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Effective footwear manufacture

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A World Footwear Markets survey published by SATRA reported 18.3 billion pairs of shoes manufactured globally in 2011 with 11.1 billion in China alone. More than 75% of the world's footwear production is now in Asia, a large proportion of which is exported for distribution in North America and Europe. Every day, millions of pairs of shoes are moved around the global supply chain. All of today's manufacturers regardless of location are however faced with rising material and labour costs and a shortage of skilled personnel. So how can production become more effective and efficient in order to minimise the impact of time and cost?

A term often used to describe being more effective and efficient is 'lean

manufacture', a method of giving staff at all levels of an organisation the skills and shared means of thinking to systematically drive out waste by designing better ways of working. The aim is to eliminate waste in all areas of production including product design and factory management. Lean manufacturing seeks to incorporate less human effort, less inventory, less time to develop products and less space. In this way manufacturers become highly responsive to customer demand while producing top quality products in the most efficient and economical way.

The main focus is on eliminating non-value added activities while streamlining value-added ones. Any activity that does not add form or function to the product and for which the customer is willing to pay, is a non-

value added activity or 'waste'. Interestingly, many manufacturers consider such waste an inescapable part of the process. Non-value added work is something that generates a zero or negative return on the investment of resources and can usually be eliminated without impairing a given process.

FIRST THINGS FIRST

When analysing any task the first things to ask are: does it need to be done and, if so, can it be combined with another task, and is the best method being used? By improving the method through lean principles and becoming more effective, a manufacturer can reduce time, materials and labour. Once a best method is implemented, this is the time to train the operative to perform efficiently. It is worth

remembering the highly influential Austrian/American management consultant Peter Drucker's comment that "There is nothing so useless, as doing efficiently that which should not be done at all".

In the footwear industry, the traditional perception that labour and materials, the two major cost items in footwear manufacturing, accounted for 80% of the ex-factory price was based on the US/EU model where labour is expensive. Since over 80% of the world's footwear is now manufactured in countries with significantly lower labour costs, this perception has since been reviewed.

Many Western companies moved their manufacturing to Asia some years ago to take advantage of lower labour costs. Although wages are now rising in Asia, the cost of labour in China, for example, is still significantly less than a comparable wage in Europe or the United States. While it is therefore certainly possible to produce or source footwear at a significant cost advantage, there are other factors however which must be considered when we add up the cost items that make up the selling price of a pair of shoes.

The time taken to transport and distribute footwear can be much greater, resulting in a higher level of inventory of finished goods to ensure the same level of customer service. For example, the cost of transportation and storage, as well as marketing and retailing activities, usually represent in total over 50% of the final retail price. This is especially true where the shoes are made in one of the low labour cost countries that now dominate the manufacturing sector of the footwear industry. Elsewhere, some sourcing companies have had to reduce their range of styles in order to meet the demand from Asian sub-contractors for much higher volumes of footwear.

If Asia is the manufacturing location of choice and despite lower labour costs, it is still essential for manufacturers to understand and control their production costs. This is important in order to not only offer customers value for money, but to also ensure they produce footwear as efficiently as possible to meet the budgeted figures agreed with the sourcing company or brand that will distribute the finished products.

A NEW SYSTEM

For many years SATRA has worked with companies throughout the world to devise and develop systems to help manufacture become more effective and efficient. Its SATRASumm reduces materials cost by minimising waste in production while VisionStitch improves sewing efficiency and quality. Now, TimeLine helps to price and control labour in advance and balance production lines to make best use of time. In the short period since its release in 2013, SATRA Timeline systems have been installed in factories run by both international brands and smaller local operations.

Footwear manufacture remains a complex and labour intensive assembly process. Indeed, moving production to lower labour cost countries has enabled some manufacturers to expand the division of labour even further and add to the levels of work content. Such expansion can lead to long throughput times which, in turn, can create excessive work in progress.

The use of lean manufacturing methods and production improvement systems can, however, redress throughput problems and often reduce them from days to a matter of hours or, in exceptional circumstances, minutes. Introducing such lean manufacturing principles requires physical changes to the production environment as well as some re-engineering of the product and the processes required to manufacture it. As well as helping the manufacturer to meet customer requirements more quickly, working this way also creates the best environment for improving product quality.

CHANGES IN WORKING PRACTICE

The introduction of lean manufacturing techniques and efficiency systems should be seen as an opportunity to review each individual operation and consider the introduction of potential changes in working practice.

- Removing excessive or unnecessary work handling
- Reducing the movement of work between operations
- Eliminating wrapping and unwrapping of work bundles
- Use of work aids (location jigs for cementing operations, adhesive

guns, etc.)

- Sharing operations (operators moving between work stations)
- Matrix skiving (to reduce machine adjustment)

Changes in working methods can of course unbalance an existing production sequence, cause unexpected delays and may call for additional equipment and operator training. Therefore, before making such changes, their potential effect should be fully evaluated.

As the actual work content for each operation is reduced, the overall throughput time should also fall as previously mentioned. It is in fact possible to produce some types of footwear in less than one hour so that lasts can be turned around as many as ten times per working day.

MONITORING QUALITY

We have said that a lean manufacturing approach is conducive to improving product quality. However, without robust control and management, making footwear in such a short time can lead to serious quality problems. For example, preparing and bonding the sole to the upper is dependent on a precise set of process control conditions. If these are not met, then the bond strength will not be adequate. Equally, shape retention after the last is slipped can be affected if attention is not paid to the setting conditions achieved.

Most production lasts are made of polypropylene which will gradually heat up during the day. Temperatures as high as 55°C have been recorded over an eight-hour period on a last surface. This can produce two effects: heat setting begins almost as soon as the upper is on the last and efficiency of the chilling operation diminishes throughout the day. SATRA has previously developed a data logger to record temperature and humidity and, by using its Sensor to monitor the actual process, conditions can be precisely measured and the necessary corrective action taken.

As process times are reduced, so the need to balance the production team increases. Operations that require a small amount of time may need to be combined in order to match the longer process times of more complex tasks. There will always be one operation time which cannot be reduced and this is the

bottleneck that realistically sets the pace for the whole team. Therefore, introducing some flexibility into the operation engineering as well as the application is essential to avoid unbalanced and potentially wasteful and inefficient production teams.

REALISTIC TIME STANDARDS

The ideal 'lean' company will have a flat management structure, unlike the traditional pyramid arrangement. This means a much reduced resource for those aspects that traditionally support the actual production, planning, training and quality control. Most of these functions are devolved to the production operatives themselves, whilst other aspects are reduced or eliminated entirely. It is therefore essential to have sufficient technical knowledge within the team to manage the many day-to-day problems that will inevitably occur, such as changes to machine settings, variations in work content and material characteristics, quality problems and absenteeism.

In order to monitor the effectiveness of production labour and so control the direct cost it represents, it is essential that the time needed for an operation is calculated before any financial value can be established. These time standards can be used for both building up the overall labour costs and also for any subsequent line balancing. They also create a useful measure of the work content or complexity of each style and are measures of the indirect resources likely to be needed.

In order to ensure the expected standards for a new style are accurate, the appropriate personnel must have a sound knowledge of the shoemaking processes likely to be used, as well as a system of creating time standards for each individual operation. Some, such as sole attaching, will occur regularly across the range of products and it is therefore possible to establish a time for them which can be reused for new styles. Other operations, mostly in the upper assembly, will vary with each style and in the time calculated for the procedure.

Having calculated a realistic time standard for each operation, the footwear engineer can examine these to identify the ratio of added- to non-added-value. All shoemaking



The SATRA Temperature Sensor.
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operations contain some element of non-added-value such as handling, moving work and loading into a machine, much of which is inevitable. As the size of the production batch increases, so the non-added-value time is likely to reflect this as the operative will need to separate individual shoes from each bundle before carrying out his or her task. Similarly, after completion, they may have to re-bundle the shoes before passing them on.

The experience of companies that have reduced production batch size as part of their lean manufacturing approach has indicated a significant reduction in the level of non-added-value time and a consequent reduction in direct labour costs. While the actual result achieved will depend on many factors, experience has shown that it can be as much as 85% in extreme cases. Not only is there a saving in

direct labour, the much-decreased throughput time results in a reduction in indirect and other expenses assigned to the manufacturing cost of the shoe. Reducing the size of the production batch, however, does require investment in more machinery, operative training to ensure versatility, changes to the physical environment and greater care when engineering the product at the development stage.

BOTTLENECKS

Whatever the type of production organisation used by a company, one feature which always occurs is that of a bottleneck operation. There will always be one operation which restricts the capacity of overall productivity either due to a lack of equipment or skill or because its complexity means it takes significantly longer than any other operation. If it is not possible to add capacity or re-engineer the operation into several shorter tasks then, in order to balance the production line, it is necessary to ensure that all operations preceding the bottleneck are carried out efficiently. Any disruption of the supply of work to it will cause lost production which cannot by definition be recovered. Ideally, the operation immediately prior to it could be an inspection point, thus eliminating any faulty work being passed on. Because of the restricted capacity of a bottleneck, any work processed there should be of acceptable quality.

Shoemaking has always been, and continues to be, a labour intensive process. The complex shapes of components and assembly operations challenge the ability of personnel involved to maintain high levels of material and labour utilisation. These two factors require thought and attention if footwear is to be produced without excess costs against the calculated selling price.

Each step from the design process through the manufacturing phase and, finally, delivery of the finished shoe to the customer represents an opportunity to look for small organisational or process improvements that can minimise non-added-value and save materials. Inevitably, as has been the case throughout the history of shoemaking, this ultimately depends on the quality and commitment of all the individuals involved. 🍷