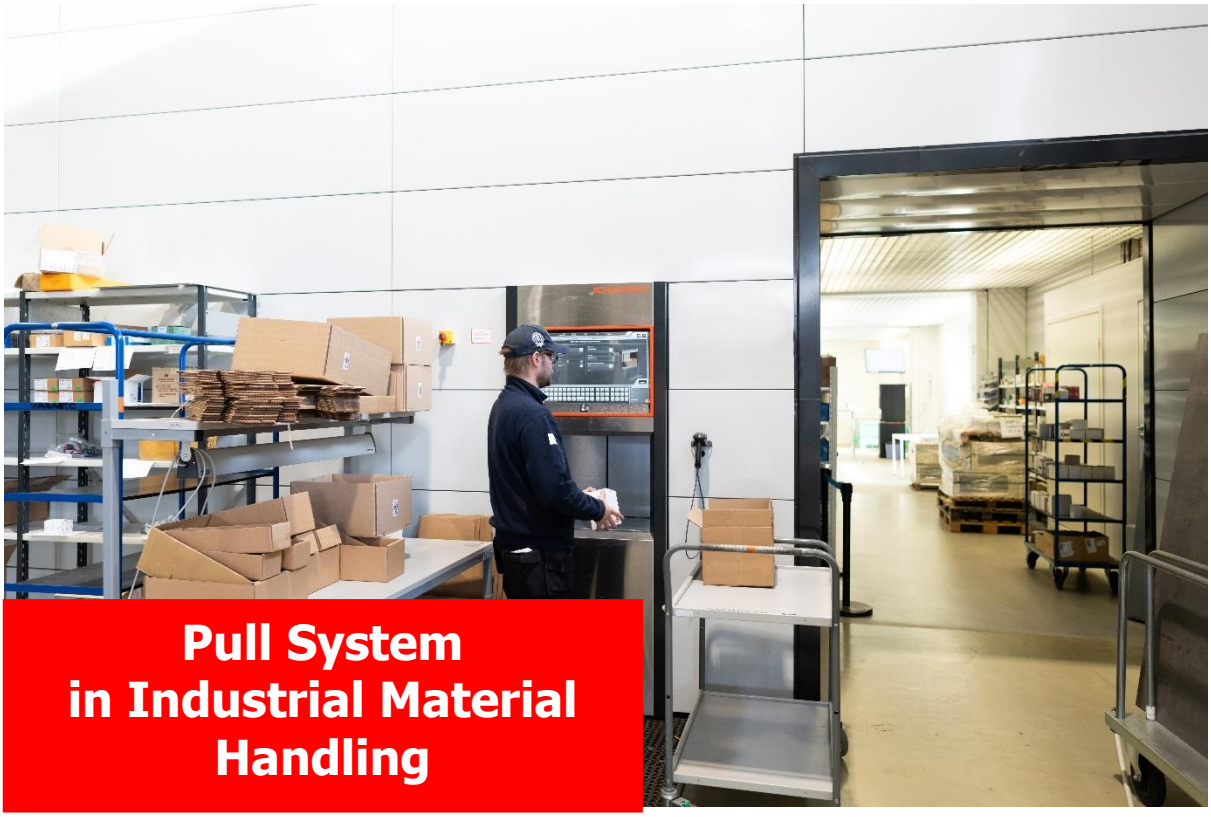

Pull System in Industrial Material Handling

"The more inventory that a company has, the less likely they will have what they need." /Taiichi Ohno/ [The Toyota Way, 14 management principles from the world´s greatest manufacturer]

Konecranes Agilon automated warehouse is a unique solution to implement a replenishment process that is controlled by the customer. With Agilon, the need is created automatically by using material management data. Agilon can handle all the needed transaction phases including delivered POs to vendors and goods receiving at the buyer's site. Agilon can control the material usage, how much is taken out and how much is delivered. Agilon makes it possible to manage the supplier base without vendor integration to factory material management according to LEAN -principles.

When the customer owns the replenishment process, the role of the vendor is to only feed the process with the items. There are also some technical solutions for these type of cases in the marketplace. The feature is available in some ERP systems.

There are two major principles to manage material flow: PUSH and PULL. Traditionally, PUSH systems try to predict the future and design a perfect process. As a result, the correct stock levels, the replenishment schedule, and the quantity is calculated together into an ideal process flow. Input for such calculations includes the planned production level, bill-of-material (BOM) and the delivery times of the supply chain. This predictive calculation, or Material Resource Planning (MRP), can be very complicated and time consuming. Some of the weaknesses of PUSH systems include a slow reaction time to changes in the demand, production process or supply chain. This can lead to problems like overstocking, an increased amount of work-in-progress (WIP) or an inability to meet customer demands. 6

PULL systems, on the other hand, are designed based on real consumption, instead of predicted consumption. Just-in-time (JIT), right parts the with right amount at the right place when needed. That is what The Toyota Production System (TPS) has advised us to aim for now for decades. To make it working and real, TPS lists five focus areas in the process design.

1. Plan production flow based on selected ***Takt Time***. This gives a framework on how to control utilization and capacity in the process.
2. ***Continuous Flow*** means that the material flow is process driven and planned for the minimum waiting time before the next phase.
3. In ***Pull System***, replenishment and process is controlled by a consumption impulse. At the end of the line, it is tricked by the customer need. This paper describes pull systems in more detail.
4. Making the production process agile requires ***Quick Changeover***.
5. Integrated Logistic chain means to reduce gaps in the logistic chain.

Figure 1 *The Toyota Production System (The Toyota Way – Jeffrey K Liker 2004). Pull system as a part of Toyota Production System concept.*

TPS teach us to use Pull System to avoid overproduction. The basic principle is that the customer need launches a pull impulse into the process. This impulse then indicates a need for a component replenishment. To meet the customer demand, the material flow is controlled with parameters like replenishment schedule and batch size. The design principle aims to obtain a stable process within certain agility tolerances. If greater changes are required, the role of the agility control becomes more important to re-gain the process efficiency. Pull system works well when there is a balance between the market demand and the cost of agility for the business to tolerate changes.

Typically, pull is created by using visual Kanban elements, like cards and containers. These elements signal a need for a replenishment after a batch of items or parts have been consumed. For example, an empty bin in the production cell is an indication for the warehouse to replenish.

Production volume is controlled by a number of Kanban elements in the process. If the market grows, one more Kanban element is added to the production. When the demand decreases, elements are reduced. Literature calls this adjustment *quantitative ability*.

When the product changes, item contents and bill-of-material in the process are also altered to meet the new requirements. This is called ***qualitative ability***. In a visual Kanban process, one change might require several changes on the factory floor. Cards and bins must be adjusted to the new situation.

Agility in the process creates competitiveness. An important part of the operational excellence in material handling is to implement control by using both quantitative and qualitative changes.

Typically, Kanban is used for low value processes. MRP tools and principles are more likely to be applied in the sourcing of high value items. For asset management reasons, the stock balance and timing are more important parameters in the material planning. The lead time is affected by, for example, when purchase orders are placed against sales orders. The cost of managing the purchases increases the transaction costs. For high value items this can be justified. However, for low value items, the transaction costs might be too high. High transaction costs are a reason why there are several solutions in the marketplace that streamline the transactions between the vendor and the customer.

When designing a pull system, crossing the customer-vendor boundary, it is important to realise who owns the process. Often, the replenishment process is part of the vendor's product. The customer's business is thus based on the costs **direct line feed,** in addition to the item price. In this case, the vendor owns the process. Demand for profit is justified by the fact that the vendor is carrying the risks and the costs related to making the items available, just-in-time.

When looking for alternatives for pull system in industrial material handling, challenge your current knowledge. Make sure to check the latest in the market: Agilon® automated warehouse - manage and handle thousands of packages efficiently | Konecranes

Veli-Pekka Vuoti
Director, Operations
Konecranes Agilon
veli-pekka.vuoti@konecranes.com

Vesa Hämetvaara
Director, Business Development
Konecranes Agilon
vesa.hametvaara@konecranes.com