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Supply Chain Inside the Walls: Inventory, Kanban, and Material Flow for Manufacturers

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Table of Contents

- **Introduction**
- **Chapter 1** The Business Case for In-Plant Logistics
- **Chapter 2** Seeing Material Flow: Principles, Waste, and Constraints
- **Chapter 3** Mapping the Inside: Value Stream Mapping for Internal Logistics
- **Chapter 4** Takt, Heijunka, and Pitch: Leveling Demand to Stabilize Flow
- **Chapter 5** From Push to Pull: Foundations of Pull Production
- **Chapter 6** Designing Supermarkets: Location, Sizing, and Control Rules
- **Chapter 7** Kanban Fundamentals: Sizing, Policies, and Exceptions
- **Chapter 8** Signal Systems: Cards, eKanban, Barcodes, and IoT
- **Chapter 9** Line-Side Presentation and Replenishment Standards
- **Chapter 10** Milk Runs and Tugger Routes: Frequency, Balance, and Safety
- **Chapter 11** PFEP—Plan for Every Part: Data, Governance, and Accuracy
- **Chapter 12** Containers, Packaging, and Kitting for Flow and Ergonomics
- **Chapter 13** Inventory Strategy: Cycle Stock, Buffers, and Safety Stock
- **Chapter 14** Supplier Integration and Inbound Cadence Design
- **Chapter 15** Production Scheduling, Constraints, and Buffer Management
- **Chapter 16** Changeovers and SMED: Protecting Flow Stability
- **Chapter 17** Internal Warehouse and Point-of-Use Storage Layout
- **Chapter 18** Material Handling Equipment and Light Automation
- **Chapter 19** Mixed-Model Assembly, Sequencing, and Variant Control
- **Chapter 20** Quality at the Source and Error-Proofing in Logistics
- **Chapter 21** Metrics and Governance: Turns, Service, Cost, and Space
- **Chapter 22** Analytics, Simulation, and Digital Twins for Material Flow
- **Chapter 23** People, Skills, and Change Leadership in In-Plant Logistics
- **Chapter 24** Sustainability and Space Utilization in Material Movement
- **Chapter 25** Implementation Roadmap: From Pilot to Plantwide Deployment

Introduction

Manufacturers win or lose inside the walls. While strategy, sales, and sourcing matter, the daily reality of production is determined by how reliably materials move from receiving to line-side and back again. This book is about that reality—the in-plant supply chain that links suppliers, supermarkets, routes, and workstations into a steady rhythm. It offers practical methods to shorten lead times, lower inventories, and cut handling costs without starving production or overburdening people.

You will not find abstract theory here for its own sake. Instead, we focus on proven tools—Kanban, supermarket systems, milk runs, PFEP, and pull scheduling—and show how to combine them into a coherent operating system. We translate principles like takt, heijunka, and pitch into concrete design choices: where to place a supermarket, how many containers to circulate, how often to run a tugger, and how to set visual controls that keep everyone aligned. The aim is to help operations managers and logistics leaders balance inventory with responsiveness while protecting quality and safety.

Inside the plant, flow competes with variability. Demand fluctuates, processes change over, suppliers slip, and minor disruptions cascade into shortages or excess. The response is not to push more material “just in case,” but to architect the flow so that small disturbances are absorbed and detected early. That means right-sizing buffers, standardizing replenishment, and using clear signals that trigger action at the right time. With the right design, material moves in small, frequent, predictable increments that match the pace of production.

Data discipline underpins everything. A robust Plan for Every Part (PFEP) clarifies packaging, container sizes, storage locations, replenishment methods, and supplier cadence for each item. When PFEP data is accurate and visible, Kanban sizing becomes straightforward, supermarket slots stay correct, and route timing holds. Whether signals are cards on racks or electronic triggers integrated with scanners and IoT sensors, the data model ensures that the physical system behaves as intended.

Technology can amplify good design but cannot rescue poor fundamentals. Before automating, we will define standard work for line-side presentation, design safe and efficient routes, and make abnormalities visible through boards and andon-style cues. Only then do we layer on eKanban, digital twins, or analytics to tighten responsiveness and reduce manual effort. The goal is not gadgetry but dependable flow that operators and material handlers trust every shift.

The journey is as much about people as it is about parts. Successful in-plant logistics

requires clear roles, cross-functional governance, and practical training for planners, tugger drivers, supervisors, and engineers. We emphasize change leadership—engaging teams in simple pilots, proving performance with facts, and scaling with discipline. Along the way, we use a common set of metrics—inventory turns, service level, handling cost per unit, space utilization, and replenishment reliability—to guide decisions and sustain gains.

Finally, this handbook is designed for action. Each chapter blends principles, design checklists, example calculations, and pitfalls to avoid. Start anywhere your plant hurts most—stockouts, congestion, excess WIP, or unreliable routes—and use the methods to stabilize and improve. As flow strengthens, quality improves, cash frees up, and lead times compress. That is the promise of a well-run supply chain inside the walls.

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CHAPTER ONE: The Business Case for In-Plant Logistics

The manufacturing floor is a bustling ecosystem, a dynamic ballet of people, machines, and materials. While often overlooked in favor of flashier external supply chain strategies, the internal movement of materials within a factory, known as in-plant logistics or intra-plant logistics, is the silent engine that drives production efficiency and profitability. This internal dance, encompassing everything from receiving raw materials to delivering finished goods to dispatch, is where the rubber truly meets the road for manufacturers. An efficient in-plant logistics system ensures that materials arrive at the right place, at the right time, and in the right quantity, directly supporting production efficiency, safety, and on-time delivery.

Many businesses often focus on the external components of their supply chain, such as raw material sourcing and outbound logistics, and neglect to adequately address their internal operational gaps. This oversight can be costly, as the internal supply chain plays an intricate and crucial role in producing the final product that will eventually reach the customer. If even one link in this internal chain falters, it can create a domino effect, impacting all other areas of the business and ultimately the quality and timely delivery of the finished product.

The immediate and most tangible impact of well-managed in-plant logistics is a significant reduction in operational costs. Poor internal logistics can lead to a host of financial drains, including increased expenses related to storage, unnecessary transportation, and inefficient labor usage. Conversely, by streamlining processes and reducing waste within the factory walls, manufacturers can lower these operational costs, freeing up capital that can be reinvested in other areas of the business.

Inventory, often a necessary evil, becomes a costly burden when mismanaged. Excess inventory ties up valuable capital, consumes precious storage space, and can lead to obsolescence. In-plant logistics, when optimized, ensures that materials are supplied precisely when and where they are needed, significantly reducing the need for large safety stocks and enabling better inventory control. This lean approach to inventory directly supports just-in-time (JIT) production strategies, which aim to minimize inventory levels across the entire supply chain.

Delays are the bane of any manufacturing operation, and poor in-plant logistics are a prime culprit. When materials are not delivered to the shop floor on time, production lines grind to a halt, causing costly downtime and disrupting carefully planned schedules. These internal delays can cascade, leading to longer overall lead

times—the total time from when an order is placed to when it is delivered to the customer. Shorter and more predictable lead times are a direct benefit of optimized material flow, allowing for more precise demand planning and ultimately enhancing customer satisfaction.

Beyond the immediate financial and operational benefits, effective in-plant logistics contributes significantly to improved quality control. A stable and systematic material flow reduces the chances of material mix-ups and handling errors, supporting consistent quality checks throughout the production process. Minimizing damage and contamination, especially for sensitive components, directly translates to fewer defects, less rework, and a higher quality finished product, which in turn leads to increased customer satisfaction.

The pursuit of efficiency within the factory also fosters a safer and cleaner work environment. Optimizing material flow inherently reduces unnecessary movement and manual handling, thereby mitigating risks associated with workplace accidents. A well-organized plant with clear flow paths and designated storage areas improves overall mobility and reduces congestion, making the environment safer for operators and material handlers alike.

In essence, in-plant logistics is not merely about moving things from point A to point B; it's about orchestrating a symphony of movement that underpins the entire manufacturing process. It's the silent hero that, when performing optimally, translates into a more productive, cost-effective, and responsive manufacturing operation, ultimately contributing to a stronger competitive advantage in the marketplace. By understanding and actively managing the internal supply chain, manufacturers can unlock a hidden goldmine of opportunities for sustained growth and success.

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