

# The Message in the Milk Bottle

By Dave Garwood

Kanban, sometimes considered as being synonymous with Demand Pull or a 'pull system', is a simple and potentially effective technique. Here's how it works. A small inventory is maintained for each item (product or part) and replaced when the customer (next work station or downstream internal customer) signals that they've consumed the inventory. "Only replace what you have used" is the mantra.

The Kanban technique is a tool frequently incorporated in pull systems. Understanding how it works and the foundations that must be in place for it to be effective are critical for pull systems to be effective. Unfortunately, Kanban is often deployed without being aware of the necessity of these basic foundations. Disappointment is the result!

The Kanban technique was originally conceived by the home delivery milkman. That's right. The original Kanban signal was an empty milk bottle! When you needed milk, you placed your empty bottles on your porch, which the milkman replaced with full bottles.

Kanban signals may be empty containers, cards, taped off squares on the floor, colored golf balls, or any other conceivable, physical signal. Kanban is a reorder point system with a Japanese name!

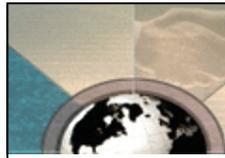
Frequently, some misguided soles incorrectly proclaim "pull systems" eliminate the need for forecasting. This is rarely, if ever, true. It almost always takes longer to buy parts/materials, then fabricate components and perform assembly (or filling or finishing) than the customer is willing to wait for delivery. We can debate who does it, how they do it and how effective they are but forecasting is mandatory.

Other misguided soles might even claim ERP (or MRP II) is not needed if "pull systems" are in place. Not true. This is a clear sign that we likely have a semantics problem.

Kanban is often associated with Lean Manufacturing or JIT, even sometimes considered to be synonymous. In fact, some people erroneously thought Kanban was Lean or that Lean couldn't be done without Kanban. Since Lean is considered as "goodness", many companies tried to shoehorn Kanban into their company. Sometimes they were successful, sometimes they weren't. The degree of success depends on getting a few essential foundations or prerequisites in place prior to using Kanban.

## Essential Kanban Prerequisites

Kanban can be applied in many situations, but the magnitude of the effectiveness depends on the degree of compliance with a few prerequisites. These are:



**1. The Pull Rule must be in Effect.** The Pull Rule (versus the Push Rule) means an item can only be made after the Kanban signal is received. No signal; no production. The Kanban signal is the production or material movement authorization. With the Push Rule the next item on the schedule is made immediately after finishing the last one, regardless of inventory levels or when it is needed in the future. Authorization for making or moving more is not required. A so-called "Pull System" is the result of combining the Kanban technique with the Pull Rule. The Pull Rule requires making only as much as we need and when we need them, not as much as we can. Production is stopped if product or parts are not being consumed. This conflicts with traditional equipment utilization measurements, requiring this metric to be abandoned.

**2. Repetitive Usage.** Kanban assumes we are going to use more of the item just consumed. This is a valid assumption for repetitive use, low demand variability items. On the other hand, it's a dangerous assumption for non-repetitive items like one-time specials, seasonal items or items with highly erratic demand such as low annual usage items. Linear master schedules and thus repetitive component usage is an initiative associated with properly managed ERP/MRP II systems. The Kanban technique must be modified for non-repetitive use items and the benefits of Kanban are minimized when this is done. Kanban is most applicable for high volume, low mix products and their components. ERP/MRP works best for low volume, high mix products.

**3. Very Few Items.** Remember: Kanban is based on having some inventory at all times of every item and triggers immediate replacement of inventory when it is consumed. A large variety of items (ie many SKUs or many product options) would require some inventory of all of them. The total inventory will be huge if there are many varieties and flavors of items and Kanban may not be practical in these conditions.

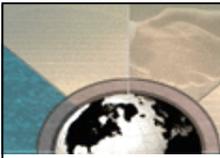
**4. Very Small Lot Sizes.** Kanban signals when to make more. How many to make (Kanban lot size) is an independent question. Large lot sizes could tie up a piece of equipment for a long time while making one individual item, increase the queue, lengthen lead times and thus increase the Kanban inventory. But, before small lot sizes can be economically manufactured, obstacles such as long setup or changeover times must be eliminated. Lot size reduction is an effort usually associated with Lean. Extra material handling to frequently issue material or many transactions to record material issues are two additional obstacles created with small lot sizes. Moving to a point-of-use inventory and backflushing bills of material to reduce inventory transactions is usually required. These techniques could be considered part of MRPII, Lean or any buzz word.

**5. Very Short Lead Times.** The downstream work center must be able to quickly produce what is used and replenish the inventory. Otherwise, Kanban signals must be triggered long before the inventory is used up, thus potentially increasing the total inventory. Lead time reduction requires excellent capacity management to keep the Queue or wait time short and under control. This could be the result of both Lean and ERP/MRP II initiatives.

**6. Very Few Rejects.** If material waiting to be consumed is frequently found to be defective, buffer inventories are required to avoid production delays. The benefits of smaller inventories with Kanban are then reduced. Raising quality and reducing defects is a contribution from Total Quality (TQM) initiatives.

**7. Excellent Material Planning.** The material must be there to make more when the Kanban signal is received. This won't happen by accident. Material doesn't just magically fall out of the sky when the Kanban signal appears. Kanban without excellent material planning means heavy-duty expediting! Valid master schedules, accurate bills of material and inventory records and on-time deliveries are essential to high performance material planning. This is where ERP/MRP II is needed.

**8. Excellent Capacity Planning.** If the number of Kanbans being received exceeds the number of Kanbans being filled, ie the amount of work to be done exceeds the capability, lead times



will increase. This is a capacity issue. The cells or work centers (or suppliers) need visibility of future capacity increases (or decreases) in order to have adequate time to adjust capacity. Waiting until more (or less) Kanban signals show up may be too late. Therefore, they must have visibility of future capacity requirements. For example, if the milkman pulled into the driveway and found 5,000 empty milk bottles on the front lawn he needs more cows! The lead time to "install" more cows (increase capacity) could be a problem! The visibility of capacity requirements comes from projections that are inherent in ERP/MRP II.

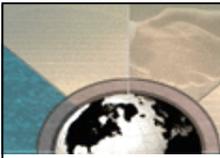
**9. Kanban levels to trigger replenishment and the Kanban lot size must be frequently reviewed and re-sized.** The level of inventory when Kanban signals should be launched is based on anticipated usage in the future. When a Kanban signal is launched, the assumption is the remaining inventory will satisfy demand until we get more. For example, if we send a Kanban signal when 100 pieces are in inventory, we expect to get more within the planned lead time before the 100 pieces are used. How much more we expect to get is the Kanban lot size, say 250 in this example. The assumption is demand during lead time is less than 100. Frequently, some safety stock allowance (thus additional inventory) is baked into the Kanban trigger level calculation to absorb some demand variation during lead time. When the demand consistently exceeds (or consistently is less than) the planned usage and the Kanban is not re-sized, excess inventory or shortages will occur. Seasonality in demand also requires periodic Kanban recalculations.

All of these prerequisites must be satisfied before Kanban will be effective and thus the pull system is effective. This may require reducing setup times, changing traditional performance measurements, linking Kanban sizing to projected requirements or improving the scheduling system and sometimes even redesigning the product. But here's the key point. What are usually perceived as benefits of Kanban or pull systems are, in fact, the result of laying these foundations! Fail to build the foundations and the results will be very disappointing, at best. How do we meet these prerequisites? In almost all companies the prerequisites are not met for most of the products or parts//and might never be met.

While recently on a plant tour, I asked the plant manager why Kanban was used on less than 30% of the parts (which I find to be typical). His response, "Kanban is very effective but only for parts with very repetitive demand, short lead times, small lot sizes, reliable quality, etc". Sound familiar? In fact, the use of Kanban, and thus pull systems, is limited to high volume, low mix products. ERP is needed to manage the rest of the parts or products. So, beware if elimination of ERP is being touted. This will rarely, if ever, happen.

#### Kanban and the Balance Sheet

In many cases, the use of Kanban has no effect on the total inventory and thus the balance sheet. In many situations Kanban is used as a material movement technique, not a signal to produce more. Kanban signals the stockroom to "pull" inventory and move it to a point-of-use location on a production line. This is essentially a two bin system. The prerequisites such as short lead times, small lot sizes, defect free etc. are easily satisfied. Inventory value on the balanced sheet is not impacted, just the location and maybe the classification, stockroom vs. WIP, of the inventory.



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In other cases, Kanban is used to authorize or trigger production. The Kanban signal (essentially a reusable work order in this case) is sent to a producing department and they make a new item or part, thus, additional inventory on the balance sheet.

Make sure you understand which application you are using before setting expectations for results from Kanban and pull systems.

### Supplier Kanban

Kanban can also be used to trigger the supplier to deliver more material. Again, the Kanban principles or foundations, especially short lead times and small order quantities, are essential for this approach to be effective. Suppliers frequently satisfy the short lead time requirement by maintaining an inventory of the part at their plant (or distribution location). Some companies have historically referred to this as “consignment” inventory. The Kanban signal triggers shipment from the supplier’s inventory to the customer’s inventory. The suppliers still need a projection of future requirements to plan their production to replenish the inventory and thus have it in stock when the next Kanban arrives. The “quality” of those projections is the critical factor for supplier Kanbans to be effective. And the Kanbans need to closely match the projections. Good planning prior to “Kanban arrival” is an essential ingredient.

The meaning of “Supplier Lead Time” significantly changes when using supplier Kanbans. Is supplier lead time the time to move, ie ship from inventory (typically a short transportation time), or the time the supplier needs to respond to significant changes in projected demand? The latter is usually much longer. Understanding the difference in these two lead times is critical to making supplier Kanban effective. The “customer” has a huge responsibility to project reliable requirements. The customer’s responsibility is not as simple as mandating short lead times from the suppliers.

### Which Acronym Gets the Credit?

In order to satisfy the Kanban (and thus pull systems) prerequisites do we use Lean? TQM? MRP II? ERP? The answer is yes, yes, yes, yes! Kanban is not indigenous to Lean, Demand Pull, Pull System, MRPII/ERP or TQM. Effective pull systems require tapping into the techniques associated with each of these acronyms.

Reducing lot sizes, shortening lead times, excellent material planning, reducing defects, performing to schedule and providing visibility of capacity requirements will yield benefits with or without the Kanban technique. The payoff comes from focusing on the prerequisites, not the form of the Kanban signal.

And that’s the message the milk bottle!