

## **The Wonder of Level Pull – April 2004**

Many years ago in Toyota City I first witnessed the twin concepts of level production and the smooth pull of needed items throughout a complex production operation. My education occurred at a supplier of components to Toyota assembly plants that had created a small and precisely determined inventory of finished components near the shipping dock. (And I had thought Toyota suppliers in Japan had no inventories!) It used the finished goods inventory to decouple itself from any day-to-day and hour-to-hour gyrations in Toyota's demand as expressed through frequent deliveries of kanban. (And I had thought that there were no fluctuations in Toyota's demand!)

My guide explained that the supplier had carefully calculated Toyota's average demand for components, by total volume and by mix within this total, and was running a level production schedule at the pacemaker process (which was component final assembly). Placing a precisely calculated amount of inventory at the downstream end of the facility effectively created a sea wall that protected all of the up-stream production operations from disruption by sudden waves of demand. This permitted internal inventories at every point in the process to be very small, leading to low total inventories in the plant.

My guide also pointed out that information management was "reflexive" in the sense that each step in the process simply signaled its immediate need to the next upstream step in the process. There was no need to send information to a "central brain" in the form of a computerized Material Requirements Planning (MRP) system that could then tell every process step what to do and when. The analogy he used has always stuck with me: "When you put your finger on a hot stove, do you send information to your brain that this is a stove, and that it is on, and that your finger is starting to smoke, so maybe you ought to remove your finger? Or do you let your reflexes pull your finger away without bothering your brain? So why are you using a brain to manage demand information in your factory when your reflexes can do a better job by simply pulling needed materials from the next upstream process?"

Because the operation was so precise, total inventories were so small, and the logic of the concept was so compelling, I imagined that it would be only a short time before every production facility across the world converted to level pull. I was wrong! As time has passed I've realized that many aspects of lean thinking are easy to implement. But this has not been one of them.

Thus I was enormously pleased last week when I visited a plant in a tiny Mexican town far south of the border and saw a level pull system in operation that would be right at home in Toyota City. This facility had:

- Analyzed actual customer demand, based on orders over the past several months, so it could stop using weekly forecasts and daily ship orders to schedule the plant.
- Calculated an exact finished-goods inventory level for each product, consisting of cycle, buffer, and safety stocks.
- Leveled the final production schedule, by both volume and mix.
- Identified a pacemaker process (component final assembly) as the single point to schedule each product family value stream.

- Delivered material to final assembly while taking away finished goods by means of a fixed-time conveyance route responding to kanban signals.
- Established markets in front of upstream processes with small amounts of inventory.
- Utilized signal kanban to trigger production in upstream batch processes (such as molding and stamping).
- Implemented kanban signals and a second conveyance route to deliver materials, tools, and instructions to upstream processes.
- Created a purchased-parts market with a Plan for Every Part, with precisely calculated inventories of every purchased item and kanban signals for re-ordering.

As I drove away I realized that if these techniques can work in this remote location and if they are now spreading this far, there must be a widespread willingness today to make the level pull transformation I anticipated many years ago.

What's mainly needed, I believe, is a clear recipe in simple language that shows managers step by step how to make the leap. I'm therefore delighted that LEI is publishing a new workbook on April 1 -- appropriately titled "Creating Level Pull" -- that does precisely this. I have asked Toyota veteran Art Smalley to write it and I believe it will speak directly and clearly to the immediate needs of the Lean Community. Please visit [www.lean.org](http://www.lean.org) for details and to order.

I'll be anxious to hear your reactions to the latest LEI workbook and I look forward to many facilities duplicating the lean leap I just witnessed in Mexico.

Best regards,

Jim  
Jim Womack  
President and Founder  
Lean Enterprise Institute