

Why is the Inventory in my ERP System Always Wrong?

A White Paper by Peter and Eric Green



Introduction

This white paper is intended for the CFOs, materials managers, and other senior managers in manufacturing plants as well as in industrial distribution warehouses that do secondary operations such as repacking, kitting, assembly, and relabeling of products.

A critical role of ERP systems for these managers is to track the quantity and value of the organizations inventory. This is required for accurate reporting on the organization's balance sheet but is also critical because it often forms the collateral for bank loans and any changes in inventory value need to tie out with the profit and loss statement.

An accurate inventory is also essential when it forms the basis of inventory ordering in response to pending customer orders, as well as deciding what to make and when.

In this white paper, we examine some case studies where inaccurate inventory impacted operations, describe some common problems, and then look at a possible solution.

Case Studies

Manufacturer of Fire Safety Equipment

Issue: Had to shut down plant for 6 weeks because they ran out of a critical inventory item.

Reason: They were having the supervisor update their new ERP system based on Kan-Ban cards for inventory withdrawal placed on his desk whenever a tube of the critical fire-retardant epoxy was withdrawn. ERP system showed 20 tubes in stock but they ran out because the department supervisor was too busy attending training for their new ERP system to have time to enter the withdrawals into the ERP system.

Plastic Injection Molder

Issue: Inventory valuation in ERP system fluctuating by over \$100,000 at month end, with no apparent cause.

Reason: They withdrew raw materials from inventory, when pulled from stock, and did not enter finished product into inventory until several days later, when a batch was completed. As a result, total inventory value dropped, when raw materials were withdrawn, and increased again several days later.

If this happened for a big order, over a month-end, then the total inventory value at the end of the prior period dropped significantly, which made their bank nervous. Then the inventory value in the next period rose substantially, above normal values, which made the bankers question the accuracy of the inventory.

This is often referred to as the “Black Hole” inventory tracking problem, as the value of the raw materials disappears into a black-hole for however long it takes to make a batch of product.

Electromechanical Contract Assembler

Issues:

1. Parts inventory in ERP system was always wrong, resulting in over-ordering parts for projects or in stock-outs.
2. Unable to track customer owned parts and tooling in ERP system.

Reason: This organization did not record raw materials parts as they were withdrawn from projects and instead used the ERP system’s “Backflushing” algorithm, as a way of avoiding the black-hole problem described in the previous case.

Whenever a finished assembly was placed into finished goods inventory, the Backflushing algorithm was used to reduce the raw materials inventory quantity according to the Bill of Materials (BOM) for making a finished product. As a result, the raw materials parts were shown as being in stock, until the finished products were completed, when they had already been used.

Also, customer owned parts and assets could not be treated as regular inventory as they were not owned by the organization. They tried using the artifice of assigning zero value to these parts. This, however could not be used where parts with a common part number, which were both customer-owned and directly owned by the organization, were in stock at the same time.

This method also ignored any additional raw materials consumption due to unanticipated scrap or wastage and precluded the inventory validation unless production was shut down.

Food Processor

Issue: The quantity of raw materials inventory shown in their ERP system was always wrong.

Reason: They did not record the receipt of raw materials until they received invoices from the growers. They did this because the per-unit price was determined by the grower and depended on quality, quantity, and a number of other factors.

As a result, newly arriving raw produce was not recorded into inventory, until 30 or more days later, when the invoice was received from the supplier.

Envelop Manufacturer

Issue: Had nine master rolls of paper, worth tens of thousands of dollars each, “disappear” from inventory.

Reason: At first this was thought to be due to theft. But it turns out that they were using backflushing to compute their raw materials inventory, based on expected usage, which often had left over offcuts from the master rolls, which were scrapped, rather than reused.

This was compounded by the fact that were forced by their ERP system to track the total quantity of paper in pounds, with no concept of tracking separate rolls of paper. As a result, when they came to audit their inventory, a large shortage, in pounds, equivalent to nine full mater rolls of paper, showed up. Hence the loss.

Rolled Materials Converter

Issues:

1. Had to shut-down production for 2 weeks every year while they took inventory.
2. They were scrapping left-over materials from jobs rather than reusing them on other jobs.
3. Had little or no information about the cost/value of finished products. As a result, they often lost money on bidding repeat orders or lost the orders by bidding too much.

Reasons:

1. They were using back-flushing with their ERP system. As a result, they could only reconcile inventory quantities, obtained in a physical item count if production were completed on all open jobs. As a result, movement of materials in and out of each warehouse had to be stopped, during the time it took to take inventory.
2. Their ERP system was incapable of tracking different sized rolls and sheets of left-over paper, having a common part number, so they could be reused.
3. They bid their jobs on a cost per square foot basis but their ERP system had no way of tracking the width and length of materials, or of taking account of scrap or wastage.

Fine Jewelry Manufacturer

Issue: This was a mass-producer of gold jewelry for Walmart and other major chains. The bank essentially owned all their gold and did monthly audits, which, in the organization’s words “were hell” because the inventory was never accurate and audits could last days to try to find the missing gold.

Reasons:

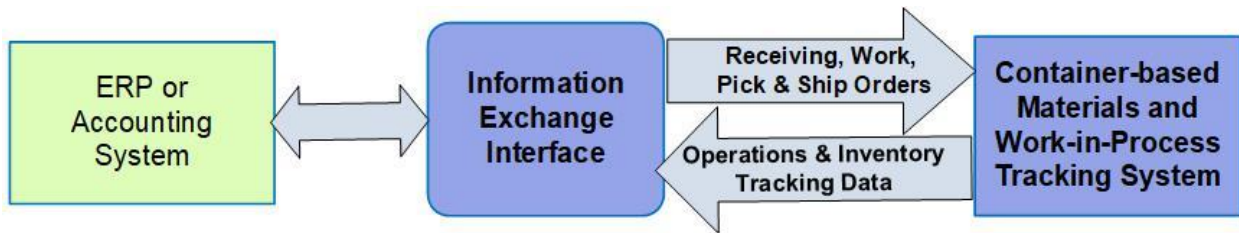
1. Their ERP system did not account for work-in-process. Once gold went to the production floor, it entered a black-hole, and did not reappear until the intermediate and finished batches of product were checked back in to the vault.
2. Inaccurate allowance for scrap gold and gold-dust produced in the production process.
3. Inaccurate valuation. Gold was priced at spot market values, which varied from day to day. Their ERP system contained a unit value for each of the hundreds of different intermediate and finished items. This made updating the inventory valuation a very difficult and time-consuming job.

Commonalities

Some of the common issues causing inventory accuracy problems, from these case studies, are:

1. Not having materials handlers enter changes to inventory, as it occurs, to avoid errors due to delayed data entry. Unfortunately, the data entry screens in most ERP systems are designed for office use and are not designed for real-time operational data entry by material handlers and production operators.
2. Using Backflushing to belatedly “withdraw” inventory from stock based on finished products rather than reducing inventory in real-time in the ERP system as inventory is withdrawn from stock, thus retaining an accurate inventory count.
3. Not tracking the value of raw materials as they are transformed into finished products. Solving this requires tracking the transfer of value from the raw materials, as they are consumed, into the value of work-in-process and then through further work-in-process operations into intermediate or finished products. This avoids the “black-hole” problem as well as being able to accurately value work-in process inventory, for accounting purposes.
4. Not tracking received raw materials until they are “approved” such as through vendor invoice or through passing QC inspection.
5. Inability of their ERP system to be able to track materials with a common part number but different dimensions resulting in inability to track and reuse off-cuts.
6. Not tracking scrap or wastage, resulting in inventory errors.
7. Not able to do inventory auditing without shutting down operations.
8. Inaccurate inventory due to delays in manually updating inventory in the ERP system.

A Possible Solution



One possible solution is to use a separate container-based tracking system, such as KnarrTek's BellHawk software, in conjunction with the ERP system.

The function of the container-based tracking system is to:

1. Enable real-time data capture by materials handlers and production operators using technologies, such as barcode scanning with mobile computers. Also provides real-time feedback when operational or data entry mistakes are about to be made.
2. Keep real-time track of containers of raw, intermediate, and finished product inventory. This includes tracking who the materials in each container belong to and the accumulated cost of materials, labor, and equipment time needed to make the intermediate and finished products in each container from raw materials.
3. Track work-in-process materials, including the cost of making the work-in-process materials, who they belong to, and which project they are designated for. This includes tracking scrap and rework, so as to have an accurate cost for each container.
4. Keep track of the length and or width of rolls, reels, sheets and other "containers" of off-cut material so that these can be reused and accurately accounted for.
5. Track the receipt of containers of raw material, including data such as manufacturer, lot number, expiration date and whether these have passed quality control inspection or assigned to an MRB area for eventual return to their suppliers.
6. Keep track of tools, jigs, and fixtures which are purchased as inventory and then issued to people, vehicles or departments.

Please note that these functions cannot be performed by "Item Locator" systems such as traditional inventory tracking, warehouse management and ERP system, which simply track the quantity of each material by location.

In addition, it is important to use a software platform, such as KnarrTek's MilramX enterprise integration software, to intelligently exchange information between the ERP and tracking system. Some of the functions performed by the interface software are:

1. Convert purchase orders entered in the ERP system into receiving orders in the tracking system
2. Record changes in the contents of containers as changes in quantity and value of the inventory in the ERP system, provided that the materials in the container are owned by

the organization and not the customer. This may require conversion between units of measure, including conversion of length and width of material into pounds for example.

3. Record the receipt of containers of material as receipts in the ERP provided that the materials are not customer owned, have passed quality control inspection, and possibly the invoice has been received from the supplier.
4. Record conversion of raw materials into scrap as withdrawal of raw materials inventory from the ERP system followed by entry of new scrap material.
5. Update the WIP inventory account(s) in the ERP system for the value of WIP changes in the tracking system, except for that part of the WIP value attributable to customer owned materials.
6. Convert customer orders from the ERP system into ship orders and work orders to be sent to the tracking system.
7. Convert shipment of containers, recorded in the tracking system, to shipment records in the ERP system plus changes to inventory for products that are not customer owned. This may include the generation of ASN data for the shipment of pallets containing different parts.

For details of how container-based tracking works, please see video comparing container-based tracking with traditional inventory location system. This can be reached through the Videos link at the bottom of www.KnarrTek.com.

Outcomes

- Fire Safety Equipment manufacturer: As a result of running into financial difficulties due to the 6-week shutdown and the cost over-runs in implementing their new high-end ERP system, the division was sold off and its product line was transferred to another division elsewhere.
- Plastic Injection Molder: They added a BellHawk materials and work-in-process tracking system to their ERP system. As a result, they were able to track the quantity and value of their inventory accurately as well as the value of their work-in-process. As a result, the “black-hole” that caused unexpected swings in their inventory valuation was eliminated.
- Electromagnetic Contract Assembler: They thought that container-based tracking was the way to go but decided to develop their own custom software. This was rather than pay KnarrTek about \$1,000/month for the use of the BellHawk software (which cost well over a million dollars to develop). When we last checked, a couple of years later, they were still developing their own custom container-based tracking software.
- Food Processor: Uses BellHawk to track inventory and work-in-process, including capturing materials traceability data, but still uses duplicate data entry to exchange data with their ERP system so that they can make manual adjustments to quantities and values sent to their ERP system, when needed.

- Envelop Manufacturer: They modified their ERP system to track left over rolls of paper, in pounds, and their reuse, but continued to manually track left over rolls. This solved the problem of the missing master-rolls of paper but didn't improve their reuse of left over rolls. As a result, the machine operators were able to always exceeded the organization's goals for the amount of scrap paper sent for recycling.
- Rolled Materials Converter: Was able to reduce the time to take year-end inventory from two weeks to less than a day, using BellHawk and container-based tracking. They were also able to accurately track rolls and sheets of material with different widths and lengths, including off-cuts and to accurately account for these in their ERP system.
- Fine Jeweler: Through the use of BellHawk, and its container-based tracking capabilities, this organization was able to reduce days of audit "hell" down to a couple of hours. In this time, the bank auditor checked 10 containers (plastic bags) of gold parts, in the vault, chosen at random, against the values in BellHawk and found them all correct. After 10 samples, all of which were found to be accurate, the bank examiner declared that the inventory was statistically accurate to 99.9% and that there was no further testing needed. Accounting was also able to have BellHawk update the spot value of all the different grades of gold inventory in stock in their ERP system on a nightly basis.

Commentary

Having a separate system to track the quantity of inventory in stock, irrespective of whether the inventory belongs to the organization or whether it has passed quality control inspection, is essential for maintaining accurate inventory.

It is also essential that this system:

1. Be able to capture changes to inventory in real-time and be able to warn materials handlers and production operators when they are about to make an operational or data entry mistake.
2. Be able to track containers of material rather than the quantity of materials at a location
3. Be able to track reels, rolls, and sheets of material having different lengths and widths.
4. Be able to receive all raw materials and then track which are customer owned, project related, or need inspection, as well as to track returns to suppliers.
5. Be able to track the value and quantity of work-in-process inventory.
6. Be able to compute the value of each container of intermediate and finished products.
7. Be able to track the packing, movement, and shipping of pallets containing many different materials.
8. Be able to automatically exchange inventory cost and quantity data with an ERP system in near real time.

These capabilities are available at an affordable cost, starting at a few hundred dollars a month, from KnarrTek using its BellHawk and MilramX software platforms.

Authors

Peter Green

Dr. Peter Green serves as the Technical Director of KnarrTek Inc. Dr Green obtained his BSC (Hons) in Electrical Engineering and his Ph.D. Degrees in Electronics and Computer Science from Leeds University in England. Subsequently Dr. Green was a senior member of technical staff at Massachusetts Institute of Technology and a Professor of Computer Engineering at Worcester Polytechnic Institute.

Dr Green is a Systems Architect who is an expert in using real-time artificial intelligence methods to implement real-time Inventory Tracking and Operations Management systems for Industrial Organizations. He has led the implementation of over 100 such systems over the past decade. Dr Green also led the team which developed the BellHawk job and materials tracking software, the MilramX intelligent information integration software platform, and the KnarrOps EDS software platform.

Eric Green

Eric Green serves as the Director of Support of KnarrTek Inc. Eric Green obtained is bachelor's degree from UMASS Dartmouth in Operations Management and Management Information Systems. Eric has been a part of 40 plus implementations of operations management systems over his 8 years of experience in this field. This includes receiving, production, inventory management, shipping, order management, as well as integrations with a number of ERP systems and a range of different manufacturing equipment.

For further discussion, or to send comments, please contact peter.green@KnarrTek.com or eric.green@knarrTek.com.

Copyright

This White Paper is the copyright of Milramco LLC. Please contact marketing-support@Milramaco.com for permission to republish this paper.

This paper may be copied and distributed internally within Educational, Government, and Industrial organizations for educational purposes.