Charlie Reid & Associates
STRATEGIC MANUFACTURING SOLUTIONS

Manufacturing Philosophies 101

The sections below provide a brief outline of essence of the most common approaches to manufacturing management. In fact the vast majority of repetitive manufacturing companies will follow one or more of these operational philosophies. The exception might be very low volume operations focussing on "one of" production (like fabricators, tool and die makers, or machine builders). The ones I've covered are:

- Lean Manufacturing
- Theory of Constraints (TOC)
- Six Sigma
- MRP
- Short Interval Scheduling
- No Philosophy

Included in each section are things to **look for**, **listen for** or ask about as you make your initial site inspection visits. This will give you clues as to which philosophy your target follows – or at least seems to or says it does.

Remember that, in the end, it doesn't much matter which one they follow. What matters is how well they execute the one they choose to follow.

For readers who want more detail on any of the subjects noted below there are literally dozens of books available on each – or you could contact me with any questions you might have.

Lean Manufacturing

Probably one of the most liberally used terms you'll find in any manufacturing target, Lean Manufacturing refers to an overarching operational philosophy focused on minimizing waste and variability in all processes. It is an approach that was originally championed by the Japanese and made famous by Toyota. Its signature features are the use of visual approaches to production control, the minimization of inventories, and very small production lot sizes – a Lean Mantra is to drive towards a batch size of one.

To be honest I have seen perhaps a handful of truly Lean companies over the past two decades of consulting. Most companies mistake adopting a few discrete Lean Principles with actually being Lean Manufacturers. While a great deal of progress can be made with

selective use of a small number of these principles, mostly I find that companies have read the literature and attempted to implement without understanding Lean in the context of their own business.

When visiting shop floors **look for** an extremely well organized work place including very well laid out work stations. It should be clear to you that there is a place for everything and that everything is in its place. **Look for** lots and lots of signage, and other visual aids like coloured lights and graphics. **Listen for** words like "5S", "pull system", "cellular manufacturing", and "kanban" (a Japanese term). Unfortunately Lean Lingo is widely known so hearing it don't make it so.

Theory of Constraints (TOC)

Made famous by the author of The Goal, Eli Goldratt, basically the theory of constraints says that no manufacturing company can make anything faster than the slowest operation so maximizing operational throughput is based fundamentally on identifying and managing the "constrained" operation.

TOC is most powerful when an operation is at or nearing capacity.

The most strategic application of TOC is tailoring the product offering to maximize throughput on the constrained asset as defined by dollars of contribution per hour on the constrained asset. This is as tricky as it sounds. By definition in order to come up with what's knows as the "break through" market offer, the entire company but especially, marketing, sales, operations, and engineering, needs to be acting in complete coordination. A: Operations needs to understand what its constraint is B. Marketing needs to understand what the constrained operation can make to understand what to sell, and C: Engineering needs to be developing products that meet market needs AND flow though the constraint more quickly. I've heard of companies that have done this but to be honest have never seen one.

There is little you can look for to see whether company is a good TOC shop or not. **Listen for** words like "constraint", "profit velocity", "through put", "drum", buffer", "rope", or "Jonah" (the TOC "expert" designation). These may indicate that the company is following a TOC philosophy.

Lean vs. TOC

The fact is that these approaches are not inconsistent with each other but sadly it seems that you're either in one camp or the other.

Purists in TOC often eschew Lean principles since approaches to Lean do not selectively focus on either identifying or managing the bottleneck operation.

Lean Manufacturing zealots often eschew TOC as accepting waste.

Both positions can be true but represent pretty gross generalizations. As an investor you need to know whether or not the company's operations perform stably. Whether they're Lean or TOC is interesting but more as it pertains to how well they execute.

Six Sigma

If Lean is the most liberally used terms in operations, Six Sigma would likely be a close second.

Six Sigma refers to a philosophy focussed almost exclusively on the reduction of process variability, and the lowering of defect rates through the application of evidence based statistical methods and tools. Made popular by GE, it is worth noting that Six Sigma approaches were not invented by GE and in fact almost all six sigma techniques were and are still included in entry level university statistics courses. The average auto parts manufacturer will have had "six sigma"-like statistical methods in place since the early eighties.

The difference is of course the degree of discipline, coordination, and rigour in using six sigma approaches. It is an extremely powerful tool for increasing reliability and repeatability. Applied properly it can make enormous contributions to cost down initiatives.

Six Sigma initiatives can coexist with most other operational philosophies but generally speaking should be subordinated to them.

Look for visual examples of statistical methods being applied on the shop floor (control charts, run charts, Pareto's, P charts etc.). **Listen for** words like "black belt", "green belt" (levels of certification of six sigma practitioners), "Taguchi" aka "design of experiment" aka "DOE".

MRP I and MRP II

Materials Requirements Planning (MRP I), and Manufacturing Resource Planning (MRP II) are both information technology enabled tools for forecasting, purchasing and scheduling the material and manpower needs of an operation.

MRP II is much like MRP I except that it generally includes integrated financial reporting, and is able to handle such things as finite capacity (MRP I generally assumes that capacity it limitless and as such it is

possible for these systems to create schedules that are functionally impossible).

Both systems are absolutely and fundamentally dependent on a very high degree of inventory accuracy to work properly (must be higher than 98%). This is in turn is fundamentally dependent on good shop floor production control and reporting. They are also fundamentally dependent on accurate product structure, and product processing data. Product structure is often documented in what's known as a Bill Of Material (BOM) and product processing data (production speeds, and yields on all pieces of equipment needed for the product) is usually documented in what's known as a Routing.

Most good standard costing systems rely on the same data.

Both systems, often referred to as ERP systems nowadays, are particularly useful where either the sku count is very high or the product structure is particularly complex (eg hundreds of components, multiple sub assembly levels, lots of revision levels in the componentry etc).

Listen for words like Bill of Material, Standard Routing, demand function or forecast, economic order size, economic batch size.

Short Interval Scheduling

Short Interval Scheduling is at its core a brute force command and control oriented approach to scheduling and controlling production in a factory.

Simply put a short interval scheduling approach clearly documents and makes visible how every minute of a machine's time will be used throughout a shift; and dynamically adjusts as disruptions or changes occur. It sets expectations and monitors compliance. This process is almost always done manually using a "Scheduling Wall" that details what quantities of which part numbers will be made at which time in which sequence, machine by machine, for **all** the machines.

This system of operations management depends on constant, consistent, and aggressive supervision to succeed but when installed in operations that have had very little command and control and or very poor supervision, the operational cost improvements are significant and immediate (typical gains would be 15 to 20% of direct and indirect labour costs).

Short interval scheduling approaches would be the typical first step in a turn around.

Look for a scheduling wall, and highly visible hourly production count signs showing expected vs actual production, mounted at each station (important: lots and lots of factories have production count boards mounted at each machine. See if they are filled in and up to date).

No Philosophy

It sounds glib to even talk about such a thing but the fact is that many small to mid sized manufacturing companies just "do" what they've always done. They never had a system to begin with and haven't developed one since.

These companies are usually "quarterbacked" by one individual who knows everything about everything. It's not written down anywhere but rest assured he or she will know. They'll know for example that the Anderson order was finished last Tuesday and it's in the brown bin behind the corrugate compactor when the shipping guys come asking about it.

If this one individual is the quarterback, there's only one play in the playbook and that is "everybody go out for a pass". Each player will be given a pass route and it'll be a different one every day. It's not that there isn't a plan it's that the plan is known by only one person and in reality, generally speaking, it's not a very good plan.

Look for congestion in the factory, **look for** lots of inventory, much of it unlabelled or if it is labelled it might be more than a few months old. **Look for** the absence of visual cues to help you understand the flow in the shop. **Look for** – well – general untidiness, poor housekeeping, perhaps even trash lying around. **Listen for** the words "fire fighting", "hot list" and other indicators of a lack of coordinated planning.

Summary

In the above sections I have outlined very briefly six of the most widely seen manufacturing philosophies.

It is not unusual to find that a company can't actually articulate which philosophy it follows in which case you have to figure it out by observation.

The more important issue is how well the company executes the approach it does take. This will tell an investor how competent the target staff are and how stable the operations are in their current state.

While it is generally true that companies that clearly pursue the more advanced techniques (like Lean, TOC, and Six Sigma) will perform better, it is important to understand that a well run finite scheduling or

even MRP shop can outperform a mediocre Lean/TOC/Six Sigma shop, no matter how many Johah's or Black Belts they have.

Be cautious of putting too much stock in the hype of the sexier operational philosophies.

Again, there is no one correct dogma for maximizing manufacturing effectiveness.