

Pull Systems Must Fit Your Production Needs

Pull production sounds simple enough: downstream activities signal their needs to upstream activities. But many managers stumble with implementation because they don't appreciate that there are three basic types of pull systems. Which system is best depends on the manufacturing environment. Here is an overview, along with the pros and cons of each system.

Supermarket Pull System

The most basic and widespread type, this is also known as a fill-up or replenishment or A-type pull system. In a supermarket pull system, each process has a store -- a supermarket -- that holds an amount of each product it produces. Each process simply produces to replenish what is withdrawn from its supermarket.

Typically, as material is withdrawn from the supermarket by the downstream customer process, a kanban or other type of information will be sent upstream to the supplying process to withdraw product. This will authorize the upstream process to replace what was withdrawn. Each process is responsible for the replenishment of its supermarket, so daily management of the worksite is relatively simple and kaizen opportunities are relatively easy to see.

Pros: Ready to ship all items on short notice.

Cons: Requires lots of space and inventory for each part number, which may not be feasible if the number of part numbers is large.

Sequential Pull System

A sequential pull system -- also known as a B-type pull system -- may be used when there are too many part numbers to hold inventory of each in a supermarket. Products are essentially made to order while overall system inventory is minimized. In a sequential system, the scheduling department must set the right mix and quantity of products to be produced. This can be done by placing production kanban cards in a heijunka box, often at the beginning of each shift. These production instructions then are sent to the process at the upstream end of the value stream.

Production instructions often take the form of a "sequence list," sometimes called a "sequential tablet." Each following process simply produces in sequence the items delivered to it by the preceding upstream process. A first-in, first-out (FIFO) sequence of individual products must be maintained throughout the production process.

A sequential system creates pressure to maintain short and predictable lead times. For this system to work effectively, the pattern of customer orders must be well understood. If orders are hard to predict, production lead time must either be very short (less than order lead time) or an adequate store of finished goods must be held. A sequential system requires strong management to maintain, and improving it may be a challenge on the shop floor.

Pros: It requires less inventory and associated waste than replenishment pull systems.

Cons: It requires high process stability, short lead times to produce items, and strong management

Mixed Supermarket and Sequential Pull System

The supermarket and sequential pull systems may be used together in a mixed system, also known as a C-type pull system. A mixed system may be appropriate when the 80/20 rule applies, with a small percentage of part numbers (perhaps 20%) accounting for the majority (perhaps 80%) of daily production volume. Often an analysis is performed to segment part numbers by volume into (A) high, (B) medium, (C) low, and (D) infrequent orders. Type D may represent special order or service parts. To handle these low-running items, a special type D kanban may be created to represent not a specific part number but rather an amount of capacity. The

sequence of production for the type D products is then determined by the method the scheduling department uses for sequential pull system part numbers.

Such a mixed system enables both the supermarket and sequential systems to be applied selectively and the benefits of each are obtained, even in environments where the demand is complex and varied. The two systems may run together, side-by-side horizontally, throughout an entire value stream, or may be used for a given part number at different locations along its individual value stream.

A mixed system may make it more difficult to balance work and identify abnormal conditions. It also can be more difficult to manage and conduct kaizen events. Therefore, discipline is required to make a mixed system work effectively.

Pros: A mixed system is particularly effective when the majority of items are repeat orders, but many infrequent items are needed.

Cons: It requires daily equipment stability and mixed production control.

About the author: Art Smalley was one of the first foreign nationals to work for Toyota Motor Corp. in Japan. From the late 1980s to the mid-1990s, he helped Toyota transfer its production, engineering, and management systems to facilities around the world.

Art Smalley is the author of a new book from the Lean Enterprise Institute (LEI), *Creating Level Pull*.