Supermarket Design

Principles of Supermarket

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Introduction - Marek Piatkowski

● Professional Background
  ● Toyota Motor Manufacturing Canada (TMMC) - Cambridge, Ontario from 1987-1994
  ● TPS/Lean Transformation Consulting - since 1994

● Professional Affiliations
  ● TWI Network – John Shook, Founder
  ● Lean Enterprise Institute (LEI) – Jim Womack
  ● Lean Enterprise Academy (LEA) – Daniel Jones
  ● LEI Poland – Tomasz Koch, President

● Lean Transformation Solutions, Toronto, Canada

www.TWI-Network.com
Supermarkets – Future State Objectives

- One Purchased Parts Supermarket near Receiving
- Small WIP Mini-Markets at Point of Use
- One Finished Goods Supermarket near Shipping
- WIP Mini-Markets located along main delivery aisles to allow timely delivery of parts
- Visual management in place – address locations, min/max levels identified, parts shortage indicators, inventory controlled by Kanban cards
- All ergonomic and safety rules followed
Who designs Supermarkets?

Design Team

Materials Management

Industrial Engineering

Manufacturing
Design Considerations

There are several basic activities that need to be understood in order to develop a material movement/supermarket plan

**Concepts**

- Layout
- Categorization
- Storage / Racking
- Addressing
- Stock Rotation
- Couple/De-couple Tugging
- Rightsizing / Repacking
- Information Flow System
- Visual Controls

**Enablers**

- Materials Organization
- Location / Layout
- PFEP – Plan-for-Every-Part
- Standard Work
- WPO – Work Place Organization
- Receiving Window Compliance
- Escalation Plans
Design Principle # 1

All parts, materials and components must be delivered to and stored in single centralized warehouse locations – called Supermarkets
Supermarket Design Principle # 1

Current State Layout

Legend
- Assembly Cell
- IM: Injection Molding
- DC: Die Cast
- MC: Machining Center
- PB: Paint Booth
- IM: Inventory Location
- Value stream inventory
- Value stream area

Legend
- Paint Booth
- Shipping Dock
- Finished Goods Storage

Value Stream Market
- Molded Parts
- Painted Parts
- Purchase Parts

Cell #1
Cell #2
Cell #3

Receiving Dock

Paint Booth

Supermarket Design
Principle # 1
Supermarket Design Principle

# 1

Future State Layout

Legend

- Raw Material
- WIP - Die Cast
- WIP - Molded
- WIP - Paint
- Purchase Parts
- Finished Goods
- Assembly Cell
- Injection Molding
- Die Casting
- Machining
- Washer
- Aisle Way

Legend

- IM
- DC
- MC
- WA

Aisle Way

Paint Booth

Shipping Dock

Resin store for molding

Receiving Dock

Finished Goods Storage Area

Paint Booth

Future State Layout

Legend

- Raw Material
- WIP - Die Cast
- WIP - Molded
- WIP - Paint
- Purchase Parts
- Finished Goods
- Assembly Cell
- Injection Molding
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Legend

- IM
- DC
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Aisle Way

Paint Booth

Shipping Dock

Resin store for molding

Receiving Dock

Finished Goods Storage Area

Paint Booth

Shipping Dock
Supermarket Design at Donnelly

Start: 9:50
Stop: 21:00
Supermarket Layout

- Supermarket layout must optimize Man/Machine/Material flow

- **Material** - overflow, safety stock, normal, stock rotation, parts utilization, cardboard, empty containers

- **Man /Machine** - minimize walk patterns (shopping), minimize mixing of Tugger (Milk Run) and forklift traffic, create “one-way streets”, information flow management
Supermarket Design Principle # 2

All parts, materials and components must be grouped into some sort of logical fashion:

- Either by family type, frequency of use, destination or suppliers
Design Principle # 3

Each part (container) must have a unique, designated, well identified storage location and address

**Good**

**Bad**

Duplicate Storage Address
Supermarket Design Principle #3

Supermarket Addressing System

This part number’s address is C5

This part number’s address is B2

This part number’s address is C3

This part number’s address is D10
Supermarket Design Principle # 3

Storage Address System

Location Indicator

Level Indicator
Supermarket Design Principle
# 3

Storage Address Labels
Rack Labeling System

Supermarket Design Principle # 3
Supermarket Design Principle # 4

Design Principle # 4

• All boxes and containers stored in the Supermarket must be “Line or Customer Ready”:
  ❖ meaning right size and weight
  ❖ 100% Quality acceptable
  ❖ any re-packing, to make boxes Customer Ready must be done in a centralized location outside the Supermarket.

Good

Bad
Supermarket Design Principle

# 4

Repacking

Repacking - Not acceptable
Supermarket Design Principle

# 4

Repacking
Single Box Flow Rack

- Advantages:
  - Maximum utilization of storage space

- Disadvantages:
  - Double handling of boxes
  - Safety / Ergonomics

- Best application:
  - Low volume consumption
  - Small / light boxes
Single Box Flow Rack
Single Box Flow Rack
**Bulk Flow Racks**

- **Advantages:**
  - Elimination of unnecessary double handling of boxes (loading and unloading the rack)

- **Disadvantages:**
  - Not the best utilization of floor space

- **Best application:**
  - High volume demand
Supermarket Design - Racks

Bulk Flow Racks
Supermarket Design - Racks

Bulk Flow Racks
Bulk Shelf Storage

- Advantages:
  - Elimination of double handling of boxes

- Disadvantages:
  - Material Handler (Tugger) and Forklift working in the same aisle

- Best application:
  - Low volume consumption (ex. Service Parts)
  - Heavy boxes

Supermarket Design - Racks
Supermarket Design - Racks

Bulk Shelf Storage
Supermarket Design - Racks

Bulk Shelf Storage

[Images of bulk shelf storage in a warehouse]
TPS - 5S Process

- Well organized material storage
- Timely material deliveries
- Reduced inventory levels
- Zero down time due to parts shortage

1. SEIRI
   SEPARATE
   Separate the necessary items from the unnecessary

2. SEITON
   ORGANIZE
   Organize each item in its optimal position in the storage area and label it.

3. SEISO
   CLEAN
   Clean thoroughly the relevant work items and the surrounding environment

4. SEIKETSU
   STANDARDIZE
   Standardize work procedures in order to assure correct material deliveries and withdrawals (pulls). Define inventory levels – Min/Max

5. SHITSUKE
   DISCIPLINE
   Disciplined application of the previous steps to maintain a well organized Supermarket
Supermarket - Design Principles

- All materials must be delivered to and stored in centralized warehouse locations – called Supermarkets.
- All parts must be stored in a unique (designated) storage locations.
- All boxes and containers stored in the Supermarket must be “Customer Ready” - meaning right size and weight and 100% Quality acceptable
  - Any re-packing, to make boxes Customer Ready must be done in a centralized location outside the Supermarket.
Supermarket - Design Principles

- Once parts are produced and identified with a Master Label (Pallet/Skid Label) they are immediately moved to the Supermarket.
- The system must be designed so the oldest parts are moved first – FIFO.
- A very strong effort should be made to eliminate any unnecessary pedestrian traffic in the Supermarket.
Purpose of a Supermarket

- The purpose of a Supermarket is to create a Buffer of inventory (Purchased Parts, WIP or Finished Goods) in order to safeguard against process or delivery variations

- Process variation can be caused by:
  - Batch (large lot) production process
  - Variation in working hours
  - Equipment breakdown or problems
  - Etc ...

- Delivery variation can be caused by:
  - Large lot and non-frequent deliveries
  - Transportation costs and distance
  - Delivery schedule changes
  - Weather
  - Etc ...
Supermarket and Lean Transformation

- Supermarket is NOT a final stage of Lean Transformation
- Supermarkets are constructed at the beginning of Lean Transformation in order to:
  - Stabilize the operation by eliminating parts shortages
  - “Protect the Customer” – short Lead Time and 100% on time Customer deliveries
  - Gain control of inventory problems – not enough of what we need and too much of what we do not need
- Ideal State is - No Supermarket !!!
  - Supply chain able to move at pace of manufacturing in component model, sequence, and mix.
  - Therefore, the little inventory that exists would be a ‘rolling inventory” delivered frequently to point of use in the manufacturing facility