E.R.P.

&

LEAN

How "Lean Manufacturing" Makes ERP Credible!

*"You can't build a reputation on what you're **going** to do!"*

Henry Ford

Where's The Beef?

Disappointed With Your ERP Results?
Help Is On The way!

***ERP**, Combined With **Lean Manufacturing**,*
Produces Huge Results.

Industry abounds with ERP installation disappointment. "We spent millions putting in the software, inputting our data, and training our people... I'm still looking for the benefits." To quote a CEO of a large integrated steel mill.
The problem is often **not** the fault of the software.

An Enterprise Resource Planning (ERP) system can be an extremely powerful tool for management. The system plans future resource requirements through its' scheduling algorithms. It then uses these schedules to predict the amount and timing for each of these resources. Manpower, materials, and cash flow are all readily predicted based upon the planning done within the system.

The value attained from ERP software derives from this ability to predict future requirements, and the consequences of taking the recommended actions.

These recommendations, however, are generally in error when the data reflects "traditional" operating practices.

- Excessive planned lead times bloat the company with too much inventory. They also force our customers to predict further into the unknown future, causing frequent changes.
- Large lot sizes add even more unnecessary inventory.

- Deep bills of material structures unnecessarily complicate operations, increase inventory, extend customer lead times, and add non-value-adding transactions.
- Just-In-Case "safety stocks and/or safety time" further dilute schedule reliability and add to the inventory burden.
- And all of the above destroy the scheduling credibility; the very thing that ERP systems are employed to provide!

The remainder of this booklet will focus on why
Lean Manufacturing concepts are absolutely required if ERP is to fulfill its promise of providing credible data.

We will also look at the tremendous impact attainable by combining the predicting capabilities of ERP with the streamlined productivity, and enhanced customer service, provided by adopting a lean operating philosophy.

Let's take a moment to investigate how ERP systems work.

ERP / MRP Is Simply A "Time-Phased" Shortage List

The core scheduling algorithm of an enterprise system is the Material Requirements Planning (MRP) module. MRP does classical back-scheduling. It takes your lead times, lot size policies, and any safety stock reserves you've entered, and uses them to calculate all future operations needing to be performed. It then uses this information to compute the corresponding material, labor and cash flow requirements.

The primary questions MRP is designed to answer are:

What do we really need?
And,
When do we really need it?

Since MRP is simply a time-phased shortage list, let's re-acquaint ourselves with the logic of the shortage list.

How do you make a shortage list?

Information Required	**Information Source**
What do we want to make?	Schedule
What does it take to make it?	Bill of material (BOM)
What do we have?	On-Hand Inventory
What do we have to get?	Calculate

Example:

- The schedule calls for us to make 50 *Mousetraps*.
- The Bill Of Material (BOM) shows that each *Mousetrap* takes one *Board,* two *Springs,* one *Clapper,* and four *Screws.*
- Stock on Hand:

Boards:	*16*	*Springs:*	*173*
Clappers:	*10*	*Screws:*	*119*

- Shortage Calculation:

Part No.	(a) Qty per M'trap	(b) M'traps Req'd	(c) = (a) x (b) Total (Gross) Req'ts	(d) Qty On Hand	(e) = (c) - (d) Shortage
Board					
Spring					
Clapper					
Screw					

OK, Take a minute and fill in the above work sheet, i.e. calculate the shortage for each item.

Got it? Good.

The clapper is also made in-house. Use the information you computed, plus the information below, to calculate the amount of wire we need, i.e. its' shortage amount.

- The *Clapper* Bill of Material (BOM) shows that each Clapper takes eight inches of *Wire*.
- *Wire* stock on hand: 200 inches.
- Calculate the shortage (net requirement) of *Wire*: _____ inches.

You should have computed a wire shortage of 120 inches. This calculation is based on the "gross to net" algorithm of MRP. The system calculates **gross requirements** at the top level for each component part (50 mousetraps times the "quantity per" for each component, e.g.1 clapper per mousetrap = 50 clappers required). It calculates **net requirements** by subtracting the quantity available (50 clappers required, minus the 10 clappers available = a net requirement of 40 clappers).

This now becomes the gross requirements for the next level. We need to produce **40** (not 50) more clappers. Each clapper requires 8 inches of wire, therefore we need 40 x 8 = 320 inches of wire (the gross requirement for wire). We then subtract the quantity on hand to determine the amount of wire we need to order. 320 inches required, minus 200 inches available = 120 inches net requirement (shortage).

MRP simply takes the logic of the shortage list and **time phases** it.

In the above example, if we need two days to assemble the mousetrap, the shortage materials would be required two days earlier than our mousetrap scheduled completion date.

MRP Back-Scheduling Logic

Lot Size	L'd Tim	Sfty St'k	On-H'nd	**Mouse Trap**	Current & P-D	1	2	3	4	5	6	7	8
				Gross Req'ts									70
				Sch'd Rec'pts				20					
1	2	0	20	Proj'd avail	20	20	20	40	40	40	40	40	
				Net Reqm'ts									30
				Plan'd rec'pt									30
				Plan'd Rel's							30		

In MRP format, the example above shows the underlying "given" parameters in the first 3 columns: The lot size specified for the mousetrap is 1 (also referred to as lot-for-lot). The Lead-Time for this part number (mousetrap) is specified as 2 periods. There is no safety stock required on this part.

The next column shows the quantity currently on-hand.

Our Master Schedule calls for us to complete 70 mousetraps in period eight.

We can also see that 20 more mousetraps are expected to arrive into stock in period 3. This "scheduled receipt" is the quantity due to be received in the designated period, generally from an open Purchase Order (P.O.) or an open work order.

MRP calculates the numbers shown in red. We have 20 on hand. We will receive 0, and we will use 0 in period one. Therefore we'll still have 20 at the end of period one.

We'll receive 20 more mousetraps in period three, therefore we'll have "projected on hand" our original 20 plus 20 new arrivals, for a total of 40 mousetraps at the end of period three.

In period eight, we need 70, but our projected balance is only 40, therefore we'll have a "net requirement" (shortage) of 30.

Since there is no safety stock required, and no lot size issues, MRP "plans to receive" 30 mousetraps in period eight.

Since it takes two periods (the "lead time") to produce mousetraps, MRP plans to release, i.e. have all of the required material on-hand to produce, 30 mousetraps in period six.

MRP then goes through a similar process for each of the components (derived from the bill of material).

Lot Size	L'd Tim	Sfty St'k	On-H'nd	**Mouse Trap**	Current & P-D	Period 1	2	3	4	5	6	7	8
				Gross Req'ts									70
				Sch'd Rec'pts				20					
1	2	0	20	Proj'd avail	20	20	20	40	40	40	40	40	
				Net Reqm'ts									30
				Plan'd rec'pt									30
				Plan'd Rel's							30		

Each Mousetrap Uses 1 Clapper 30 x 1 = 30

Lot Size	L'd Tim	Sfty St'k	On-H'nd	**Clapper**	Current & P-D	Period 1	2	3	4	5	6	7	8
				Gross Req'ts							30		
				Sch'd Rec'pts					5				
1	2	0	10	Proj'd avail	10	10	10	10	15	15			
				Net Reqm'ts							15		
				Plan'd rec'pt							15		
				Plan'd Rel's					15				

Each Clapper Uses 8 Inches of Wire 15 x 8 = 120

Lot Size	L'd Tim	Sfty St'k	On-H'nd	**Wire**	Current & P-D	Period 1	2	3	4	5	6	7	8
				Gross Req'ts					120				
				Sch'd Rec'pts									
100	3	0	100	Proj'd avail	100	100	100	100	80	80	80	80	80
				Net Reqm'ts					20				
				Plan'd rec'pt					100				
				Plan'd Rel's		100							

Note that the planned receipt for wire is 100, even though the net requirement is only 20. What caused this? Your right! It was due to the lot size. In this case you can't buy wire except in 100 inch increments, so MRP ordered 100 inches.
Note also, that MRP calculates that we'll have 80 inches of wire left over after we make our scheduled 15 more clappers.

MRP is logical and straightforward. **You** tell the software what you want to produce and when, and **you** give it all the operating parameters you wish it to utilize, and it will plan accordingly.

The problems arise when Just-In-Case "slop" is allowed to reside in the system, i.e. you are using a traditional, and not "Lean", manufacturing philosophy.

ERP systems utilize the information **you** provide, i.e. your current operating parameters, to plan events and predict outcomes. If the parameters we give the system are bogus, so too will be the output from the system!

What Happens If The Lead Times Are "Padded"?

Let's take a look at our same mousetrap example. We'll change all lead-times to four days and see what happens.

Lot Size	L'd Tim	Sfty St'k	On-H'nd	**Mouse Trap**	Current & P-D	1	Period 2	3	4	5	6	7	8
				Gross Req'ts									70
				Sch'd Rec'pts				20					
1	4	0	20	Proj'd avail	20	20	20	40	40	40	40	40	
				Net Reqm'ts									30
				Plan'd rec'pt									30
				Plan'd Rel's					30				

Each Mousetrap Uses 1 Clapper — 30 x 1 = 30

Lot Size	L'd Tim	Sfty St'k	On-H'nd	**Clapper**	Current & P-D	Period 1	2	3	4	5	6	7	8
				Gross Req'ts					30				
				Sch'd Rec'pts					5				
1	4	0	10	Proj'd avail	10	10	10	10					
				Net Reqm'ts					15				
				Plan'd rec'pt					15				
				Plan'd Rel's	15								

Each Clapper Uses 8 Inches of Wire 15 x 8 = 120

Lot Size	L'd Tim	Sfty St'k	On-H'nd	**Wire**	Current & P-D	Period 1	2	3	4	5	6	7	8
				Gross Req'ts	120								
				Sch'd Rec'pts									
100	4	0	100	Proj'd avail	100	80	80	80	80	80	80	80	80
				Net Reqm'ts	20								
				Plan'd rec'pt	100								
				Plan'd Rel's	100*								

* Past due, expedite, reschedule top level

Now, instead of the planned release for mousetraps taking place in period six, it shows being required in period four. This makes the clapper requirements move to period four. MRP backs off its start date four days, making it due to start immediately! And, as you can see, we don't yet have sufficient raw material to make all the necessary clappers.

What does this mean to the operation's bottom line?

It means: A lot more work-in-process inventory (more money tied up, more handling, more damage, more searching to find the correct items, etc.). Expediting, and the associated costs to get the wire into the plant soon. Perhaps splitting of the order to get the 12 clappers made that we **do** have material to build (and the administrative costs to make the changes in the

system). Possible customer disappointment due to either split shipment or late delivery.

And the most subtle and insidious ramification of all:

The schedule loses credibility.

People begin to go around the system. In our example, the buyer calls Joe, the supervisor in the clapper area. "Hey Joe, I can't get the wire in today. When do you **really** need it?" Joe knows that he doesn't need four days to make his clappers. He also suspects that it doesn't take 4 days to assemble a mousetrap. He calls up Harry, the assembly supervisor. "Hey Harry, when do you **really** need those clappers?"

Your company has just spent a heap of money to put in a super ERP system, and your people are ignoring the schedules it produces! And just how useful is all the spin-off data generated from these "formal" schedules? The material receipts are wrong. The labor-hours required are in the wrong periods. And, of course, the cash flow requirements are also in error.

The above example illustrated the problems with "padded" lead times (common in traditionally run manufacturing organizations).

NOTE: Lean Manufacturing attacks and drastically reduces all lead times.

What About Lot Sizing?

Traditional manufacturing attempts to "optimize" each operation. One of the ways this is done is by minimizing the number of set-ups required.

We've all heard this one: "If you've got to set up to run a quantity of 10, you might as well run 50 (i.e. a large lot size)". On the purchasing side, we want to "minimize our transaction and transportation costs", and of course we get a price break if

we buy in volume! "Besides, we'll need those parts sometime in the future, why not get them now? Eventually we'll use them." Unless, of course, the bill of material or design changes; Or a new product obsoletes this item; Or the part has a shelf life; Or they get lost in storage; Or…

Let's see what lot sizing does to our mousetrap synario:

Lot Size	L'd Tim	Sfty St'k	On-H'nd	**Mouse Trap**	Current & P-D	Period 1	2	3	4	5	6	7	8
				Gross Req'ts									70
				Sch'd Rec'pts				20					
40	2	0	20	Proj'd avail	20	20	20	40	40	40	40	40	10
				Net Reqm'ts									30
				Plan'd rec'pt									40
				Plan'd Rel's							40		

* Each Mousetrap Uses 1 Clapper 40 x 1 = 40

Lot Size	L'd Tim	Sfty St'k	On-H'nd	**Clapper**	Current & P-D	Period 1	2	3	4	5	6	7	8
				Gross Req'ts							40		
				Sch'd Rec'pts					5				
50	2	0	10	Proj'd avail	10	10	10	10	15	15	25	25	25
				Net Reqm'ts							25		
				Plan'd rec'pt							50		
				Plan'd Rel's					50				

* Each Clapper Uses 8 Inches of Wire 50 x 8 =400

Lot Size	L'd Tim	Sfty St'k	On-H'nd	**Wire**	Current & P-D	Period 1	2	3	4	5	6	7	8
				Gross Req'ts					400				
				Sch'd Rec'pts									
800	3	0	100	Proj'd avail	100	100	100	100	500	500	500	500	500
				Net Reqm'ts					300				
				Plan'd rec'pt					800				
				Plan'd Rel's		800							

With our lot size "optimization," we'll have leftover mousetraps, leftover clappers, and leftover wire in stock.

And, how does our buyer feel after she's jumped through hoops to expedite material, only to find half of it sitting in stock a month later? How do the guys on the shop floor feel when they miss the kid's soccer game to "build it for the Giper", then find the product accumulating dust weeks later?

And what did those extra units, made so economically, really cost you? Sure you had some of your cash tied up for a while (you did have to pay your suppliers and your labor didn't you?). And, of course there's the space required to store the leftovers. And someone had to enter a transaction to put those extra's away. And you really should cycle count those items. And of course, when the engineering does change, you'd best pull them from stock and update them (if possible). And sure, a few may get dirty and/or rusty and need a quick re-cleaning prior to use. And yes, we do occasionally lose them, but they always show up again at the annual physical inventory (hopefully we didn't re-make them in the interim). And sure, we occasionally have to postpone taking advantage of a new improved design until we use up all of the old inventory. And yah, I guess we do occasionally have a need for the raw material, and/or the capacity that we just used up to make the items that are now sitting in stock, and thereby missed a potential sale. But wow, just think of how much we saved by not having to set-up the equipment again! Our labor efficiency (against standard) looks great! And look at all that PPV (Purchase Price Variance) we racked up!

So what really happens?

The buyer calls Joe: "Psst Joe. How much do you really need?" And Joe calls Harry: "Psst Harry. How many clappers do you really need?" And Harry calls the sales department!

And once again, we've destroyed the credibility of the schedules produced by the system.

NOTE: Lean Manufacturing attacks and drastically reduces all lot sizes.

How About "Safety Stocks"?

Note: some people use "safety time" instead of safety stock. This has the same effect as our padded lead time example.

Safety Stock is treated differently by different software packages. Classically, safety stock is treated like an immediate requirement. We will illustrate the impact below. Note: some software subtracts out the safety stock before it shows in the on-hand balance.

Lot Size	L'd Tim	Sfty St'k	On-H'nd	**Mouse Trap**	Current & P-D	Period 1	2	3	4	5	6	7	8
				Gross Req'ts									70
				Sch'd Rec'pts				20					
1	2	**10**	20	Proj'd avail	20	20	20	40	40	40	40	40	10
				Net Reqm'ts									30
				Plan'd rec'pt									40
				Plan'd Rel's							40		

Each Mousetrap Uses 1 Clapper

40 x 1 = 40

Lot Size	L'd Tim	Sfty St'k	On-H'nd	**Clapper**	Current & P-D	Period 1	2	3	4	5	6	7	8
				Gross Req'ts							40		
				Sch'd Rec'pts					5				
1	2	**15**	10	Proj'd avail	10	15	15	15	20	20	15	15	15
				Net Reqm'ts	5						35		
				Plan'd rec'pt	5						35		
				Plan'd Rel's	5*				35				

Each Clapper Uses 8 Inches of Wire 5 x 8= 40 35 x 8 = 280

Lot Size	L'd Tim	Sfty St'k	On-H'nd	**Wire**	Current & P-D	Period 1	2	3	4	5	6	7	8
				Gross Req'ts	40				280				
				Sch'd Rec'pts									
100	3	**100**	100	Proj'd avail	100	160	160	160	180	180	180	180	180
				Net Reqm'ts	40				220				
				Plan'd rec'pt	100				300				
				Plan'd Rel's	100*	300							

* Past due, expedite, reschedule top level

As you can see from the above example, this seemingly harmless device of putting a little safety stock in place "just in case", can have major ramifications!

At the Mousetrap level, the impact is mainly one of carrying some extra inventory.

At the Clapper level, however, our on-hand inventory is less than the safety stock level. This generates an immediate trigger to replenish. This emergency order for more Clappers requires them to be made in less than normal lead-time. Note that expediting this order can cause other "real' orders to be missed.

At the Wire level, the emergency Clapper order, caused by it's safety stock, drives the Wire level below the Wire safety stock level, thus triggering an emergency expedite order for more.

The bottom line? Extra inventory at all levels. Unnecessary expediting, and the associated expenses. And erroneous information from the system. Joe, Harry, and the buyer, will once again "break the code" and start going around the system.

NOTE: Lean Manufacturing attacks and eliminates or drastically reduces all Safety Stocks.

Now here's the real killer…

Traditional, Non-"Lean" Manufacturing Companies, Use ALL of the Above "Just-In-Case" Mechanisms!

Lead times are 5 to 20 times longer than needed. Lot sizing rules are too large by a factor of at least four. And "safety stocks" have been stuck into the system at all levels.

Is it any wonder that the expected big bang for the buck from their ERP implementation was never realized? Fact is, it's a wonder the system works at all.

Typical, pre-Lean, lead-time, lot sizing, and safety stock policies, when combined with an ERP system and the mandate that we "follow the recommendations of the system", can quickly bring a company to its knees.

By contrast, Lean Manufacturing is not terribly interested in the objectives of ERP, i.e. computing what and when we need certain resources far out into the future.

What Is Lean Manufacturing?

While there are a whole set of techniques and related disciplines, the general concept of "Lean" is that of **continuous product flow**, without interruption, through the entire value stream. Inventory is seen as an equivalent to cycle time (the more inventory, the longer any one item must wait for "its turn"). An underlying philosophy is that the **reduction of cycle times and inventories** will force waste to be exposed, and create the urgency for its elimination (see the classical "water & rocks" analogy on the back page of this booklet).

Waste is re-defined as "anything that does not add value from the customer's perspective".

The results of a successful transformation to this powerful operating philosophy can be staggering. Huge reductions in inventory and cycle times. Order of magnitude improvements in quality. Dramatic cost reductions.

Lean attempts to reduce Waste. By doing so, however, it reduces or eliminates the very practices that cause ERP systems to fail!

Lean Manufacturing's Philosophy And Techniques Drive The Inventory, And The Waste, Out Of The System.

- Lead times approach the actual value-add time.
- Operations are joined together and bills of material compressed, greatly simplifying the MRP explosion process.
- Set-up and purchase-order costs are attacked, allowing small runs and frequent supplier deliveries.
- And safety stocks are aggressively reduced or eliminated. Any safety stocks that remain are normally handled through some form of simple replenishment mechanism.
- In some applications, the MRP planning process is supplemented, or even replaced, by simple "pull" replenishment mechanisms. ERP becomes a macro-forecasting/planning tool.

ERP's purpose is to credibly predict future resource needs. These predictions are driven from MRP's planning dates.

MRP attempts to answer the basic scheduling questions:

What do we really need?
And,
When do we really need it?

Without Lean Manufacturing disciplines, the answers that MRP, and it's derivative, ERP compute will be bogus.

Running an ERP system with traditional manufacturing practices will, at minimum, cost your company considerably in the form of unnecessary inventory, transactions, and planning & administrative costs.

At the extreme, running ERP with traditional operating practices can cause the literal collapse of the company, drowning in the morass of erroneous data, action notices, and the second-guessing required to "stay afloat". However:

Lean Manufacturing's concepts and techniques, combined with the resource predicting capability of **Enterprise Resource Planning** Enables

TRUE WORLD CLASS OPERATING PERFORMANCE!

<u>Now</u> Is The Time To Embrace Lean Manufacturing's Powerful Philosophy!

LET'S TAKE A LOOK AT SOME ACTUAL CLIENT RESULTS:

- **Street and Highway Sign Manufacturer**: Lead time cut from two weeks, to three days. 40% reduction of space. On-time delivery improved from 65% to 95%. Accomplished in three months!
- **Business Mail Order Company**: Total inventory reduced by 67%. Operating profits doubled, increasing from 9% to 18%. On-time deliveries improved from 15% to 92%. Manufacturing floor space cut by 40%. Done in twelve months!
- **Food Products Producer**: Finished goods inventory cut by 60%. One entire distribution warehouse eliminated (no longer required). Lost sales due to "out of stock" reduced by 95%, from $12,000/day to $600/day. Process yields increased from 90% to 99%. Setup time reduced 86%, from 3 hours to 25 minutes. Replenishment cycle cut by 64%, from 11 days to 4 days.
  Accomplished in nine months!

The Hands-On Group

www.handsongroup.com

1443 Dingens Ave, P.O. Box 26
Gotha, FL 34734-0026
Phone: 407-299-5245
Fax: 407-290-1441

Each manufacturing company makes the transition to Lean but once. Whether you use the Hands-On Group, or someone else, get some help. Experience is a powerful teacher!
Contact us to schedule a risk-free assessment.

CAN I BORROW YOUR WATCH?

Consultants have a bad reputation. Sadly, in many cases the "rap" is justified. We're different. Let me explain why.

1. The typical consulting assignment is met with a bevy of young recent MBA's. They call it a "task force".
   For any one client site, our typical task force is composed of ***two*** seasoned individuals.
2. This task force is assigned to a nearly full time effort.
   Our normal process involves monthly visits of about four days each.
3. They identify a set of "deliverables". These are usually composed of a "report" and/or some software.
   We don't do reports or create software. Our only deliverable is the achievement of the tangible goals set by our clients. These goals generally include: Significant reduction of **inventory** and **cycle time**; greatly improved **on-time delivery**; reduced **costs**; and improved **quality**.
4. The consulting "project" is often seen as a temporary anomaly. "It'll be 'business as usual' in a few months".
   Our Rapid Impact process causes permanent culture change, i.e. Creates a new way of doing business that consistently produces World Class results.
5. It can be difficult, if not impossible, to tell what, if any, results actually came from the effort.
   In most industries, our *Rapid Impact* process produces significant, quantifiable results by the end of the SECOND WEEK! What's more, we offer a simple tangible performance guarantee. We aren't finished until you have attained these commitments! Your company's objectives are completely aligned with our own.

ERP's Purpose Is To Predict Future Resource Requirements.

It Does This By Answering The Questions:

What Do I Really Need?

And

When Do I Really Need It?

Lean Manufacturing Focuses On Removing The Waste.

It Provides The **Credibility** Needed By ERP By

Reducing Lead Times, Lot Sizes, And Safety Stocks To Realistic Levels.

Lean Manufacturing's Basic Philosophy:

Inventory Hides Waste!

Reducing Inventory Exposes the Waste and Forces Correction.