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Crack that WIP!
Best Practice for Maintaining Accurate Inventory in a Work Cell

by Louise Beauchamp

President's Note…

This month DBMEXECUTIVE looks at WIP, that elusive dark hole of inventory that causes most people to hold their breath and pray for accuracy. Louise Beauchamp, a senior management consultant with DBM, will outline 3 possible scenarios to tackle the WIP issue, discuss pros and cons, and give a best practice for work cell inventory accuracy.

Also this month, Doug writes about S&OP and Kanban, and how together, they can both help your organization work towards production stability.

My first encounter with WIP was years ago, just out of university, when I was told to count everything on the production line and compare my counts to what the system showed.

It was a simple enough request. But it took me a whole day to realize that the line was continuously moving, so how could I count anything accurately on a production line?

The Problem with Counting WIP

What this initial counting exercise taught me was that cycle counting your WIP inventory is different than counting your stock locations.

Stock locations typically require a system of IN/OUT transactions to keep their inventories accurate. Sometimes a stock transfer gets missed, but this kind of error is easy to capture in a count, trace back to its cause, and correct the balance.

WIP inventory is much more challenging, and that challenge can be significant if you are backflushing to consume your components.

Backflushing is a method accounting for inventory use by acknowledging a part as used only when it becomes part of another assembly on a production line. Backflushed transactions won't issue the components until the assembly is received.

This means that the components on the production line will still be included in the on-hand balances in your ERP system, until the assemblies they are used to make are received in the next production stage.

This is an important point. On-hand balances will show higher than they actually are, which can affect a number of other processes including procurement and MRP. Depending on how long it takes components to be assembled and received, your system will show more on-hand component inventory than you actually have.

With WIP it's all about timing. Because of the timing issues associated with backflushing, it becomes important to lessen the "damage" this does to your on-hand balances in your ERP system.

The best place to handle this WIP issue is in the production cell, where the material is being consumed.

This is why work cell reconciliation needs to play an important role in your day-to-day activities and in your goal for inventory accuracy.

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The Solutions in Scenario

There are 3 scenarios I will describe as ways of handling the WIP issue of inventory accuracy. These scenarios are based upon what DBM has encountered through years of helping customers become better at inventory accuracy.

These are issues everyone faces. Finding the right balance is a continuous task for inventory control.

First I will describe the inventory scenarios we have seen, and then I will discuss DBM's Best Practice Solution, and how it can improve your inventory accuracy.

Scenario 1: Four Wall Inventory

PRO: Less inventory transactions.
CON: No control of inventory.

In this scenario, the entire inventory is stored in one location on the ERP system. Simple to set up, but a disaster in inventory reconciliation.

Material movement is dynamic across the warehouse and shop floor. The on-hand balance of components is changed as a result of backflushing or scrap transactions. The on-hand balance of the assembly changes when production is reported.

A positive to this approach is less inventory transactions. This is efficient from a time management standpoint, but the problem is that cycle counting is impossible if production is active. This is the lesson I learned early on.

Typical WIP inventory in production.

On the neagative side, bill of material errors are masked. Backflushing is based on the bill of material, and material consumption will follow the BOM regardless of what is actually consumed. If there is an error in production reporting that error is propagated through all the component issues.

Finally, yield and material usage variances will accumulate over time, and will be buried in the on-hand balance of the inventory.

This scenario turns root cause analysis of cycle counting errors into a monumental task that often ends in frustration. Errors, yield, material variance and consumption are all affecting the on-hand balance at the same time.

Scenario 2: Material Transfers, receive to Finished Goods

PRO: Better inventory control of materials and line components.
CON: Receiving errors masked in finished goods.

In a material transfer scenario, customers add three warehouse locations to scenario 1 – raw material, line, and finished goods. Here's how it works:

A material transfer transaction reduces the on-hand balance in raw materials, and places that inventory into the line location. The components are backflushed from the line location as production is received. The assembly is received into finished goods.

The discrete transfer transactions from raw materials storage to the line location have done a number of things to help reduce the issues of scenario 1. First, it is now possible to cycle count raw materials storage. The transfer transaction has effectively separated stock from WIP.

The line location carries a minimal amount of inventory and is directly related to the production in progress. Material usage and production yield variances are now isolated in the line location. The production process does not affect your storage inventory, and the impact of those variances is limited to the line location.

During a changeover, a cycle count can be done in the line location because the quantities issued are small. It is safe to assume that count errors are caused by the production process. Root cause analysis becomes much easier.

However, by reporting production into the finished goods location, receiving errors are still masked. The integrity of two locations – the line and finished goods – may be compromised.

Scenario 2 uses additional transactions to transfer component inventory from raw materials to the line. The payback is that you will spend less time reconciling your inventory variances.

Scenario 3: Material Transfers, transfer to Finished Goods

PRO: Better inventory control of materials and line components.
CON: More transactions

We've now added one more transaction to the previous scenario. The production receipt will be processed into the line location. A transfer transaction will be done to move the assembly to the finished goods location.

This separates accountability. Production owns the inventory (and its accuracy) in the work cell. Materials own the assembly when it is transferred out of the cell into the finished goods location.

By reporting production into the work cell, shift reporting is facilitated. Partial container/skid reporting is possible, since the receipt transaction is no longer based on the movement of a full container of an assembly.

Inventory Accuracy Best Practices

Scenario 3 is a best practice because:

1. Separates accountability between raw materials, production, and finished goods.
2. Respects geographic responsibility.

Scenario 3 facilitates bill of material verification. The transfer transaction from raw materials to the work cell is a known and accurate cut-off. If the on-hand balance in the work cell is incorrect, the bill of material can immediately be compared to the actual production process.

More importantly, scenario 3 facilitates work cell reconciliation. Actual material usage can now be 'seen'. Scrap, as a result of the production process, can now be segregated from scrapping from stock, and can highlight an issue in the production process immediately.

Yield variances, such as gauge variances with steel, are captured inside the work cell and are directly attributed to the production process instead of the perpetual inventory.

This best practice comes at a price, however. You need discrete locations for storage and production areas. Transfer transactions into the work cell from raw materials of components are a must. And you must also use transfer transactions out of the work cell into finished goods.

Adopting this best practice significantly increases inventory accuracy across the supply chain node. It helps establish trust in the numbers reflected in the ERP system, and it provides the opportunity for reconciliation and analysis of material variances, by area of accountability.

Without this best practice for controlling the movement of inventory, your ERP system will not work. It's a simple equation, with a simple question: Does your inventory best practice measure up?

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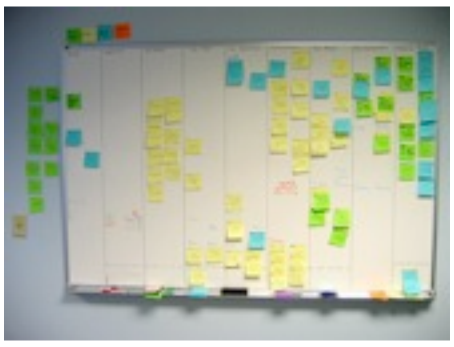
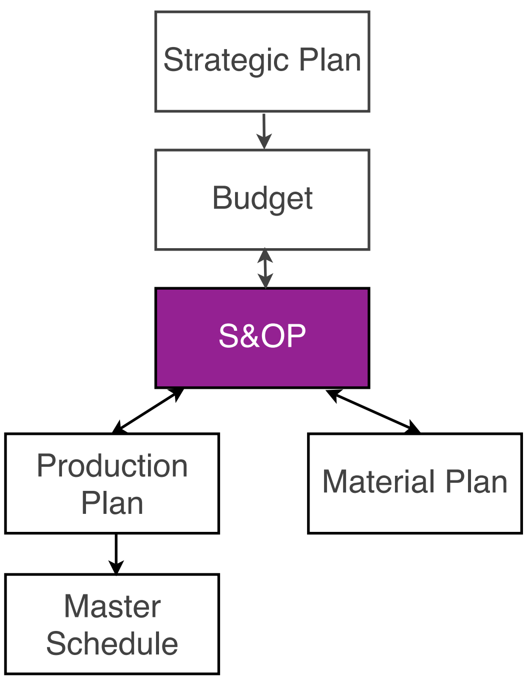


You need to Push before you Pull
Sales and Operations Planning and Kanban

by Doug Dedman

The other day I was asked an interesting question during an S&OP training course: "We are using kanban at our company so why do I need to have an S&OP process? What you are talking about is a push system of planning, not pull." Let me explain why this question came up.

When we talk about S&OP and it's place in the overall planning structure of an organization, I often refer to a standard APICS chart that positions S&OP between the budgeting process and the production planning process. A simplified version looks like this:



I could spend time on the different relationships in the planning cycle that are shown in this picture, but I want to focus on the relationship between S&OP and the Production Plan.

Two key outputs from S&OP are the Production Plan and the Demand Plan.

The Production Plan is the authorization for the Master Schedule. The Production Plan is at the family level in monthly buckets, and it is usually expressed in units, but sometimes in hours. It represents the planned level of the family for the month.

Then the Master Schedule breaks down the Production Plan into individual SKU's or end items. It also breaks the schedule into more finite time periods (weeks and days). The sum of the end item's SKUs should add up to the Production Plan.

Sounds simple on paper, but it's not.

Links in the chain: MRP

If you were to look at the detailed APICS chart from the Production Plan out to supplier, you would see the Master Schedule linked to your material planning system, then out to your supplier.

Material Requirements Planning, or MRP, is the dependent demand planning system that creates this linkage.

The Master Schedule is the independent demand feeding MRP, which in turn uses the product bill of material (BOM), and inventory, to determine the demand quantity and timing for all the manufactured items and purchased parts.

It's usually at this point in my explanation that many people start to think: "Whoa, stop the bus! Did he just say MRP? That's 1970's and 1980's thinking! We're way beyond this. We are using pull systems and JIT. You're talking about push systems in a pull system world!"

It's usually at this time that I feel ancient. Bear with me though, because we need to understand the context to truly answer these questions, and this means understanding where kanban fits.

Links in the chain: KANBAN

In it's simplest form kanban means "tag". It is a tool to communicate need from a using operation or work center, to a supplying operation or work center.

When production occurs, at the supplying work center the kanban or "tag" travels with the product. When the product is used again, the tag goes back to the supplying work center and the loop repeats itself. The "pull" concept, where the using work center pulls from the supplying work center, is based on need.

The concept of kanban was conceived after the second World War, as a part of the Toyota Production System (TPS).

Taiichi Ohno, the creator of TPS, writes in his forward to the English edition of *Toyota Production System: Beyond Large-Scale Production*, that TPS "evolved out of [the] need for production of small quantities of many varieties under condition[s] of low demand."

To meet this need Toyota had to eliminate waste in all processes.

This is the core principle of TPS: eliminate waste. Kanban evolved as a simple tool to control and schedule the flow of product through the plant, ensuring that material was available when it was needed. Kanban also put the control of execution of the system in the hands of the operators, and ensured that the disciplines required to make this work were in place.

> " The fact of all planning operations is that we don't know what is going to happen in the future"

With the introduction of the Internet and other busines-to-business technologies, we've been able to extend kanban beyond the plant to suppliers and customers.

Electronic kanban signals allow the "tags" to be virtual. Scanning a barcode can send the signal across the street, or around the globe.

While it is easy to send a virtual signal around the globe, we haven't figured out how to virtually send material back. This introduces the concept of longer lead-times into the kanban reality.

Chinks in the kanban armor

As was stated earlier, kanban is an execution system. The kanban quantities and kanban loop sizes (the calculations used to ensure just-in-time delivery of product) need to be determined based on the production level and lead times.

If I plan on producing 100 units a day, and my supplier is five days away, I need to set up my kanban system to supply those 100 units a day. I also need to ensure that the signal to the supplier is sent at least five days early, so that they can ship in time to get the material to me when I need it.

This system works well in predictable environments, but what happens if demand is greater than 100 units? I may decide not to meet the demand (short-ship), or if I increase production I run the risk of running out of parts.

The trick with kanban is determining at what level to plan production and, therefore, setup the execution processes to follow-through with the plan.

It is at this point that we go back to the initial discussion on the production plan.

Goals of the Planning Process

Recall that the S&OP process sets the production planning level for the month. The goal of S&OP is to set this production level to align resources to meet the plan. Resources include the execution of the kanban system. Setting the kanban quantities and loop sizes is part of this resource planning.

The fact of all planning operations is that we don't know what is going to happen in the future. We have to make our best prediction of what we think is going to happen, and align the plan to this expectation.

If you have been following my articles on S&OP, you understand that predictability is at the root of the S&OP process. We may be wrong, but we want to make sure we are all executing to the same plan.

Taiichi Ohno states: "establishing the flow is the basic condition." Not only the flow of material, but also what the flow rate should be. Establishing the flow rate is also the goal of S&OP. What better way is there than to use the inputs from sales and operations to determine what the flow rate should be?

Further in his book Ohno states: "Kanban is a tool for realizing just-in-time. For this tool to work fairly well, the production processes must be managed to flow as much as possible. This is the basic condition. The other important conditions are leveling production as much as possible and always working in accordance with standard work methods."

We often think about kanban in terms of product flow and standard work methods, but not in terms of leveling production. Ohno goes on to state that in a kanban system, any fluctuations in production at the final process are a negative impact on all earlier processes including internal and external suppliers.

This doesn't mean that we need to set one level for the entire year and execute to that level, but it does mean that we should be reviewing our future requirements periodically, and setting our production level to meet those requirements.

> In a kanban environment, the S&OP meeting should be followed by a detailed planning and scheduling meeting. Here the kanban loop sizes and quantities must be reviewed to ensure they line up with the production plan levels. If this isn't done, execution will be disconnected from planning, and you will end up with material shortages or excess material.

Answering the big question

So to finally answer the question: "If I'm using kanban, why do I need S&OP?"

Unless you are blessed with customers that order the same quantities daily you need to have some method to set your kanban levels for the future.

A good S&OP process gives you the forum in which to set the production plan, and then translate that into execution. It doesn't matter if you are using MRP with a linked shop floor execution and control system, or if you are using a kanban system. The important part is you need to set the plan, check to see if you are executing the plan, and make adjustments to the plan as required.

If you get a chance, read Taichii Ohno's book. The focus on communication and continuous improvement that is required to make TPS work, is also required to get a good S&OP process working. This includes the root cause analysis for waste, that can be applied to the root cause analysis for missing forecasts and plans.

Push and pull systems working towards one goal. That's an answer we can all benefit from.

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Feeling Alone?

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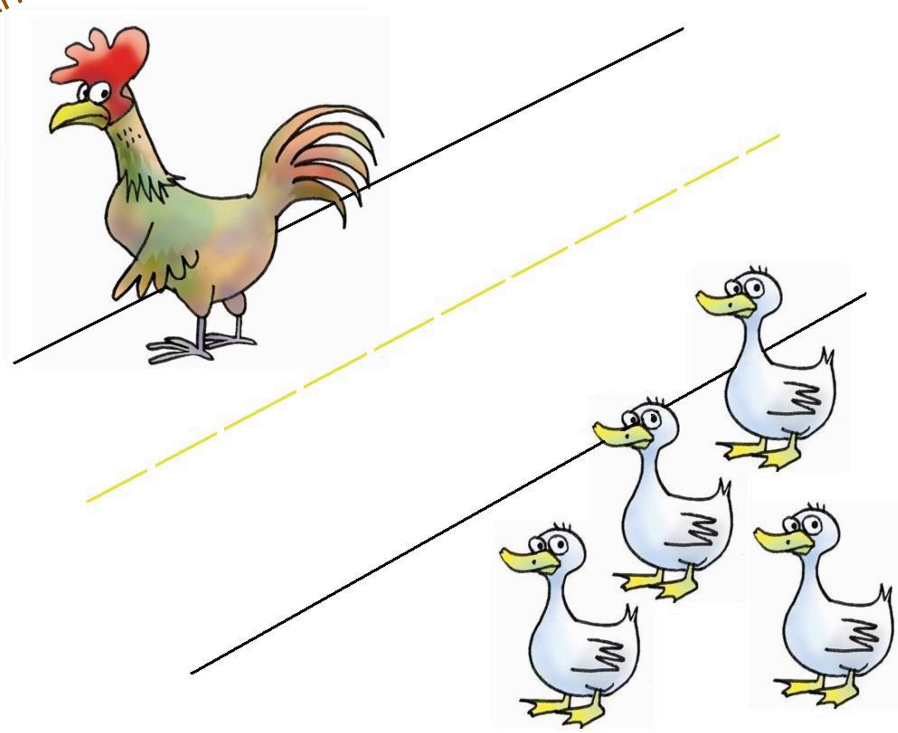

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