

DBA Software

*The Alternative
to Over-Complicated
ERP Systems*

DBA Manufacturing

NEXT-GENERATION

Manufacturing Efficiency Guide

Mfg Fundamentals • Continuous Improvement • Efficiency Rating

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1. Introduction

A Letter from the Authors

Dear Reader:

We do not believe that investing in a mid-market ERP system and hiring consultants is a requirement for improving your manufacturing efficiency. If that were a proven formula for success, we would believe otherwise, but the track record for mid-market ERP systems among smaller manufacturers is a poor one.

Our vision for DBA is to provide an alternative solution for small businesses that is easy to evaluate, purchase, and implement without all the complexity, cost, and risk associated with mid-market ERP systems.

We believe that any company that follows our self-implementation methodology and uses the DBA process workflow will become an efficient manufacturer that completes jobs quickly and on time with lower costs, better quality, and a higher return on investment.

Our software cannot do this on its own. You must contribute time and effort and a willingness to follow our implementation methodology and to operate using the DBA process workflow. If you attempt to use bits and pieces of the system and devise your own processes, you will not achieve the efficiency improvements that are possible with DBA.

In this guide we “pull no punches” and express our philosophy of manufacturing as we see it, based on 20+ years experience developing manufacturing software and helping companies get implemented. Over the years we have discovered clear patterns of behavior among companies that achieve success and those that fail to get results. We share those insights with you in this guide so that you can benefit from our experience.

We hope you find this guide to be a practical, no-nonsense tool that helps you improve your manufacturing efficiency.

Sincerely,



Michael Hart
Co-Founder
DBA Software Inc.



Joseph Hart
Operations Manager
DBA Software Inc.

Purpose of this Guide

This guide explains how to use the DBA Manufacturing system to improve your manufacturing efficiency. It is organized in four segments:

- We begin by explaining the process by which you can become an efficient manufacturer.
- Next, we explain how to get a good start by following our self-implementation methodology.
- We then present the 10 core practices of efficient manufacturing that apply universally to all companies and industries.
- Finally, we give you an Efficiency Checklist that can be used to monitor your progress.

Use this guide as a text book

Many people in manufacturing have never received formal education in the principles of efficient manufacturing. We encourage you to use this guide as a text book on manufacturing that can be circulated among your key employees.

Transform philosophy into practice

You can read books and articles on “lean manufacturing” and the “theory of constraints”, but the challenge lies in transforming these philosophies of manufacturing efficiency into the practical reality of running your shop.

Manufacturing software alone will not make you an efficient manufacturer. You must use the software in specific ways to achieve the dramatic efficiency gains that are possible. This guide takes widely accepted management theories and translates them into specific processes that yield actual results.

What is “lean manufacturing”?

“Lean manufacturing” is an operating philosophy, originally developed by Toyota, which optimizes efficiency by reducing waste throughout all facets of the process workflow, frequently using “just in time” techniques. Integral to the lean manufacturing philosophy is the practice of “continuous improvement.”

What is the “theory of constraints”?

The “theory of constraints” is a management philosophy developed by Dr. Eliyahu M. Goldratt that explains that the maximum throughput of any shop is governed by a key “constraint”, which is a machine, process, or work center with finite capacity through which most manufactured items must pass, directly or indirectly. To maximize throughput, the constraint should be kept as fully utilized as possible.

Who is this guide for?

Owners and Top Management

If you are an owner or in a top management position and you wish to improve your manufacturing efficiency, this guide provides a set of specific actions you can take to dramatically improve your overall efficiency. Your challenge is to overcome user resistance to change and commit to 100% adherence to the DBA process workflow.

Implementation Manager

If you have been designated the project manager responsible for overseeing system implementation and you are looking for specific recommendations on how to use DBA to its full potential, this guide is for you.

Department Heads

If you are a department head and you want your department to operate as efficiently as possible, this guide gives you specific recommendations that can help you achieve your objective. In most cases this involves setting up, learning, and following standard workflow processes.

Consultants

If you have client companies struggling with inefficient manufacturing operations, you can use this guide to help you identify the company's operational weak points and provide specific recommendations for improvement.

1. Introduction

2. How to Become an Efficient Manufacturer

What is an efficient manufacturer?

An efficient manufacturer is a company that does the following:

- Completes jobs quickly and on time
- Keeps inventory and WIP to a minimum
- Maintains high product quality

Efficient manufacturers have higher operating margins, greater return on investment, and are more profitable than inefficient manufacturers.

Most manufacturers are inefficient

Most manufacturing companies are inefficient. Typical symptoms of inefficiency include:

- Chronic shortages
- High expediting costs
- Late deliveries
- Poor quality
- Over stocking
- Anemic profits

Is manufacturing software the solution?

You cannot become an efficient manufacturer without using manufacturing software. Manufacturing, by its nature, is too complex to be done efficiently without the aid of software that addresses issues such as job scheduling, material requirements, and job and product costing.

Although using manufacturing software is necessary to become an efficient manufacturer, its use is no guarantee of success. Many companies invest in manufacturing software without achieving any efficiency gains, and failed implementations are not uncommon.

Why do companies fail to achieve efficiency gains?

Why is it that some companies using DBA achieve significant efficiency gains while others see little or no improvement?

In virtually all cases, failure to achieve efficiency gains happens when a company substitutes processes of its own devising for portions of the DBA process workflow.

What is the DBA process workflow?

The DBA process workflow is a set of integrated processes that work together in a synergistic fashion to maximize the efficiency of your shop. Here is a listing of the specific processes that comprise the workflow:

- Maintain Settings
- Enter Orders
- Generate Jobs
- Generate POs
- Receive POs
- Release Jobs
- Schedule Shop
- Issue Material
- Enter Labor
- Subcontract Services
- Enter Job Receipts
- Close Jobs
- Pick Orders
- Generate Shipments
- Generate Invoices
- Match POs

Formal processes lead to better decision making

The DBA process workflow formalizes many processes that are done informally in most companies. Formal processes provide an abundance of timely information that helps users make better decisions. By contrast, informal processes are characterized by a lack of information that causes users to develop counter-productive defensive measures such as stock hoarding, hot lists, and a reliance on expediting.

Does the DBA process workflow apply to all companies?

Yes it does. The basic principles of efficiently combining labor, material, and outside services to make products are universal and apply to all companies and industries. The details and emphases may differ, but the fundamental workflow processes are the same.

You adapt the workflow to your operational requirements

The DBA process workflow is not a rigid, “one size fits all” method of manufacturing. Instead, you adapt the workflow to suit your operational requirements. For example, if your jobs are short in duration or run on automatic machines, you can apply standard labor hours to jobs instead of collecting actual labor hours.

It is natural for users to resist change

Be aware that left to their own devices users often try to replicate familiar processes from their old system within DBA. They tend to ignore processes that are new or are perceived to be unnecessary (such as defining labor using routings) or “too much work.” They often devise processes of their own. It is human nature to cling to the familiar and to resist change.

So how do you become efficient?

The way to become an efficient manufacturer is to implement DBA Manufacturing using our step-by-step methodology and to commit to 100% adherence to the DBA process workflow.

Don't get off to a bad start

Our Implementation Planner provides a structured methodology for setting up the system to conform to the DBA process workflow. The implementation tasks include extensive user training during the “rehearsal” stage in preparation for a startup day when you cease using your old system and start operating exclusively in DBA.

Unfortunately, some companies ignore the recommended sequence of events and implement the system in pieces, without user training, and with a rolling start instead of a startup day. This can result in chaos and risk of a failed implementation.

Change must be initiated by top management

Delegating system implementation to your users will not work because it is extremely rare for users to willingly adapt to a new set of processes without significant resistance to change. It is vital that whoever is responsible for system implementation have the full backing and authority of top management, without which implementation can easily sputter and stall.

User resistance is common

It is human nature to resist change. If you adopt the DBA process workflow, jobs and POs will be generated automatically instead of being entered manually. Shop supervisors and material handlers will enter their own transactions in real time instead of using back office data entry. Labor will be defined and tracked using work centers and routing sequences. In most companies, these are big changes that may engender fierce resistance among your users.

Users strive mightily to retain the status quo. Purchasing agents refuse to use MRP and insist on entering POs the way they always have, by manual entry. Users do not see the benefit in using routings or stock locations and complain about excessive data entry. At this critical stage in the life of the system, tempers flare and finger pointing abounds.

2. How to Become an Efficient Manufacturer

Overcome resistance through user involvement

“Top down” edicts and controls do not work because they stiffen user resistance. The best way to overcome user resistance is to get users fully involved in the implementation process with discussions, training, and implementation tasks. The more each user understands how the DBA process workflow benefits the system as a whole, the more willing that user will be to conform and contribute to the new processes.

The 10 core practices are your guarantee of success

The core practices involved in operating a shop efficiently are well established and use methodologies associated with “lean manufacturing” and the “theory of constraints.” The key to becoming an efficient manufacturer is to faithfully use the 10 core practices detailed in this guide.

Systemic change takes time and effort

Be aware that it takes time and effort to change a company culture to adapt to a new set of processes and to gain a respect for the accuracy of dates, details, and timeliness of data entry.

Review your progress once a quarter

Successful manufacturing requires continuous improvement. If you don’t set up a formal means of gauging your progress, it is easy for users to drift back to old bad habits such as stock hoarding, hot lists, and after the fact data entry.

We recommend that you use the chart at the back of this guide once a quarter as part of a “continuous improvement” program where you formally review your progress and exchange ideas for efficiency gains.

Efficient Manufacturing = Efficient Accounting

General accounting software packages are inefficient for manufacturing companies because they do not track work in process and do not absorb labor and overhead into the inventory costs of your manufactured items. You therefore lack the metrics needed to gauge your efficiency level.

When you use DBA to improve your manufacturing efficiency, you automatically improve your accounting efficiency as well. This is because DBA includes a standard chart of accounts and account assignment settings that correctly handle all your manufacturing accounting, right out of the box. All GL posting is handled in the background such that your non-accounting users can operate freely and efficiently without ever having to make accounting decisions.

3. Getting off to a Good Start

You need a plan

As with building a house, preparing for a military campaign, or any other complicated endeavor, it is always more efficient to have a well thought out plan than it is to barrel ahead and damn the consequences.

The Implementation Planner provides a proven plan



Our Implementation Planner provides you with a proven plan that is the most efficient means of getting the DBA process workflow up and running. Implementation is broken out into four phases:

- Installation
- Setup
- Rehearsal
- Startup Day

Each phase is broken out into a set of specific tasks that are to be performed in the prescribed sequence.

Guarantee success by following the plan

The key to successful implementation is to complete each task in the Implementation Planner in the exact order it is presented. Each task is well documented and most tasks are covered within our video training courses.

If you don't understand a task, submit a support ticket

If you are on a task and there is any aspect about it that you don't fully understand from our documentation and videos, submit a support ticket and we will help you.

Do not skip a task in frustration. Stay with it until you fully understand it and can complete it. This is how you build your knowledge of the DBA process workflow – one building block at a time.

Why do companies fail at implementation?

There are eight common mistakes that can result in companies having a poor implementation experience or failing to implement DBA altogether:

- Mistake #1: Ignore the suggested order
- Mistake #2: Take shortcuts
- Mistake #3: Ignore key processes
- Mistake #4: Don't involve users
- Mistake #5: Ignore the rehearsal phase
- Mistake #6: Ignore startup day
- Mistake #7: Rush startup day
- Mistake #8: Don't monitor your consultant

Let's now examine each of these mistakes.

Mistake #1: Ignore the suggested order

Each implementation task is predicated on the completion of previous tasks, which creates a "building block" effect. A common mistake is to ignore the suggested sequence of events and import master tables all at once or pick and choose tasks at random. In doing so, the building block effect is lost and overall implementation ends up taking more time.

Mistake #2: Take shortcuts

Another common mistake is to take shortcuts, especially when importing master tables. Instead of carefully editing data transfer spreadsheets to optimize them for compatibility with DBA, spreadsheets are imported with minimum editing. This creates far more work later than any time saved up front because final master table changes have to be made within the application screens, one record at a time, instead of within the spreadsheet, which is a far more efficient format for mass editing.

Mistake #3: Ignore key processes

Apart from the financial modules, which are optional, the core DBA system (including the General Ledger) functions as an integrated system and is not designed to be used in bits and pieces. And if you wish to maximize your manufacturing efficiency, you must use all the workflow processes. A common implementation mistake is to ignore key processes and assume they are not needed. In particular, work centers and routings, which are the source of much of your potential efficiency gains, are often ignored.

Mistake #4: Don't involve users

It is natural for users to resist change. The best way to overcome user resistance is to get users fully involved in the implementation process with

discussions, training, and implementation tasks. The more each user understands how the DBA process workflow benefits the system as a whole, the more willing that user will be to conform and contribute to the new processes.

Mistake #5: Ignore the rehearsal phase

It is vitally important that users fully participate in the “rehearsal” phase of implementation, which involves reviewing video training courses and using the training company installation to practice on your company’s data. Not only does this prepare users for startup day, but it also enables you to test the DBA process workflow to avoid surprises during system startup that could disrupt operations.

Mistake #6: Ignore startup day

It is not practical to run two systems in parallel, which is a recipe for chaos that will stress your users and disrupt your ability to serve your customers. The only efficient way to change over to the new system is to prepare for a “startup day” when you cease using your old system altogether and start operating exclusively in DBA. If you ignore startup day in favor of a “rolling” start, you inadvertently create an unstable system that frustrates users and customers and makes it impossible to get a handle on key balance sheet accounts such as *Inventory* and *Work in Process*.

Mistake #7: Rush startup day

Startup day can occur at the beginning of any accounting period and is not tied to your fiscal year. We recommend establishing target dates on all implementation tasks as a means for keeping implementation on schedule. If your target date approaches for startup day and your users have not completed the “rehearsal” phase of implementation, it is a mistake to rush startup day instead of delaying it one more month. The risks associated with not being prepared outweigh any benefits that might be gained by rushing the process.

Mistake #8: Don’t monitor your consultant

If you use an outside consultant to help with implementation, it is vital that you monitor the consultant’s adherence to the Implementation Planner tasks. A good consultant can be helpful, but a bad one can be costly and harmful to your implementation success. Here are red flags to look for:

- Tasks have been skipped.
- Tasks have been performed out of order.
- Data has been imported outside of the system’s data import utilities.
- Custom programming is being advocated.
- Selected processes are being started up incrementally instead of all at once with a system startup day.

3. Getting off to a Good Start

Take our training courses

Many of today's computer users are more comfortable learning from visual media rather than written documentation. Accordingly, we have created video training courses that explain how to set up and use most elements of the DBA system and process workflow. Video training courses are a highly efficient means of conveying information because they can be viewed by any user when needed at any time of day or night. Each user should be given a support center account and should be required to review all training courses that are relevant to his or her functional roles.

When a user does not fully understand the video content, as a next step, he or she should be required to review the operating guide or online Help. If that does not provide clarification, the final step is to submit a support ticket.

4. The 10 Core Practices of Efficient Manufacturing

In this section of the guide, we present the following 10 core practices of efficient manufacturing that apply universally to all industries and companies:

1. **Follow the workflow**
2. **Process in real time**
3. **Commit to accuracy**
4. **Refine your settings**
5. **Issue just in time**
6. **Pull jobs through the shop**
7. **Focus on the bottleneck**
8. **Manage your inventory**
9. **Cost for efficiency**
10. **Continue to improve**

These 10 core practices are derived from our experience as manufacturers and software developers combined with the philosophies of “lean manufacturing” and the “theory of constraints.”

Training Course

Support Center – Videos–How Do I? – Mfg #1 – Efficiency Principles

Practice #1: Follow the Workflow

In order to achieve the efficiency gains possible with “lean manufacturing”, you must use the DBA process workflow in its entirety, which provides the operating framework needed for the adoption of lean practices.

Do not attempt to replicate your old system’s processes

We find that when a company fails to achieve efficiency gains with DBA, most typically it is trying to replicate its old system’s processes within DBA. Using processes that are optimized for a different system will never work well. In doing so, key processes crucial to the DBA workflow inevitably get skipped over. You cannot become a truly efficient manufacturer unless you use all the key processes in the DBA workflow.

You will spend more time on the screen and less time walking around

Using all the key processes involves more time on the screen. At first, users may balk because they feel that the manufacturing system requires more work. In reality, the extra time on the screen performing processes correctly and in a timely manner saves far more time that would otherwise be spent walking around the shop trying to find out what’s going on.

Do not skip using MRP for job and PO generation

Inefficient companies create jobs manually instead of using MRP, usually because it has always been done that way or users are reluctant to learn how to use MRP. Using MRP is far more efficient than manual entry because it enables you to generate jobs directly from sales order lines for CTO (custom to order) items and to use reorder levels and other settings when generating jobs in response to net demand.

Inefficient companies enter purchase orders manually instead of generating them through MRP, usually because it has always been done that way or users are unwilling to learn how to use MRP. Manual PO entry is extremely inefficient, not only because of the extra time it takes, but because it results in more shortages, more expediting, and higher inventory levels. Time is far better spent refining MRP settings such as reorder levels and supplier selection and using MRP to generate POs automatically on a “just in time” basis that keeps inventory lean without risk of shortages.

Do not skip the job release function

Inefficient companies skip the job release function and release jobs upon creation, thinking that doing so provides more time to get jobs completed on schedule. In reality, this creates the opposite effect. Immediate job release makes it more difficult for jobs to get finished on time because the shop gets needlessly clogged with excessive work in process. Each job should only be released when its first work center has available capacity.

Do not skip using routings

Inefficient companies skip using routings because they have no experience with them and perceive that setting up work centers and routings is “too much work.” If you skip using routings, however, you lose much of your ability to improve your overall efficiency. Only with routings can you schedule jobs and work centers, track jobs as they progress through the shop, and achieve accurate job and product costing.

Do not bypass inventory processes

Inefficient companies skip standard inventory processes (PO receipts, job issues, job receipts, job material returns to stock, order picking) and use stock adjustments instead, typically because users skipped the “rehearsal” phase of implementation and have devised their own processes. Stock adjustments have no audit trail and play havoc with job and inventory costing. They have no role to play in any manufacturing process.

Do not skip real time processing

Inefficient companies use the back office to enter inventory and job transactions instead of having supervisors and material handlers make these entries in real time. Typically this is because it has always been done this way or “our shop people are not computer literate.” In reality, shop personnel can be trained to use two or three screens, regardless of their computer literacy level. If you want a manufacturing system to gain acceptance among your users, it is essential that users trust that the numbers they see on the screen are timely and accurate. Back office entry is always done well after the fact and destroys trust in the numbers.

Do not skip the job close function

Inefficient companies do not close their jobs, typically because users skipped the “rehearsal” phase of implementation and are not aware of its importance. If you don’t close your jobs, your WIP account is never balanced and your job schedule never gets relieved of finished jobs. Skipping this process is not an option.

Do not skip PO matching

Inefficient companies do not match received POs with supplier invoices, usually because it is perceived as “too much work.” PO matching must not be skipped, for a variety of reasons. The matching process closes out your POs, keeps your received not invoiced account in balance, serves as a check on supplier prices, and updates item last cost values.

Do not skip using the Shipment Planner

Inefficient companies make shipping decisions manually instead of using the *Shipment Planner* tool in the *Order Picking* screen. The *Shipment Planner* lists the orders that are ready to ship and prioritizes them in earliest required date

Practice #1: Follow the Workflow

order. By contrast, manual shipment planning is more time consuming and mistake-prone.

Do not skip GL posting

Inefficient companies skip GL posting, presumably in the belief that manufacturing accounting is not important. On the contrary, manufacturing accounting provides important performance metrics in regards to inventory, work in process, gross margins, direct labor, and factory overhead. You cannot become an efficient manufacturer without financial metrics to gauge your performance.

Do not use dummy jobs

Do not create “dummy” jobs for internal purposes such as maintenance or product development or for the collection of downtime hours. Dummy jobs of this nature are not compatible with the job accounting architecture, which is designed for production purposes.

In a production job, job costs accumulate in work in process and get transferred to inventory when job outputs are received to stock. Ultimately the inventory cost becomes the cost of goods sold when items are invoiced. If you receive a dummy job’s output to stock, its costs accumulate in inventory, which gets inflated because the output never gets sold. And if you keep a dummy job perpetually open to collect downtime hours, the costs accumulate in work in process, which continues to inflate over time.

Instead of attempting to use dummy jobs for internal cost tracking, do so using spreadsheets or other means and only use jobs for production purposes.

Do not attempt departmental accounting

Departmental accounting, where you charge various manufacturing expenses to different departments, is not possible in DBA, nor is it needed. Any attempt to somehow reproduce the departmental accounting from your old system through journal entries or purchasing manipulation will ruin the integrity of your manufacturing accounting. In DBA, all manufacturing expenses accumulate in your work in process account and get transferred to inventory as job outputs are received to stock. Expenses in the form of cost of goods sold do not occur until items are invoiced. Use the standard chart of accounts and account assignment settings and your manufacturing accounting will be done correctly.

Training Video

Support Center – Videos–How Do I? – Mfg #1 – Efficiency Principles

Segment: Follow the Workflow

Practice #2: Process in Real Time

An absolute requirement for practicing “lean manufacturing” is to know the real time status of inventory, jobs, and work centers.

Enter job labor in real time

The *Shop Control Panel* is designed to enable job labor hours and completions to be entered in real time. Simply click the *Labor* icon against any routing sequence and the *Job Labor* screen is opened and prefilled with that routing sequence. The *Hours Calculator* functions as a time clock when it calculates the actual setup or labor hours.

Ideally, job labor would be entered by work center supervisors as workers are given new assignments and at the end of each shift for all workers. When real time entry is not practical, start and stop times should be entered on the work center daily dispatch list, which shop supervisors can use to periodically update job labor throughout the day in as close to real time as possible.

These are easy entries to make and provide the real time job tracking information that is essential for releasing jobs and scheduling work centers. Without these entries, you cannot implement *Practice #6: Pull Jobs through the Shop* or *Practice #7: Focus on the Bottleneck*.

Only collect labor hours where needed

It is not efficient to collect labor hours against all processes, nor is there any accounting requirement to do so. Collecting labor hours has two useful purposes:

- It provides information that helps you refine process cycle times (*Hours/Process* or *Processes/Hour*) for more accurate costing and scheduling.
- If enables you to track labor productivity in the bottleneck work centers where productivity gains provide the most benefit.

It is not efficient to collect labor hours in these situations:

- Processes that are run on automatic machines.
- Setup time, other than to initially establish routing setup standards.
- Processes that don't lend themselves to time-keeping, such as inspection, shipping, some types of packaging, and short processes that are performed quickly.

When you enter routing sequences in BOMs and jobs, set the *Hours Type* to 'Actual' when you wish to collect actual labor hours and to 'Standard' when you wish to use standard hours.

What about downtime?

Downtime among workers is normal and occurs for a variety of reasons, including company meetings, coffee breaks, work area maintenance, machine repair, machine setup, waiting for another assignment, and so on. There is no accounting requirement to track downtime. The absorbed labor cost that gets charged to jobs is based on your shop labor rate, which takes downtime into account when the shop rate is calculated by the *Shop Rates* screen.

Do not correlate job hours with payroll hours

Job labor hours are not related to payroll. It is not efficient to combine time and attendance tracking with job hours tracking. Use a time and attendance system that is optimized for payroll purposes and don't attempt to use it for anything related to jobs.

Generate subcontract POs “just in time”

During the course of a job, items may need to be sent to outside suppliers for subcontract services such as painting, plating, or heat-treating. POs for subcontract services should be generated on a “just in time” basis, using the *Job Subcontracting* screen, just prior to sending the items to the supplier.

Enter job receipts in real time

Whenever finished job items are moved out of the job's final work center, whether the job is fully completed or only partially completed, the quantity being moved must be entered in the *Job Receipts* screen and dispatched to its next destination. The next destination might be a shipment staging area, a warehouse location, or, in the case of a subassembly, another work center.

Training Video

Support Center – Videos–How Do I? – Mfg #1 – Efficiency Principles

Segment: Process in Real Time

Practice #3: Commit to Accuracy

“Lean manufacturing” practices cannot be effective without accurate job details. By “job details” we mean each job’s specifications for raw materials, components, and routing sequences.

Job details originate from a BOM and can then be modified

In DBA the BOM (bill of material) and job details are not one and the same. The BOM is used to store the core specifications of a product. When MRP generates a job, the BOM specifications are multiplied by the job quantity to create the job details. If the core product is to be customized, the job details can be modified as needed by adding or deleting components or copying in phantom assemblies. Therefore, the BOM serves as a “template” and the job details function as the production bill of material.

“One-off” Job Details

“One-off” items can be created during sales order entry (using the *One-Off Item Generator*) for one-time manufactured items or repair jobs. You have the option of creating a BOM for the one-off item or MRP can generate a job without a BOM. When a BOM doesn’t exist, the job is initially created empty of any details. In that case you can enter job detail lines and routing sequences from scratch and you can copy in phantom assemblies or copy details from a previous job.

Job details drive the manufacturing system

Job details determine what items get purchased, what items get issued from stock to jobs, and what processes are performed in each work center or by outside subcontractors. Without accurate job details, you cannot purchase efficiently or control your inventory or schedule your shop.

Therefore, you cannot become an efficient manufacturer unless you make a complete commitment to maintaining accurate BOM specifications and job details.

What if job details evolve during the course of a job?

When making a highly customized product or a new product for the first time, job details can evolve during the course of a job as changes are made on the shop floor. In DBA you can flexibly modify job details at any time up until the job gets closed. Start the job with a set of job details that are your “best guess” specifications. After the job is started and changes get made, require your users to modify the job details in real time to reflect those changes.

Correct the BOM immediately when an error is found

If during the course of a job, an error is found such as in incorrect component or component quantity, immediately correct the BOM to insure that specifications are accurate for future jobs.

Routing accuracy is also important

Routing accuracy in terms of cycle times (process per hour) is also important because it is the basis of your product costing for labor and overhead and is used to schedule jobs and work centers. If you skip using routings altogether, you lose much of your potential for efficiency gains.

Use phantom assemblies where applicable

A phantom assembly is a set of components that can be thought of as a made to order subassembly. Unlike a subassembly, which is made on its own job, a phantom assembly is always assembled within a job for another item.

To use a phantom assembly in a BOM, specify the phantom parent as a component. When a job gets created, the phantom components get pulled into the job and are assembled as part of the job. This reduces the number of jobs involved in making multi-level products and keeps inventory to a minimum.

Phantoms are also useful for product customization. Many customized products consist of a core assembly that gets combined with various options. These options are often sets of components that can be represented by phantom assemblies. After a job gets created from the BOM, you can copy in one or more phantom assemblies to quickly configure a customized product.

Always use a unique part number for any variation

Always use a unique part number for any variation of an item. For example, if an item can be stocked as painted or unpainted, the unpainted version should have a different number than the painted version. If an item can be stocked as “new” or “used”, the used version should be differentiated with a different part number than the new version.

Unique part numbers for each variation is a requirement for accurate costing and purchasing. It may be perceived by users as additional work, but the extra effort is more than compensated by the avoidance of problems caused by part numbers without precise meaning.

Never use descriptors for stock items

Absolutely do not attempt to use non-stock “descriptors” as a substitute for stock items in your BOMs and jobs. Some accounting systems permit the use of “non-inventory” parts, but they have no role to play in a true manufacturing system.

Training Video

Support Center – Videos–How Do I? – Mfg #1 – Efficiency Principles

Segment: Commit to Accuracy

Practice #4: Refine Your Settings

“Lean manufacturing” is about producing more using less inventory and WIP. This is achieved through continuous refinement of your planning settings.

The planning settings generate your jobs and POs

Six planning settings on the *MRP Settings* screen (Reorder Level, Min Order, Multiple, CTO, Lead Days, Job Days) are used to generate all your jobs and POs.

Manual processes are inefficient

When users insist on manually planning and entering jobs and POs, they simulate the logic behind these settings without realizing it. It is far more efficient to spend time refining the settings and generating jobs and POs automatically than it is to do manual planning and data entry. Job scheduling and procurement is far too complicated for manual processes.

Purchasing agents often resist change

It is common for purchasing agents to cling to manual purchasing and present vehement arguments in its defense. The fact is, automated purchasing takes a fraction of the time. As you get more efficient, the need for expediting decreases as well. The PA fears being automated out of a job.

Use the time savings to obtain lower prices

The inefficiencies associated with manual PO planning and entry is not acceptable. Management’s challenge is to calm the fear over job security and focus the PA on using his or her time more productively. Obtaining better supplier prices, for example, an activity that gets neglected in high-expediting environments, can significantly improve your margins and bottom line profits.

The PA can also maintain reorder levels and lead days settings

If you purchase only as each job materializes, purchase planning is relatively simple. But if you order material for stock so that it is immediately available when needed by jobs, POs are triggered whenever net demand falls below an item’s Reorder Level. The PA can help establish item Reorder Level and Lead Days settings so that MRP generates POs as efficiently as possible.

If you make to stock, review reorder levels at regular intervals

Jobs for make to stock items are triggered whenever net demand falls below an item’s Reorder Level. The Reorder Level must be set high enough to cover anticipated demand for the duration of the job, plus a safety factor to cover potential variations in demand. If you set the Reorder Level too low, you risk shortages, but if you set it too high, you can tie up excessive working capital in inventory. Because the Reorder Level is such a critical setting, we recommend

Practice #4: Refine Your Settings

that you conduct a formal review of Reorder Level settings at regular intervals, such as once a quarter.

Use the CTO setting for customized items

If an item is always made to order and is customized in some manner, it should be designated as a CTO (custom to order) item. CTO items are never stocked and jobs are always generated directly from sales order lines.

Do not use the CTO setting for standard items

A common mistake is to use the CTO setting for make to order items that do not undergo any customization. This results in each customer order being given its own job, which needlessly multiplies the number of jobs in the schedule. When there are multiple orders calling for the same item, it is more efficient for MRP to generate a single job to cover the total net demand than to have multiple jobs all making the same item.

Use the Lead Days setting for make to order items

A made to order items may require several days before it can be started in order to procure material or to make lower level subassemblies. Where this is the case, use the Lead Days setting to account for this extra scheduling time. Although this setting is primarily used for make to order items, you can also use it as a safety factor with make to stock items.

With Job Days, start conservative and tighten over time

The Job Days setting establishes the number of work days that MRP allocates to make the job. You can click the button in the *Job Days* field in the *MRP Settings* screen to launch the *Job Days Calculator*, which gives you a calculated number based on applying the Run Size setting to your routing cycle times and work center Buffer Days settings.

Be careful not to use the calculated job days as a literal number. It takes time to refine your routing cycle times and work center Buffer Days settings. The Buffer Days setting recognizes that jobs often have a waiting queue at some work centers and that jobs in general have more move time and queue time than actual production time. We suggest you establish conservative Job Days settings at first, based on your experience and judgment. Over time, you can tighten your Job Days settings as you get more efficient and gain confidence in their accuracy.

Leave slack in the schedule

As you establish your planning settings, keep in mind that any scheduling system needs some slack in it to account for unexpected events. We all know too well that machines break down, key employees don't show up for work, suppliers are late with deliveries, key customers place unexpected rush orders, and any number of other things can disrupt the job schedule. So do not establish your settings based on the most optimistic scenarios – lean towards pessimistic

scenarios so that you leave slack in the schedule to accommodate unexpected events.

Strive for smaller run sizes with make to stock items

It is a common perception that larger run sizes are more efficient because it reduces the number of setups. In reality, it is more efficient to reduce your run sizes (by lowering the Min Order setting), even though it will increase the number of setups and create more work for your setup personnel. Shorter run sizes make jobs easier to schedule and generate less work in process to the benefit of all jobs. Shorter run sizes have a profoundly positive effect on your overall efficiency that far outweighs the extra setups.

Refine routing cycle times

On a periodic basis, use the *Work Center Performance* data view to review and refine your routing cycle times. When you note significant variances between planned and actual results within a process, adjust the BOM process cycle time (Hours/Process or Processes/Hour) for greater accuracy in future jobs.

Planning is an art, not a science

If manufacturing planning were a science, we could give you exact formulas to plug into and the whole process would be a mechanical exercise. In reality, planning is a series of assumptions based on best guess estimates and judgment calls.

Planning is an art. Like an artist, you get better the more you practice your craft. Over time, you will learn what settings work for your shop based on continuous feedback from a comparison of planned versus actual results.

Training Video

Support Center – Videos–How Do I? – Mfg #1 – Efficiency Principles

Segment: Refine Your Settings

Practice #5: Issue Just in Time

An effective “lean manufacturing” technique for minimizing WIP is to issue material to jobs on a “just in time” basis.

Stock hoarding is counter-productive

It is common for work center supervisors to practice “stock hoarding”, which is to issue and stage job material as early as possible in order to guarantee that the material will be on hand when the job actually starts.

Unfortunately, stock hoarding is counter-productive to your overall efficiency. It “pushes” material onto the shop, which needlessly clogs up staging areas and aisles and impedes the free movement of material. Once you have the planning system working smoothly, there is no need for stock hoarding because shortages will no longer be a common occurrence.

Assign components to routing sequences

When you enter your BOM components, always assign each component to the routing sequence within which it gets consumed. This provides two benefits. First, the components print on the job traveler within the sequence they are used. Second, it enables you to issue job material by work center.

Supervisors should dispatch material “just in time”

Stock hoarding must be forbidden. Instead, work center supervisors should be trained to “pull” material into the shop by dispatching their material requirements on a “just in time” basis, which is just prior to when the material is actually needed. This will keep WIP as lean as possible, which keeps aisles and staging areas clear and provides for free movement of material through the shop.

Dispatching is done using the *Shop Control Panel*, which provides a daily schedule of job sequences to be performed within each work center. An indicator in the lower panel lets you know whether material has been issued or not. If not, you can click a button that opens the *Job Issues* screen, prefilled for the selected job. You issue the material on the screen and then print a dispatch list that is used to physically gather the material.

Do not allow lag time between dispatching and gathering

Dispatching is meant for real time inventory updating. It is predicated on material being gathered immediately after the dispatch list is printed, with minimal lag time. Do not allow it to be used as a disguised form of “hoarding” where material is grabbed on the screen and is not actually gathered until days later.

Practice #6: Pull Jobs through the Shop

In a “lean manufacturing” environment, WIP (work in process) is kept to a minimum. This can be accomplished by “pulling” your jobs through the factory using queue control.

Use queue control to optimize your workflow

The *Shop Control Panel* offers a “queue control” capability that helps manage the shop workflow and keeps WIP to a minimum.

A work center can be flagged for queue control, which works like this. The work center’s actual “queue days”, which is the total estimated setup and labor hours for all job sequences that are waiting in the work center or are already in production, is compared to its planned “buffer days” setting, which is its expected queue days.

When queue days are less than buffer days, the work center has open capacity and can accept additional job sequences. When queue days are equal or greater than buffer days, the work center is overloaded and should not accept additional job sequences.

When a job’s first work center does not have open capacity, the job should not be released to production until capacity becomes available. When a job is in production and its next work center does not have open capacity, the job should be paused and other jobs run instead until capacity opens up in the next work center.

Overloading the shop is like overloading a freeway

Queue control prevents your shop from getting overloaded, which has the same negative impact on efficiency as overloading a freeway.

A freeway has an optimal carrying capacity in the number of vehicles it can accommodate for maximum efficiency. Once that carrying capacity is exceeded, the freeway’s efficiency drops severely because of traffic jams and accidents. The optimum carrying capacity is a tipping point where it may take only a small number of extra vehicles to trigger a drastic decrease in efficiency.

Your shop works the same way as a freeway. It has an optimum carrying capacity in the number of jobs it can handle at any given time. If you exceed this optimum carrying capacity, traffic jams result as work centers get backed up and aisles clogged with work in process and staged materials. Accidents occur in the form of quality defects from excessive material handling. Overall efficiency declines and shop throughput decreases.

Queue control “pulls” jobs through the shop

With queue control, each job gets released to production only when its first work center has open capacity. In turn, the first work center’s capacity is affected by the capacity of “downstream” work centers. For example, if a job’s second work

Practice #6: Pull Jobs through the Shop

center has no open capacity, it may cause the first work center to stop taking more jobs until the second work center opens up. In effect, the second work center “pulls” jobs into the first work center.

With queue control, job sequences are never “pushed” onto other work centers. Instead, job sequences are paused until downstream work centers become open. This results in an even workflow that maximizes shop efficiency and throughput.

When workers are temporarily idle:

When you use queue control, work center capacity dictates the pace at which jobs can be released to production. The total number of jobs stays within the shop’s optimal carrying capacity. As a result, some workers occasionally may be idle while waiting for shop capacity to become available.

When this happens, it is a mistake to go ahead and release jobs and schedule job sequences just to keep workers busy. This is counter-productive because it increases WIP, consumes inventory, ties up working capital, and reduces shop efficiency to the detriment of all your other jobs.

It is better to operate the shop as lean as possible and to give temporarily idle workers something else to do, such as employee education and training, work area maintenance, or some fall-back production task on the sidelines that doesn’t affect your mainstream jobs.

If you start falling behind schedule:

If you detect a pattern where many jobs are unable to be released on time, it is an indication that your order volume has exceeded your shop capacity. There are three possible remedies for this condition:

Increase your capacity

You can increase shop capacity by working overtime, running an additional shift, or adding workers or machines. You can expand or reduce your work center capacity settings to see the effect on work center queues.

Quote longer delivery times

For items made to order, you must quote longer delivery times when you accept new customer orders. This will not affect the time it takes to actually run the job, but the job will have to wait longer than usual before it gets released to production.

Increase finished good stocking levels

For items made to stock, you must increase your finished good stocking levels. This is because it will take longer than normal for stock to get replenished, which means that stock on hand must be boosted to cover expected sales over a longer period of time.

The point to keep in mind is -- you never want to overload the shop beyond its optimum capacity. When order volume exceeds that capacity and you are

unable to increase capacity, you must quote longer delivery times or increase finished good stocking levels.

Do not lengthen your job schedules

A common mistake is to give jobs a longer interval between scheduled start date and finish date, thinking that this gives the job more time to get through the shop. This is counter-productive because it overloads the shop and decreases overall efficiency to the detriment of all jobs. Instead of lengthening job schedules, lengthen the waiting times before jobs get released to the shop floor.

Training Video

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Segment: Manage Your WIP

Practice #7: Focus on the Bottleneck

The central tenet of the “theory of constraints” is the role the bottleneck work center plays in the overall efficiency of your factory.

What is the “bottleneck” work center?

Each shop has at least one key work center with limited capacity that is the “constraint” that ultimately governs the pace at which jobs get through the factory. This work center is called the “bottleneck” work center. Most jobs either must pass directly through the bottleneck or are dependent on the completion of related jobs that must pass through the bottleneck.

Your bottleneck might be a unique machine, or a process such as painting or heat-treating, or a labor operation that can only be performed by one or two workers with specialized skills. At our old company, the bottleneck was the welding department. No matter how efficient we were elsewhere in the shop, it was the pace at which items could be welded that ultimately governed what got out the door.

Always keep the bottleneck fully utilized

To maximize shop throughput, you want to keep the bottleneck work centers fully utilized with no downtime, which can be achieved by using queue control, which was described in detail in the previous chapter.

The work center “buffer days” setting can be used as the target backlog for a bottleneck work center. You want to maintain a backlog sufficient enough to insure that the work center stays fully utilized. Therefore, set an appropriate number of buffer days to insure that the bottleneck work center maintains an uninterrupted production workflow.

A chain is only as strong as its weakest link

Think of your shop as a “chain” of work centers in which the bottleneck is the weakest link. You can be as efficient as possible in all your other work centers, but if you are inefficient in the bottleneck work center, all that other efficiency is of no benefit. The chain is only as strong as its weakest link.

Focus on productivity at the bottleneck

A common misconception is that an emphasis on maximizing labor productivity leads to major gains in efficiency. Yes, you can increase efficiency at the individual work center level, but that contributes little to overall efficiency, which is governed by the bottleneck. The place to focus on labor productivity is at the bottleneck work center itself, because any efficiency gains you make there benefit all your jobs.

The Proper Use of Labor Standards

Even though labor productivity outside the bottleneck contributes little to overall efficiency, maintaining labor standards serve two other purposes that indirectly contribute to overall efficiency:

- Labor standards give you realistic routings for job scheduling and estimated costing purposes.
- Labor standards instill good habits in your work force because they provide workers with a measure of acceptable performance.

So by all means, establish labor standards and track worker performance for the reasons stated, but keep in mind that it is at the bottleneck where you can achieve dramatic gains in overall efficiency.

Can there be multiple bottlenecks?

You can only have more than one bottleneck when you have two different product lines that go through completely different processes and are sold and shipped separately. For example, at our old company we had two product lines, one that was sheet metal based and one that was plastic based, that were sold to different sets of customers. Each product line had its own bottleneck – welding in one case and extrusion in the other.

Even though at first it may feel like every work center is a bottleneck, only one work center can be the “constraint” that is the weakest link in the chain. Do not attempt to use multiple bottlenecks other than the one exception described above because it is counter-productive and may actually reduce your overall efficiency.

Practice #8: Manage Your Inventory

You cannot operate in a “lean manufacturing” environment without accurate inventory.

You will never be efficient without accurate inventory

The lack of inventory control is the number one problem for many companies. If you cannot control your inventory, you are plagued with shortages, delays, high expediting costs, and over stocking. You can never become an efficient manufacturer without accurate inventory.

The DBA process workflow is the solution

If you are unable to maintain accurate inventory, the solution is not to apply a band aid remedy such as more frequent stock counts or bar coding, but to get at the toot cause, which is the failure to follow the DBA process workflow. If you institute the following processes, you can get your inventory under control.

You must operate with accurate BOMs and job details

You cannot achieve an accurate inventory if you operate with inaccurate BOMs and job details. Without accurate manufacturing specifications, you cannot avoid shortages, delays, and high expediting costs. See *Practice #3: Commit to Accuracy*, for more details.

You must update inventory in real time

DBA is designed on the premise that all inventory transactions are entered in real time as they occur. No provision is made for “back dating” transactions after the fact, nor is negative stock on hand allowed when issue, pick, and receipt transactions are entered out of sequence.

You will never have an accurate inventory if you rely on the back office to enter inventory receipts, issues, and picking transactions. After the fact entry is prone to errors and fosters distrust in the system because users know that the numbers on screens and reports do not reflect reality. It is imperative that you give supervisors, material handlers, and shipping personnel access to computers and train them to enter their own transactions in real time.

Use location control

Virtually any company, no matter how small in size, benefits by using location control. Having to specify exactly where stock is received, issued, and picked promotes a company culture that is devoted to details, which is essential for achieving manufacturing efficiency. All inventory processes – receiving, issuing, picking, and counting – are performed more quickly and accurately when locations are specified.

Use dispatching

The most efficient way to perform inventory transactions is through “dispatching.” With dispatching you receive, issue, or pick stock on the screen first, then you print a dispatch list that is used as a guide by material handlers for physically storing or gathering stock.

Dispatching insures that inventory gets updated in real time and not after the fact. It also serves as an allocation system because once stock is dispatched, that stock cannot be used for another job or sales order. Dispatching is ideal for lot and serial control because the desired lot or serial numbers are selected in advance and are printed out on the dispatch list.

Always correct stock discrepancies immediately

No matter how precisely your users follow the DBA process workflow, mistakes will be made. Whenever you encounter a stock discrepancy, meaning that the screen says there is stock on hand that does not exist, or stock is not on hand that does exist, immediately track down and correct the discrepancy. If the error is ignored, it will simply perpetuate and cause problems down the road.

What are the possible causes of stock discrepancies?

Stock discrepancies can occur for a variety of reasons:

- Someone physically made an inventory transaction without recording the event in the computer. If you use dispatching and require all stock movements to be made from dispatch lists, this cannot happen.
- It is possible that someone gathered job material without following a pick list or dispatch list and then “prefilled” a batch transaction where the job details differed from what was physically gathered. Forcing stock to be gathered from dispatch lists will solve this problem.
- A subassembly may be completed on its job and used in a higher level job without a job receipt transaction being made first. A shortage then occurs when the subassembly needs to be issued to the next job. Requiring all transactions to be dispatched will solve this problem.
- Someone entered an incorrect quantity. This can always happen. When you use dispatching, however, most quantities are “prefilled”, which reduces the probability of quantity errors.
- Stock counts can get off for all kinds of reasons. Some stock is inherently difficult to measure or count. Some items have variations in scrap quantities from job to job. When the on hand quantity is off, an instant stock count should be made to correct it.

The most important reason for making instant corrections is that it may uncover a pattern that gets to the root cause of the discrepancies.

Avoid mass physical inventories

Do not rely on mass physical counts for inventory control. Mass physicals are notoriously error-prone and disruptive to operations. You should only conduct a mass physical inventory when you are required to do so for an audit.

Use cycle counts instead of mass physicals

You may have certain items that need periodic cycle counting because they have variable usage due to a scrap factor. This is common with plastics and metals. Devise a cycle counting plan that schedules counts on these items in a predictable manner.

What about bar coding?

A common perception is that bar coding provides a technical solution for inventory control, the idea being that if users are forced to scan items, locations, and lot and serial numbers, they cannot make mistakes.

Bar coding is highly efficient for retailers and distributors because they deal with packaged products that are bar coded with industry standard UPC codes and SKU's.

Bar coding is much more challenging for manufacturers. Manufacturing companies deal with internal, user-defined part numbers that represent raw materials, components, subassemblies, and finished products. For a bar coding system to work, each and every inventory item, whether purchased or manufactured, must be labeled with bar codes upon receipt. Many raw materials and components are not label friendly.

Dispatching is a more efficient solution

If the objective is to reduce errors, a far more efficient solution than bar coding is to use dispatching. When a material handler is given a dispatch list, the items, locations, lot numbers, and serial numbers are already selected and updated and are listed in location order for picking efficiency. Dispatching dramatically reduces errors without the massive labeling burden associated with a bar coding system.

Practice #9: Cost for Efficiency

The “theory of constraints” explains how traditional cost accounting measures and rewards local efficiencies at the item, job, and work center level, which is actually counter-productive to overall efficiency.

Cost precision is a myth

The most common mistake in manufacturing costing is to assume that each job has a precise cost. Taking each job cost as a literal cost leads to poor decision making in regards to job scheduling, inventory, and product pricing. These poor decisions can have a profoundly negative impact on your overall efficiency that gets translated into longer delivery times, increased inventory, and higher product costs.

Smaller run sizes are more costly, but only on paper

A good example of how literal job costing leads to poor decision making is your run size policy on make to stock items. If your objective is to achieve the lowest unit cost possible, an easy way to achieve that is to increase job run sizes, which spreads your fixed setup cost over more units.

Increasing your run size lowers the cost on paper for this one product, but at a high hidden cost that gets applied to all your products. Large run sizes clog up job schedules, tie up work centers and aisles, increase WIP, and reduce your quality.

Setup is really an overhead cost

The assumption that setup cost is a literal cost is what leads to the incorrect decision that increasing run sizes is a good thing. In reality, setup is more of an overhead cost than a direct cost because you tend to have a fixed payroll cost for setup personnel, regardless of how many setups they perform in a given period. When you treat setup as an overhead cost, the cost gets spread over all your products so that no one product bears a high setup cost.

Increase your setups and reduce your run sizes

The far more efficient practice is to reduce your run sizes, even though it will increase the number of setups and create more work for your setup personnel. Shorter run sizes can have a profoundly positive effect on your overall efficiency that greatly outweighs the extra setups. Jobs are easier to schedule and get performed more quickly using less material.

A single shop rate leads to better decision making

A single hourly shop rate for labor leads to better decision making because no single job gets penalized or rewarded based on what workers happened to be used or whether the job was run during regular or overtime hours. Use the shop labor rate for setup as well.

Practice #9: Cost for Efficiency

A single shop labor rate blends all your individual direct labor wage rates into a single rate that reflects downtime and overtime. This rate can be calculated for you by the *Shop Rates* screen based on dividing actual direct labor costs by reported job hours for a recent date range.

With a single hourly shop labor rate you can freely allocate labor resources where and when they are best needed, without regard to cost implications.

Overhead is an indirect cost

Another example of how literal job costing leads to poor decision making is to assume that factory overhead is a direct cost. If your objective is to achieve a target profit margin on each job or product, treating overhead as a direct cost can lead to poor pricing and product line decisions.

Material, subcontract services, setup, and labor are direct costs. Even though setup and labor are costed at a single shop rate, which is an “approximate” cost, that cost is still directly associated with each job’s estimated or actual job hours.

Overhead is different. It represents the overall cost of running the factory, including managers, supervisors, maintenance personnel, rent, utilities, and supplies. This overall cost gets allocated to each unit of production, but only on paper. Overhead is an indirect cost, not a direct cost.

A job or product can lose on paper, but still be profitable

If you treat overhead as a direct cost, you can mistakenly conclude that some jobs or products are unprofitable because they lose money on paper. In reality, provided that direct costs are covered, some of those jobs or products may be valuable contributors to your overall profitability, even if they appear to be losers on paper.

Factory overhead is essentially a fixed cost. The only way to reduce the unit cost of overhead in your products is to spread this fixed cost over more units of production. Therefore, any product that covers its direct costs contributes additional units of production that helps absorb your fixed overhead cost. You are better off keeping what appears to be an unprofitable job or product because it helps lower the unit overhead cost of all your other jobs and products.

Increasing shop utilization is the best way to lower costs

The most dramatic way to lower unit costs and improve margins is to spread your factory overhead cost over more units of production. Therefore, it is often to your benefit to take on certain jobs and to keep certain items in your product line that lose money on paper, but help absorb your factory overhead cost.

A single shop rate for overhead is best

As with labor, a single hourly shop rate for overhead is the best way to evenly allocate overhead across all your products without unduly penalizing or rewarding one process over another. This rate can be calculated for you by the

Shop Rates screen based on dividing actual manufacturing overhead costs by reported job hours for a recent date range.

Update shop rates once a quarter

We suggest that you review and update your hourly shop rates for direct labor and manufacturing overhead on a quarterly basis, which is done within the *Shop Rates* screen.

Do not confuse inventory cost with actual job cost

Another common mistake with manufacturing costing is to confuse inventory cost with actual job cost. The two costs are related, but they are not the same thing.

Inventory cost is an accounting cost used to value your inventory on the balance sheet when items are completed and on the income statement when items are sold. The actual cost of labor and overhead are absorbed into your inventory and are only realized as expenses when items are sold, in the form of cost of goods sold.

Inventory costs are “approximate” costs in which there is always a variance between actual and absorbed labor and overhead costs. Cost variances are normal and expected when it comes to inventory costing.

Job costing is more exact because it is done after each job is completed, when all costs are accounted for. By contrast, inventory costs are often updated while jobs are in progress and are based on estimated job cost, not actual job cost. If your objective is to review job profitability or estimated versus actual performance, analyze job costs, not inventory costs.

Assess job performance at time of job close

When each job is closed, we suggest you review job performance using the *Closed Job Performance* data view. If you encounter significant variances between planned and actual results, you may wish to adjust BOM routing cycle times (*Hours/Process* or *Processes/Hour*) so that they are more accurate for future jobs.

Cost job receipts using the estimated job cost basis

In the *Job Defaults* screen, you have the choice of costing job receipts using the *Actual Job Cost* or *Estimated Job Cost* basis. The *Estimated Job Cost* basis is more efficient because work center supervisors can freely enter job receipts without regard to cost implications. By contrast, with the *Actual Job Cost* basis, input costs have to be fully accounted for so their total cost can be balanced with the final receipt cost. This can result in delays or interruptions while costs are updated, which is not efficient.

When you use the *Estimated Job Cost* basis for job receipts, it is common to end up with a variance at time of job close between total input and output costs. A cost variance is normal and expected and is handled properly by the standard chart of accounts. This costing method is similar to standard costing.

Roll up estimated costs at least once a week

The cost rollup calculates an estimated cost for your manufactured items and takes into account costs for material, setup, labor, subcontract services, and overhead. To insure that your estimated costs are as current as possible, we recommend that you perform a batch cost rollup at least once a week.

Before you run the cost rollup, update all your purchase item estimated costs with each item's last cost, using the *Mass Replace* function in the *Estimated Purchase Costs* screen. After updating your purchased item costs, use the *Batch Rollup* function in the *Cost Rollup* screen to roll up estimated costs for all your manufactured items.

The cost rollup is not the same as the estimated job cost

When a new job gets generated from a BOM, the program calculates an estimated job cost based on the job details. The estimated job cost will be similar to the BOM parent's rolled up cost, but it can differ for three reasons:

- If the job quantity is different than the BOM parent's *Run Size* setting, fixed setup cost is divided by a different quantity and will have a different value.
- If you customize the job by modifying job details, any changes will be reflected in the estimated job cost.
- The estimated job cost uses current estimated costs whereas the rolled up cost is only as current as the last rollup date.

Do not make journal entries to Inventory and WIP

Do not make adjusting journal entries to your *Inventory* or *Work in Process* accounts. These are self-adjusting accounts that tie down to the underlying transactions. If you adjust these account balances, you sever the association with the underlying transactions and lose the integrity of these key metrics.

Training Video

Support Center – Videos–How Do I? – Mfg #1 – Efficiency Principles

Segment: Cost for Efficiency

Practice #10: Continue to Improve

A core element to the “lean manufacturing” philosophy is “continuous improvement”, whereby processes are constantly evaluated and improved in regards to their contribution to overall efficiency.

Apply the 10 core practices for “breakthrough” improvement

“Breakthrough” improvement, where significant gains in efficiency occur in a relatively short period of time, can be achieved by using the 10 core practices of manufacturing efficiency outlined in this guide. Using these core practices involves large scale changes to your process workflow that can yield dramatic results.

Apply continuous improvement for “incremental” gains

Breakthrough improvement only takes you half way to your full potential for efficiency gains. After you apply the 10 principles to your operations, you can achieve further “incremental” gains in efficiency through a formal program of continuous improvement.

Systematically examine processes for improvements

In a continuous improvement program, teams consisting of workers, supervisors, and management systematically examine critical processes and subject them to these steps:

- Through an exchange of ideas, propose a specific improvement and decide how to implement it.
- Test the improvement on a small scale, if possible.
- Verify that the improvement actually made a difference.
- Implement the improvement on a wide scale and continue to verify the results.

What types of processes should be examined?

Any process that has a potential effect on total efficiency is subject to examination. Each company has hundreds of processes to examine. Here are some generic examples of processes to examine:

- Where is it most efficient to locate computers for access by work center supervisors, material handlers, and shipping personnel?
- Where can raw materials and components most efficiently be staged in each work center?
- What is the most efficient layout for the flow of materials vis-à-vis the receiving area, warehouse, work centers, and shipping?

Practice #10: Continue to Improve

- How can setup time be reduced? Should assembly workers be trained to help with setups or to do their own setups?
- What are the most efficient procedures for the “just in time” dispatching of material to work centers?

Use a “bottom up” approach for best results

You cannot maximize your efficiency if you rely on “top down” edicts and controls. Not only is this detrimental to worker morale, a top down approach denies you the source of much of your potential efficiency, which is the workers who actually perform the processes. Your workers are aware of hidden inefficiencies that are easily overlooked by management. Successful manufacturers such as Toyota use a “bottom up” approach that stresses worker involvement.

Meet on a regular basis, such as once a week

Continuous improvement is not a short term program that ends once its objectives are met. As its name implies, it is an ongoing program because there is always room for improvement and you want to guard against backsliding into bad habits. So have your team or teams meet on a regular basis, such as once a week.

Formalize your meetings by taking notes. Create a log of all efficiency improvements and suggestions and track your progress.

Perform a quarterly review of the Efficiency Checklist

Your weekly meetings will be focused on incremental improvements within your workflow processes. Once a quarter, we suggest you take stock of your overall efficiency by going through the *Efficiency Checklist*, located in the final chapter of this guide.

The *Efficiency Checklist* is a listing of all the recommended practices associated with the 10 principles of manufacturing efficiency outlined in this guide. Your efficiency review should include the following:

- Insert a checkmark against each efficiency practice that has been fully implemented.
- Identify efficiency practices that are not yet implemented. Establish time frames for implementation and use your weekly meetings to carry out the details.
- Identify efficiency practices that are implemented, but need improvement. Devise remedies for these needed improvements at your weekly meetings.

The quarterly review is essentially a “health checkup” that is conducted four times a year to help keep your continuous improvement program on track and focused on the big picture.

Training Video

Support Center – Videos–How Do I? – Mfg #1 – Efficiency Principles

Segment: Continue to Improve

Practice #10: Continue to Improve

5. Efficiency Checklist

The *Efficiency Checklist* provides a listing of all the specific efficiency practices recommended in this guide. We suggest that you review this checklist once a quarter to identify practices that require implementation or need improvement.

√ **System Implementation**

- We perform all implementation tasks in the suggested order.
- We edit transfer spreadsheets thoroughly before importing master tables.
- We implement all the workflow processes.
- We require all users to fully participate in the “rehearsal” phase.
- We require all users to review relevant training courses.
- We use the training company to practice on our own data.
- We plan for a “startup day” when we start operating exclusively with DBA
- We postpone startup day if we are not fully prepared for it.

√ **Practice #1: Follow the workflow**

- We use MRP to generate all our jobs.
- We use MRP to generate all POs related to inventory and jobs.
- We do not immediately release jobs upon their creation.
- We use routings and work centers to define all BOM and job labor.
- We don't use stock adjustments as a substitute for any standard processes.
- We formally close all our jobs.
- We formally match all our POs to supplier invoices.
- We use the *Shipment Planner* to prioritize our daily shipments.
- We batch post to the general ledger on a daily basis.
- We do not use dummy jobs for internal cost tracking.

√ **Practice #2: Process in real time**

- We use standard hours on processes that run on automatic machines.
- We use standard hours on short processes that are performed quickly.
- We update job labor as workers are given new assignments.
- We update job labor at shift end for sequences in progress.
- We do not correlate job hours with payroll hours.

5. Efficiency Checklist

We generate subcontract POs “just in time.”

We enter job receipts in real time.

√ **Practice #3: Commit to accuracy**

We have high confidence in the accuracy of our BOMs.

We accurately modify job details in real time when changes occur mid-job.

We correct BOMs immediately when job detail errors are encountered.

We have high confidence in the accuracy of our routings.

We use phantom assemblies for make to order subassemblies.

We use unique part numbers for all variations of each item.

We never use descriptors as a substitute for stock items.

√ **Practice #4: Refine your settings**

We regularly review *Reorder Level* and *Lead Days* settings on P items.

We regularly review *Reorder Level* settings on our make to stock items.

We do not use the *CTO* setting for non-customized items.

We regularly review the *Lead Days* setting on make to order items.

We regularly review the *Job Days* setting on our manufactured items.

We use work center *Buffer Days* settings to leave slack in the schedule.

We strive for lower job quantities by avoiding high *Min Order* settings.

We formally review routing cycle time settings at time of job close.

√ **Practice #5: Issue just in time**

We assign all BOM components to routing sequences.

We dispatch work center material “just in time.”

√ **Practice #6: Pull jobs through the shop**

We use queue control to manage critical work centers.

We release jobs as scheduled unless the first work center is overloaded.

We schedule each work center on a daily basis.

We provide idle workers with alternative activities to unneeded jobs. .

√ **Practice #7: Focus on the bottleneck**

We have identified our bottleneck work center(s).

- We always keep the bottleneck work centers fully utilized.
- We regularly review productivity at the bottleneck work center.

√ **Practice #8: Manage your inventory**

- We use location control.
- We use dispatching for all our inventory transactions.
- We correct stock quantity discrepancies immediately.
- We do not perform mass physical inventories.
- We perform scheduled cycle counts on selected items.

√ **Practice #9: Cost for efficiency**

- We keep our job run sizes small and ignore setup cost.
- We use a single hourly shop rate for labor.
- We use a single hourly shop rate for overhead.
- We assess margin contribution based on direct costs, excluding overhead.
- We update our shop rates for labor and overhead once a quarter.
- We review job performance at time of job close.
- We cost job receipts using the *Estimated Job Cost* basis.
- We roll up estimated costs at least once a week.
- We do not make journal entries to our *Inventory* and *WIP* accounts.

√ **Practice #10: Continue to improve**

- We have a formal continuous improvement program with weekly meetings.
- We maintain a formal log of improvements and track their results.
- Workers are given full and equal participation in the program.
- We conduct a quarterly review of the *Efficiency Checklist*.

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