Solving the Work-in-Process "Black Hole" Problem in Manufacturing ERP System Deployments

A White Paper by Peter and Eric Green

Introduction

This White Paper is for the operations managers in the 60,000 or so mid-sized manufacturing plants in the USA that specialize in short-run, quick-turn, semi-custom product manufacturing.

From a conversation with one of those managers: "But my ERP sales person said that our ERP system would do work-in-process tracking." To which I replied "Then why are you still using paper forms and Excel spreadsheets to track your manufacturing operations and then handing paper forms to your front-office to manually enter into your ERP system?"

Many manufacturing ERP systems do a great job of managing the organizations finances but do a poor job of tracking manufacturing operations in real-time. As a result, there is typically a "Black Hole" of information as to the real-time status of all the customer orders flowing through many work-centers in the manufacturing plant at any one time.

This, not infrequently leads to customer orders being shipped late or unnecessary overtime or expedited shipping fees being expended to ensure that customer orders get delivered on time. It also requires endless and time-wasting "coordination" meetings between managers and supervisors to try to avoid these problems.

Even worse is the impact on customers and customer support people. Without real-time customer order status information, the best that a customer support person can tell a customer, when they call in inquiring about the status of their order, is something like "I will send someone down to the floor to look for your order and then call you back." This wastes an enormous amount of everyone's time and destroys customer confidence by implying you have lost their order.

Attempts to work around this problem using paper forms and Excel spreadsheets, assisted by expediters and other such people, can often require the equivalent of one or more full-time people, at a loaded labor cost of over $5,000 per month to attempt to keep track of where all the work-in-process materials are located, for all the customer orders flowing through the plant. And, even worse, even when more labor is expended to enter the information into the ERP system, the information available is often a day or more old before it is available.

Why ERP Systems do a Poor Job of Work-in-Process Tracking

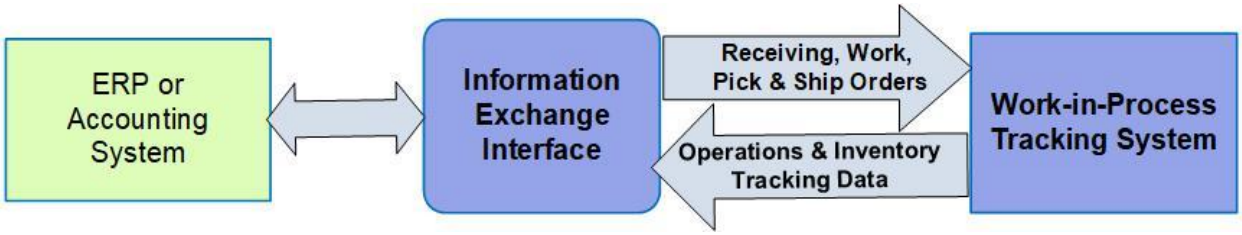
1. ERP Systems require that the manufacturing operations be reengineered to fit the standard process model of the ERP system. This directly conflicts with the needs of most manufacturing plants to use unique manufacturing processes that provide their unique competitive edge in the marketplace.
2. ERP systems are designed to have the same software sold to thousands of companies to justify their cost of development and software maintenance (plus their often-large sales and marketing budgets). This directly conflicts with the need of most mid-sized manufacturing plants for a unique work-in-process tracking solution, tailored to their specific needs.
3. ERP systems are accounting systems at their core. This means that they are crafted and hopefully thoroughly tested for financial accuracy before release. As a result, ERP vendors do not allow their software to be customized to meet the needs of individual manufacturing plants for fear of causing financial inaccuracies.
4. ERP systems track the quantity of materials at a location rather than tracking containers of material and their contents. As a result, they are unable to track the flow of materials through the plant and to which customers they belong.
5. Because they do not do container-based tracking, ERP systems are unable to track work-in-process materials as they are transformed from raw materials to finished product. They are also unable to track which materials by supplier, lot and serial number were used to make each product. As a result, recalls due to defects are often overly broad and expensive.
6. ERP Systems are unable to track nested containers of material. As a result, they are unable to track totes, carts, and pallets containing different parts, belonging to different jobs.
7. ERP systems track batches of product being made rather than the flow of materials from work-center to work-center, which is how most mid-sized manufacturing plants operate.
8. ERP systems are designed for use by office staff. They are too complicated for production workers to directly enter data into the many complex screens of these systems.
9. ERP systems are designed for historical reporting and not for providing real-time information, especially when the data is collected on paper forms and manually keyed into the ERP system the following day.
10. Also, as a result, ERP systems cannot provide real-time feedback and warnings when material handlers and equipment operators are about to make an operational mistake, such as using the wrong materials for a job.

There are also other associated issues. The Materials Requirements Planning (MRP) algorithms used by most ERP systems to plan and schedule operations are designed for long-run manufacturing operations. These MRP systems require a three-month sales forecast and then plan and schedule the materials to be purchased and made for the next 3 months.

Due to the "Amazon" effect, most mid-sized manufacturing plants in the USA have only a few days visibility of incoming orders and need to incrementally schedule the materials to be made and purchased, without redoing their production schedule, which the ERP systems require. As a result, the MRP algorithms of most ERP systems are not used.

The one thing that ERP systems do well is to provide a single centralized system into which to collect all the operational data, without requiring an IT person to support the software in each plant.

A Possible Solution



The first thing to recognize is that it is critical to separate accounting and work-in-process tracking into two separate systems joined by an interface that is able to automatically move information between the two systems.

In this way, the financial system can be locked down, after it has been thoroughly tested, to make sure that it meets generally accepted accounting principles (GAAP). Also, this system can be updated annually to account for changes in tax laws.

The work-in-process tracking system can then be customized and tailored to meet the needs of each manufacturing plant. This system is only upgraded when operations change, to avoid disrupting operations.

The next thing to recognize is the need to use a system, such as KnarrTek's BellHawk Job and Materials Tracking System, which uses container-based tracking to track materials, including tracking the transformation of raw materials into finished products, and the flow of work-in-process materials between work centers.

A system such as BellHawk performs all the needed work-in-process tracking functions for a wide variety of manufacturing operations and can be readily configured and customized to meet the needs each individual manufacturing plant.

The biggest challenge with using a configuration with a separate tracking system, is implementing the information exchange interface, to make both systems work together seamlessly, as this is idiosyncratic to how each organization runs and accounts for its operations. There also may be multiple operations tracking systems, for different geographic locations, needing to exchange data with a single ERP system.

Designing and implementing such as interface “from scratch” can be a very time consuming and costly process. Fortunately, there exist AI (Artificial Intelligence) based tools, such as KnarrTek’s MilramX, which can provide or automatically generate over 90% of the code needed for any given interface, even those requiring many information transfers to take place in parallel.

Existence of software platforms, such as KnarrTek’s BellHawk and MilramX, at an affordable cost, makes this solution to the “Black-Hole” problem a cost-effective alternative to buying yet another ERP system to try to solve this problem, or living with paper forms and Excel spreadsheets.

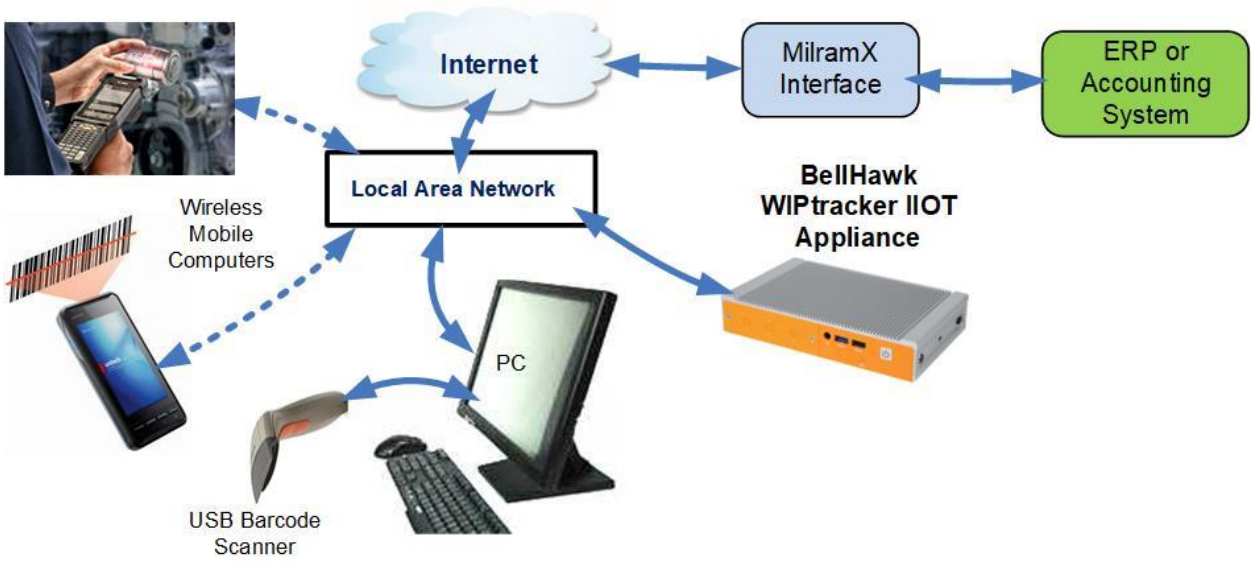
Solving the IT Staffing Problem

One of the driving forces behind the adoption of a central ERP system to serve the whole organization is that it eliminates the need for expensive IT staff members in each of the manufacturing plants. Instead, all IT support is provided through a data center where the ERP system is installed.

It is obviously an expensive step backward if an IT person is required in each plant to install, setup, and maintain work-in-process tracking software in the plant.

To solve this problem, a system such as BellHawk can be run “in the Cloud” or installed at the organization’s data center but this does bring with it reliance on the Internet to support real-time plant operations, which is the same as it is for accessing a centralized ERP system. If the Internet goes down, data collection in the plant stops and, effectively, production slows to a crawl.

This is especially problematic where the Internet data cables are strung on utility poles, as they are in many industrial parks, and can be damaged by ice-storms, traffic accidents, trees, or mobile cranes to name but a few causes.



To solve these problems KnarrTek can ship-in a complete Work-in-Process tracking appliance (WIPtracker™) into each plant, ready to plug into the plant local area network and an uninterruptable power supply. WIPtracker is then ready to start collecting data, locally without being reliant on an external internet connection.

WIPtracker consists of a small high-reliability industrial computer pre-loaded with all the BellHawk software needed to track work-in-process materials and operations in the plant. WIPtracker also comes complete with remote maintenance software, enabling KnarrTek to remotely support and maintain the box and its software, just like any other Cloud resource.

In such a configuration, the MilramX data exchange software is typically run in the same data center as the ERP system, but may be run in the WIPtracker box itself, if a Cloud-based ERP system is used. In either case, the BellHawk software comes with a prebuilt interface to MilramX, only leaving the interface to the ERP system to be tailored to the specific needs of the organization.

This MilramX interface is typically implemented as a joint effort between the KnarrTek technical staff and the organizations central or external IT ERP support group.

If needed, WIPtracker can be shipped to site complete with pre-configured mobile computers, as part of the annual rental package, thus further minimizing the need for any on-site IT support.

Commentary

A WIPtracker systems costs around $1,000/month, which is easily justified by the cost savings in labor time by eliminating at least one FTE (full time equivalent) person at a cost of $5,000/month. But the most important cost savings come from not losing customers by delivering products late and from not having to recall defective products due to mistakes that could have been caught by a system like BellHawk.

Also, BellHawk enables customer support people to look up the real-time status of a customer order and respond to inquiries as to order status, with an immediate response such as “Your order has just arrived in final inspection and should be shipped tomorrow”. Or, even better, to have WIPtracker send out text or Email messages to the customer when there is a change in the status of their order, just like Amazon.

There is an upfront cost in implementing the interface to the ERP system and in training people in how to use the work-in-process tracking system. The actual cost will depend on how much work is done by the organizations IT staff, in configuring the interface, and the organization’s managers and supervisors, in doing worker training, and how much support is required from an organization such as KnarrTek.

And for those smaller organizations who are fed-up with their old ERP system, and are looking for a simpler (but more capable) solution, KnarrTek offers a prebuilt interface to the latest version of QuickBooks Enterprise at no additional cost.

For More Information

For more information about solving work-in-process tracking issues with your ERP system, please contact client-support@KnarrTek.com. Also, please see Data Sheets link at bottom of www.KnarrTek.com for more information about the WIPtracker system.

For further discussion on this topic, please Email the authors Peter.Green@KnarrTek.com and Eric.Green@KnarrTek.com.

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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.

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