Manufacturing Awareness Limited

2 Landedmans
Westhoughton
Bolton
BL5 2QB

Telephone 01942 816492
Mobile 07712 825097

Implementing Business Improvement Techniques

Let's get back to Common Sense

Chris McKellen

A plethora of manufacturing improvement philosophies is available,

so where should the smaller business start?

Years ago, the traditional British engineering firm that I worked for was taken over by an American company and my introduction to lower cost manufacturing began.

On one of their first visits, our new American master asked why we were removing burrs from a component – 'you don't do that unless it will hurt the person assembling it or unless the burr will fall off and damage the (rotating) assembly'. I soon learnt that casting or forging chamfers on to the raw material prevented the burrs from being formed when we machined the component.

As my career progressed in other USA owned conglomerates, I was introduced to the philosophies of the Toyota Production System, to Continuous Improvement, Cycle Time Reduction, Kaizen, Lean Manufacturing, Total Quality Management, and Six-Sigma. Today we have added Quick Response Manufacturing and Agile Manufacturing.

An industry is booming around these philosophies, so let me declare an interest! I have practiced and believe in many of these techniques and philosophies and I train people in them! Seminars are held to compare the techniques and learned colleagues write many articles explaining from their view point why each technique is better than, or different to, another. Often the experts seem to be saying almost the same thing but from a differing viewpoint: -

'systematic elimination of waste leads to continuous improvement'

versus

'relentless reduction of lead time results in continuous improvement and elimination of waste'

But basically, in a 'normal' manufacturing plant, we need to combine all of the company wide philosophies! We need to practice continuous improvement (Kaizen), we need to eliminate waste (Lean), we need to reduce lead times (Quick Response), we need to respond quickly to our customer demands (Agile) and we need perfect quality (Six Sigma)

To learn and implement all of the philosophies will require a library full of text books and months of seminars and time – perhaps several years of training.

So where should the smaller business start?

What are the most important things to consider when running a manufacturing plant?

I believe that they are:-

- **Health & Safety** – we all have a statutory obligation to make sure that the place where we work is safe, that we do not harm ourselves or our colleagues and that we do not pollute the environment.
- **Communication** – if we are open, listen to our employees, talk to them and tell them as much as we can about the business, they may not always be happy but they will generally work well. Good communications with our suppliers and customers are also essential, too.
- **Housekeeping** – a clean organised and tidy plant is a safe plant. And, if it looks as if we know what we are doing, then our customers may forgive us for the very occasional deviation.
- **Quality** – Our customers expect zero defects and will keep coming back if we make them good quality products.
- **Keeping the customer happy** with on time delivery at the lowest possible cost.

But on a more detailed level there are basic day to day issues in every manufacturing plant. Let us assume that we have sufficient customer orders, so what are the primary concerns that we need to address? I would like to suggest that they are:-

a. Flexibility
b. People
c. Inventory
d. Lead times
e. Waste
f. Quality
g. Delivery
h. Payments

Each of these has a significant effect on productivity as we will discuss each below.

A Flexibility

Flexibility is an essential component of agility!

Flexibility in Process Equipment – is becoming essential. With the constant drive of customers to change designs of components and to have a shorter product life before new models are introduced, the days of having dedicated process equipment are gone.

Our equipment should be able to process not just one specific component or just one type of component but several families of components and the changeover (set up) time between components must be minimised. The process equipment should allow us several routes for making a component – so that breakdowns, or an increase in business, do not restrict our ability to manufacture parts. As product mix changes, dedicated equipment becomes underutilised but flexible equipment can be retooled.

Flexibility in Systems - Customers today demand Just In Time deliveries to meet their daily schedule, and it is already common practice for suppliers to the automotive industry to receive an electronic schedule this morning, stating the exact product mix and volumes that have to be shipped this evening. Our manufacturing processes systems need to be flexible to meet these demands – MRP is not capable of responding to sudden changes in schedules and it can encourage us to build inventory. It does not usually allow us to have alternative routings, or varying set up times. The journey to the airport takes much longer during the morning rush hour than in the middle of the day – so we plan our journey time according to the amount of traffic. Similarly, changing from part B to part A may take much longer than changing from part C to part A, but MRP assumes a fixed set up time for part A
MRP works to set rules (algorithms) and these can often allow us to load our processes in an ineffective way. Whilst MRP is a superb calculator, we can generally prepare sensible manufacturing schedules for our critical machines on a simple PC.

Flexibility in People - Our employees like to be challenged! In a typical machine shop, the CNC Lathes and the CNC machining centres have similar control systems so why do we not train our employees to operate both types of machine? If we establish a training matrix showing our employees demonstrated skills, we can reward those who are the most flexible, and we can apply the concept of the training matrix across the whole organisation and every role. In enhancing our employee's skills we can introduce Total Productive Maintenance where the operator carries out simple maintenance on his own workstation.

B People

People matter!

Employees - Most of us have invested in our employees. One of my past employers insisted that every employee, world-wide, had a minimum of 40 hours per annum training. Another had a mission statement which started with 'People are our most important responsibility' but this was revised to make shareholder value the priority and people became number 5! Of course, both are very important, but our employees generate the wealth for our shareholders.

The key to having satisfied employees is to communicate with them. Tell them the good news as well as the bad. Hold frequent and regular briefing sessions to ensure everybody gets the same message and in large facilities have a quarterly plant meeting where everybody attends and gets the same message.

Our employees are responsible for our success. When we embark on any major change in our business, such as introducing lean manufacturing, it must be accompanied by a culture change. It is of little use teaching people new tools for the new world, if we do not teach them how to behave in our new world.

Customers and Suppliers – People do business and business depends upon relationships. If we communicate well, and treat people as we would expect to be treated and are seen to be fair, then we should continue to be successful.

C Inventory

Most inventory is a waste and prevents us from being agile!

Depending upon where it is, and who you are, inventory can be seen to be a good or a bad thing. Let me offer a simplistic view: -

Good Inventory – is the minimum amount of raw material that is available to help us manufacture what the customer wants, exactly on time. It can be the managed store of finished parts that we have made with the customer's agreement to protect deliveries to him. Kanbans are good inventory and are easily introduced to eliminate the variations in demand and to ensure that the correct parts are always available. (*In the old days we used the three bin system – one was being used; one waiting to be used and one was being refilled*).

Good inventory is also the strategic buffers that we set up before our bottleneck processes after we have introduced the Theory of Constraints (TOC) which requires a fundamental change in our thinking! We are only interested in the effectiveness (efficiency) of the bottleneck process, not all processes. We learn to plan to load the bottleneck process not the first machine in the sequence and when coupled with flowing components rather than processing in batches, we are able to eliminate much of the bad inventory – work in progress. In conjunction with TOC and flowing materials, we introduce the concept of schedule adherence – only 100% achievement will do – making only the parts we want, when we want them!

Bad Inventory – includes excessive raw material purchased and supplied because 'the castings have to be made in large batches' and the stock of hundreds of tonnes of stainless steel bar that a manufacturer purchased as the market price was low – he is still using it six years later. Bad inventory is obsolete materials caused by such examples; components that may never be used, the excessive work in progress caused by manufacturing in batches and making things that the customer 'may' want soon but never orders.

Again, unless an MRP system is well managed and all the parameters are correctly and perfectly set, the MRP system itself can lead to bad inventory being created.

Negative Inventory - Imagine! Fast food outlets have fresh deliveries every day and have almost zero inventory at the end of the day. We pay for the product when we purchase it but they probably pay for the goods that they have sold and we have eaten today, a month later. Perhaps we could say that McDonald's are lean, agile and give a quick response!

D Lead Times

***Long lead times are both a waste and prevent** agility*

In the context of this article, I have defined lead times as being the time for a component to be manufactured or an item to be delivered. Cycle time is the period of time from the placing of an order to receiving payment for the goods or services. The manufacturing cycle time is the processing time on a machine.

Order Processing – In the last few years, technology has changed very quickly and we have potential to change our purchasing systems too.

Imagine a huge conglomerate with plants all over the world. Each plant has a purchasing department, purchasing both direct and indirect materials and several hundred suppliers. The traditional purchasing process is shown below based on drawings for a production part being designed with a two dimensional CAD system: -

1. Receive appropriate requisition
2. Obtain drawings and material specifications
3. Copy drawings
4. Copy Material Specifications
5. Write letter / request for quotes
6. Collate letter/ request for quotes / drawings / material specifications
7. Post to several potential suppliers
8. Wait – lead time
9. Receive queries from suppliers
10. Refer to engineering department
11. Reply to query
12. Receive written quotations
13. Analyse quotations
14. Select supplier
15. Place purchase order

Using our current technology for the same component, we could reduce the lead time and waste significantly:-

1. Receive a purchase requisition
2. Post drawing and material specifications and all other details on secure website
3. Email enquiry and passwords to many potential suppliers
4. Hold Competitive Bidding Event (internet auction)
5. Select supplier
6. Place electronic purchase order

For tooling or indirect supplies we can install point of use Automated Tool Dispensers (ATD) where, as a tool is used it electronically reorders its replacement from the supplier. We can eliminate the tool store and get the suppliers to refill the vending machine (ATD).

Materials supply - As our customers become to expect Just In Time deliveries from us, we should expect Just In Time deliveries from our suppliers. We should obtain the cost advantages of giving a reasonably long term commitment to our supplier but negotiate several deliveries per week. We could persuade our preferred suppliers to use Kanban systems and also we could reduce the number of our suppliers significantly by using integrators.

Our suppliers need to be lean and agile and as we reduce the number of suppliers and develop 'real' partnerships, we can work with the suppliers to our mutual benefit by jointly learning and implementing new techniques, together.

Manufacturing – the effect of the Theory of Constraints, coupled with flowing components and scheduling bottlenecks will all contribute to reducing manufacturing lead times, significantly.

E Waste

Waste elimination is the key to both lean and agile manufacturing.

In the discussions about the strengths of our improvement philosophies - Lean, Agile and Quick Response, Six Sigma - we should accept that long lead times are themselves a waste. Long cycle times are also a waste – if we can shorten the cycle time from six months to three days, we can get paid for our services much quicker and we have much less material around us.

To eliminate waste at all levels within our business we need to understand where we add value – Value Stream Mapping is a superb technique for identifying waste in our processes. Having identified the areas of waste, we can then implement the appropriate lean technique and begin to eliminate it.

Being lean and eliminating waste can apply to every business – whether it is manufacturing metal components, processing patients in hospitals, or delivering goods to a supermarket.

F Quality

Six-Sigma means 3.4 parts per million rejects

In every type of business and in all our improvement philosophies, it is vital that we have excellent quality. Scrap and reject components are a waste – we expend time and effort producing parts which we throw away. We replace the material at a cost and use up capacity on our process equipment to replace the part. Many companies do not realise the real cost of poor quality – what you actually see is just the tip of the iceberg.

The implementation of a flow system reduces the likelihood of there being many components scrapped for the same error at once and simple disciplines such as making operators responsible for their own quality and ensuring components are correct before the next operation is carried out, assist in increasing quality standards.

Formal quality systems such as ISO 9000 or QS 9000 (in the automotive businesses) are business, not quality, systems. They require that the whole business operates to procedures and to standards. QS 9000 itself requires that opportunities for quality and productivity improvements are implemented to eliminate waste and recommends various continuous improvement techniques including Theory of Constraints.

The philosophy of Six-Sigma takes a company from being 'good' to being 'world class'. The philosophy is based on a major culture change within the business and extensive statistical and problem solving training for most employees. However the goal is simple – understand what we are doing, measure it, and improve it.

G Delivery

Schedule Adherence is a key to on time deliveries

Schedule Adherence is another simple concept! If the schedule requires us to make 50 parts by 10.00 a.m., we make 50 parts by 10.00 a.m. If we make 52 parts we have made two pieces of bad inventory. Similarly, if we only make 45 parts we have only achieved 90% schedule adherence. If parts X and Y are assembled together with other components and we only manufacture 90% of X and 90% of Y, then there is a high possibility that we can only assemble 81% of what the customer requires. Schedule Adherence requires us to know what everybody is doing and to plan our production correctly.

On Time Deliver from Suppliers – we should monitor our supplier's schedule adherence against the schedules that we issue, but we should make sure that the schedules are valid. Only too often, customers 'with good MRP systems' issue schedules with arrears on them – even when the supplier did not know that the component was required! Pull systems and flowing work will again help our suppliers to achieve on time delivery.

On Time Delivery to Customers – as with our suppliers, the same demands apply to us supplying our customers! But we must avoid waste when we are delivering too! In the early 1990's, I visited my employer's Japanese Plant. Their major automotive customer was requiring Just In Time deliveries – four times a day with a timed delivery slot. As a supplier we were achieving 100% on time delivery and were heroes. But the manufacturing plant was still assembling in large batches.

The response to this request for JIT deliveries was to set up a warehouse just outside the customer's plant and we delivered in bulk to the warehouse, which sequenced the parts for the customer. With hindsight, the warehouse and its staff were a complete waste and were in fact making the business less responsive – as we were supplying from the warehouse we could make even larger batches in the plant and save on changeovers….. We had implemented Just In Time by adding waste.

H Payments

Cash is king!

Cash is the key to survival for us, our customers and our suppliers. We need some fresh thinking on our finances.

Several USA based companies have working capital reduction teams – working capital includes inventory, receivables – receiving money from our customers and payables – paying our suppliers. Apart from inventory, the team's goal is to maximise cash in the business – collect the money we are owed as soon as possible and pay the money we owe as late as possible.

In our new world of supplier partnerships, openness, trust and transparency, we need to find solutions that help us all. Perhaps a system using measures that we already have could be employed, where the supplier is financially rewarded for 100% schedule adherence and the customer is financially rewarded for on time, or even early, payments.

A 5% bonus for on time delivery and a 5% discount for on time payments gives us an incentive to be fair! And does not cost either the supplier or the customer anything unless one fails!

Implementing the change in philosophy

Whichever philosophy we feel we should implement - Toyota Production System, Continuous Improvement, Cycle Time Reduction, Kaizen, Lean Manufacturing, Total Quality Management, Six-Sigma, Agile Manufacturing or Quick Response Manufacturing – each requires a change in culture within the business.

This change must be driven from the top down, and whilst the whole management team must be totally committed to the change, one person should drive it. From personal experience it is sometimes difficult to see the 'wood for the trees' and this is where outside help is often necessary. Consultants cannot implement the changes, but based on their previous experiences, they can help, suggest, mentor and train you to achieve your goal. But the goal remains the same:-

Our customers are expecting us to change. We need to respond quickly to their demands and we need to change our culture to eliminate waste and introduce agility throughout all our business processes.