow units with high profile tracks for fitting under or around equipment. 24" of unsupported overhang improves ergonomics.

flow//cell



## Supermarket Racks



Increase storage efficiency and ensure FIFO stock rotation. Easy replenishment from the back. Maximize space utilization away from the line. Increase pick facings reduce search and travel time.

roller//rack



## Lineside Storage



Storage to accommodate line and process changes—reconfigurable units to match today and tomorrow's demands. Increased storage density, frees up valuable space on the assembly line.

flow//cell



## Workstations



Support Lean principles, keep inventory organized and maximize efficiency. Accessories improve the functionality of flow racks. Great for sub-assembly, kitting, and packing stations.

flow//cell



## Build a UNEX Solution in Minutes.

Our FlowCell Configurator is a design tool that allows manufacturers to create the exact UNEX solution needed to optimize workflows and maximize storage.

[Click Here to Get Started!](#)