

Reliability and maintenance management expert, president of IDCON INC, Christer Idhammar, explains how manufacturing reliability enables cost effective process improvements

Lean on: MANUFACTURING RELIABILITY

Lean manufacturing, including lean maintenance, is a well known concept in the United States and in Europe – one which has increased in popularity in the past five years. Simply put, the lean concept should result in products being manufactured on time and with less resources. It doesn't always mean doing more, as that can result in waste, but it does mean that items that have been sold should be produced when they need to be delivered.

To become lean it is imperative to prevent maintenance needs and to perform the remaining maintenance more effectively. If the previous concepts are implemented, then the production reliability will increase and thus the production costs, including maintenance costs and costs for storage, will decrease.

In effect, all losses in the manufacturing and delivery of raw material and delivery to the customer must be eliminated. Focussing on the manufacturing phase, the biggest losses in maintenance, and therefore the biggest improvement opportunities, include:

Manufacturing reliability

- ▶ loss in quality
- ▶ stop times
- ▶ loss in speed

Partnership between operations – maintenance – engineering

- ▶ reliability and maintenance related design
- ▶ operator based maintenance

Eliminating the root cause of the problem

- ▶ choose problem to eliminate
- ▶ eliminate problems
- ▶ educate and teach

Storage

- ▶ reduce store value while preserving service level to maintenance

Integrating increased knowledge and skills

- ▶ educate and train to enable multi craft or multi skills
- ▶ implement flexible work systems

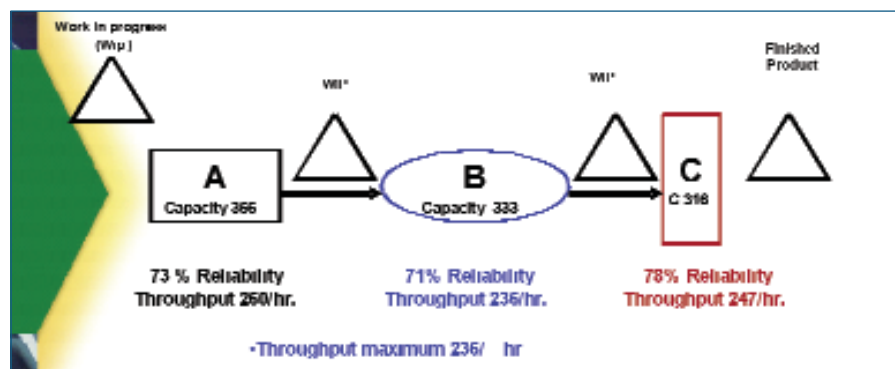


IMAGE 1. It isn't always obvious where improvements in the manufacturing chain will be the most cost effective. Flow of a product is the result of Capacity x Reliability. At first glance you could believe that C is the bottleneck in the production chain since capacity there is 316 pieces per hour compared to the higher capacity in A (356) and B (333). If you calculate the flow you will find that the bottleneck is actually at manufacturing stage B. This is compensated and hidden by increased storage of work in progress (WIP) so it can sometimes seem that throughput is not a problem. WIP is a big hidden cost for a lot of companies. With low reliability, throughput of product in the manufacturing chain takes longer and the costs are increased for WIP.

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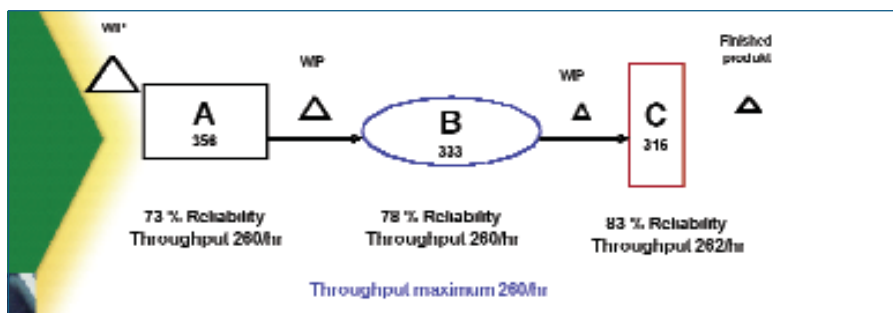


IMAGE 2. By raising the reliability in step C to 83% the increased throughput is 260 per hour. WIP is reduced since the manufacturing steps are now balanced. Other solutions include increasing capacity by investing in a parallel machine for C. However, this would lead to unnecessarily high capacity in step C. Moreover the cost of buying more capacity is about ten times higher than investing in measures that will increase reliability.

Over manufacturing

- ▶ making more than has been sold
- ▶ manufacturing too early

Over maintenance

- ▶ perform too much and incorrect preventive maintenance
- ▶ perform preventive maintenance before it is needed
- ▶ incorrectly prioritise corrective maintenance

Use new technology

- ▶ less maintenance required
- ▶ better maintainability
- ▶ smart tools and methods

All these areas need to be examined in detail, kicking off with the fundamental concepts behind manufacturing reliability.

The sub-target behind lean manufacturing is to reduce WIP and speed up throughput in the manufacturing chain. This can be achieved by addressing reliability, which includes quality, time and speed. Lean maintenance therefore has a crucial role in improving the reliability of manufacturing equipment and with the manufacturing process ever more dependent on automation, good maintenance is increasingly important.

Availability or reliability?

Many organisations use availability as a key measurement for manufacturing efficiency, however availability encompasses only the percentage of planned time, or available time, that a production process produces. Availability excludes the quality of that which is produced. In fact, producing something that isn't up to standard is often more expensive than producing nothing at all. Conversely, to slow down a process because, for example, a part of the production process can't operate at full speed, is also expensive.

For this reason, it is important to focus initiatives on all aspects of manufacturing reliability: quality, time and speed.

Manufacturing reliability can be measured in various ways and can be expressed simply as: how much is manufactured at the right quality divided by how much could have been manufactured at the right quality. Or, % Quality x % Time x % Speed. Overall nothing should be manufactured before it has been sold and is to be delivered.

In many heavy process industries it is still common practice to produce as much as possible. Lean thinking on the other hand teaches that nothing should be produced until it needs to be delivered because it has been sold.

Computer companies present a good example. When you order a computer from Dell, for example, the order is sent to production planning, which assembles the computer ready to deliver within a few days. Instead of having all types of computers in storage, the whole company's economy including cash flow, liquidity, costs for materials and material storage and capital costs are affected.

Automation equals maintenance

Producing things just in time via a lean production process is impossible unless production reliability requirements are very high. With a raised automation level the company becomes more dependant on reliable equipment - in other words maintenance.

Reliable production equipment is the most important result of the maintenance operation and it can be seen as the maintenance department's route to income generation. To become lean it is important to identify where the greatest savings could come from. What is the worth of reducing the difference between how good you are and how good you could be? In a market situation where you can sell everything you can produce, the equation is simple.

In certain industries the sale price of what you are selling can fluctuate

drastically. In that case calculations should be based on the average sales price and variable cost over, for example, five years.

| | |
|---|-------------|
| Average sales price five years | - £510/unit |
| Average variable cost five years | - £340/unit |
| Benefit per produced, sold and delivered unit | - £170/unit |

The value of producing and delivering a sold unit is £170. If you currently produce and deliver 25,000 units per year and your production reliability is 88% but it is possible to reach 94% then the value of increasing production reliability is 6%.

1500 units x 170 = 255,000 £ per year.

The next question is whether it is possible to reach even better results by focusing on lowering maintenance costs. Could it be more beneficial to lower maintenance costs if manufacturing reliability is maintained at 88%?

The answer seems obvious, but it isn't unusual that economists are so focused on lowering visible costs that they don't see the invisible opportunities that are concealed in increased production or faster product throughput.

A concept worth repeating many times, is that by increasing manufacturing reliability, manufacturing costs, including maintenance costs will decrease.

If you can't sell the increased volume that you can reach with the higher manufacturing reliability, then the savings most often lie in more reliable and faster delivery of goods sold, less energy expenditure, better safety and less overtime.

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Christer Idhammar, president IDCON INC

President of IDCON INC in the USA and founder of the Idhammar group of companies, Christer Idhammar, will address further steps to lean manufacturing in the next issue.