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22 ways to get the most out of OEE and lean manufacturing disciplines

Overall equipment effectiveness (OEE) and lean manufacturing have won many converts. These two disciplines are frequently linked because they provide a systematic way to design manufacturing processes, measure their efficiency and identify problems. Here are some tactics to get the most out of your lean and OEE initiatives:

1. **Accessing data.** One of the great challenges when executing a project to gather and report OEE metrics is easy access to manufacturing equipment status. The obstacles may include islands of automation or even equipment that's not automated. Don't expect that all equipment information is available via existing automation systems. Be prepared to install simple data acquisition systems to gather the necessary data to track OEE.

2. **Stakeholder input.** Lean manufacturing is critical in today's global economy because it helps you drive your output (product efficiency) higher while maintaining low defects and rework, thereby increasing throughput in quality. Before building a lean cell, talk to your operators, quality people, manufacturing engineers and process engineers. Get their input, hold meetings and keep them in the loop throughout the project. They are the main stakeholders who will eventually approve of your cell.

3. **Lean management.** Lean manufacturing is a powerful concept when employed correctly. The problem is that with lean, along with other methodologies, one size does not fit all.

Managers can get caught up in how it improved this company or industry, and then try to implement it internally. What they fail to do is penetrate the details of why it worked, what support structure is required and how that translates to their internal business. Lean is as much about management engagement in daily operations as it is about the methodology

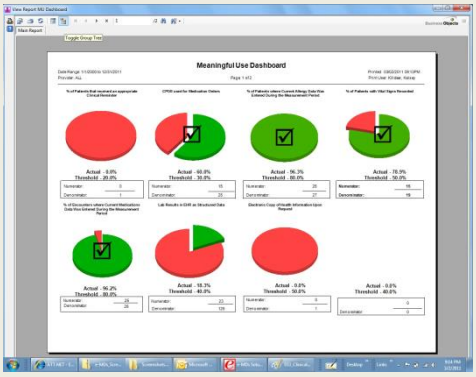
4. **Measure the right things.** Nothing is worse than the wrong input. OEE is not always a KPI metric in batch operations. If you speed up the drying process, for example, the OEE goes down, but you will be making more product in a shorter period of time.

5. **Visual management.** Visual management, including large display screens on the factory floor, are an effective tool for OEE programs, letting both managers and workers easily monitor the metrics of production lines and track KPIs. Displays harness natural human competitiveness. In one experience, once data was displayed it started a race between shifts to drive up OEE. Without any management intervention there was a 20 percent increase in productivity. Among the most useful KPIs to display: count (good or bad), reject ratio, operating speeds, takt (cycle) time, downtime and OEE (availability multiplied by performance and quality) for determining resource utilization.

6. **Increase uptime.** Lean manufacturing is a very important factor in a production plant. Just by placing materials at the point of use within the production floor area, you can increase production uptime. This is just one small adjustment that will fine-tune the flow of your product.

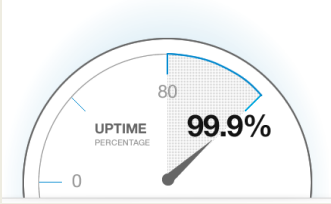
7. **Too lean?** If you operate with vendors that are stationed in areas with a high potential for natural disasters, think carefully about being too lean with your supplies. You'll need to plan for alternative routes and suppliers. Another area that has to be monitored is the amount of time for production to meet customer need. Sometimes manufacturing is too lean and when there's a sudden demand, the slow ramp to manufacture can cost more money than producing stock.

8. **Business support.** Make sure the business has adopted and fully understands OEE. This can be a huge change management nightmare if not well-entrenched prior to the project (or as part of the project execution). Lean manufacturing can also be applied to service disciplines, not just product manufacturing, mostly with only minor adaptations. Look to these techniques and principles to streamline your own processes and eliminate waste.



9. **Meaningful reports.** Data capture is quite easy. Reporting the data in a manner that helps implement change can be challenging. Don't assume a single report is sufficient. Different users need different data. And that data must be presented to each user in a manner that is meaningful.

10. **Improvement tool.** OEE can be a very valuable tool to identify problems within a process. Ensure that everyone understands what the three elements are that make up OEE: availability, speed and quality, and how to calculate each. Once processes are stabilized, use OEE to drive improvement.



11. **Software less important.** Software selection plays only a small part in the OEE process, but that is where Customers spend the most time upfront. Operator involvement, the quality of the integration partner and the ability of the controls hardware to collect data are what truly make an OEE project successful.

12. **Efficiency tool.** OEE has to be automated to be successful. The data needs to be driven from machine status, not humans inputting the status. Any manually derived OEE system can be fiddled with to produce the expected 85 percent efficiency rate. Improving systems and automating OEE measurements may bring into question the accuracy of historical OEE data. To avoid internal politics, put an amnesty in place and promote automated data as a new way of measuring OEE. On the other hand, the only reason to use OEE is to help drive an improvement process to increase operational efficiency. If that isn't a widely embraced priority, then save yourself lots of time, money and effort.

13. **Improving uptime.** OEE can help you identify opportunities to improve your total uptime. First, understand the categories that OEE represents. Next, determine what things you want to track and how specific you want to be. There isn't a set rule as to what that may be. An example may be that under your performance efficiency category, you list specific pieces of equipment in an assembly line to track. By breaking down your categories you will have better opportunities to make improvements. The last hurdle is how to capture the data used to calculate OEE. Keep it simple and train your people in how to capture the data you need, what it is and why it's important.

14. **Sharing data.** Information is fundamental to making good business decisions. However, the information must be precise and the amount manageable, not overwhelming. When installing or defining automation products in a production line, it is their capacity to share data across the enterprise that is important. One of the major causes of failure when
implementing an OEE project is the infrastructure of the automation and inspection controllers (PLC, vision system, etc.). Vision systems must be able to communicate openly with other systems, such as OPC Server or databases. Avoid the use of products that operate in a closed system and do not provide a ready means to share data.

15. **Build on current infrastructure.** Do not get overcomplicated right from the start. Pick a system that leverages your existing automation infrastructure, and can be expanded and built upon as your needs change in the future. Do one machine, or one line, or one department, then refine it so that operations, production, and maintenance all have the types of information they need, then roll out to other areas.

16. **Maintain balance.** Lean manufacturing sounds great to accountants and plant managers, but the upshot of the theory can be destructive if not enough product is produced or the lean process creates inefficiency. Remember, there has to be a balance.

17. **Make Lean work.** Lean manufacturing is all about how an organization can reduce scrap and waste in the production process. Evaluate your flow process, such as where product is placed before the production area or how the product is transferred to and from the assembly line. If your production line stops as a result of parts that are not properly staged on the line, you have a product flow problem. This becomes a bullet point in making Lean work in you plant and should be addressed.

18. **Select a champion.** When implementing these projects, make sure there is an official project champion who is very senior in the implementing organization and can be the bridge between staff and management. The champion will need to drive the changes that will be needed to business processes to achieve a successful project.

19. **Common framework.** When implementing projects for OEE, the communications between systems needs to be reliable, fast and easy to use and maintain. Ethernet has become the standard in communicating data across automation systems. The installed base, along with the expertise already existing in most companies, make Ethernet the most appropriate choice. Avoid devices that use only serial connections (RS-232, RS-485) or proprietary connections. Try to select one industrial protocol based on Ethernet. Even though there are some protocol converters and gateways that allow the conversion between protocols, try to select a protocol that is compatible with most of your existing devices. Establish a long-range standard where all your future automation equipment must be compatible with the selected protocol. In this way, your infrastructure will provide the correct framework where your OEE project can be easily implemented.

20. **Win over minds.** The first place to start with OEE is not in the machines, but in the minds of the individuals that the OEE information is going to help. Without their buy-in the project will be no more than a pretty notice board.

21. **Vision drives OEE.** Improved process efficiency and profitability through OEE improvements are increasingly important. Machine vision systems and image-based ID readers help with three traditional OEE drivers: material handling, product quality and package integrity. Vision systems for sorting, product orientation and tracking, along with robotic guidance, improve material handling efficiency and flexibility, elevate product quality and yield, and ensure package safety and integrity. In addition to these OEE drivers, machine vision inspection and image-based ID solutions address emerging brand protection and compliance drivers. They form a key part of the foundation to support track and trace, random mass serialization and traceability applications.

22. **C-level needs.** OEE is great for benchmarking and it works perfectly in theory. Many companies use statistical and not real-time data from their production facilities to calculate their OEE. Though OEE is easy to understand in theory, in practice there are many questions, especially how to properly calculate it if your manufacturing process often changes, is dynamic or if some machines are used to produce different parts/products in the same shift.

One solution is to use a simple wireless sensor network to monitor basic functions in real time
and make a monthly C-level business report based on real-time production data, which makes much more sense then a detailed, heavy-to-read collection of graphed information. This way you can adapt the OEE/lean process to a company's specific needs and understanding.

QUALITY

Quality takes into account Quality Loss, and is calculated as:

Quality = Good Pieces / Total Pieces.

OEE

OEE takes into account all three OEE factors, and is calculated as:

OEE = Availability x Performance x Quality.

It is very important to recognize that improving OEE is not the only objective

CALCULATING OEE

As described in World Class OEE, the OEE calculation is based on three factors:

1. availability,
2. performance and
3. quality.

Here's how each of these factors is calculated:

Availability

Availability takes into account Down Time Loss, and is calculated as:

Availability = Operating Time / Planned Production Time.

Performance

Performance takes into account Speed Loss, and is calculated as:

Performance = Ideal Cycle Time / (Operating Time / Total Pieces).

Ideal Cycle Time is the minimum cycle time that your process can be expected to achieve in optimal circumstances. It is sometimes called Design Cycle Time, Theoretical Cycle Time or Nameplate Capacity.

Since Run Rate is the reciprocal of Cycle Time, Performance can also be calculated as:

Performance = (Total Pieces / Operating Time) / Ideal Run Rate.

Performance is capped at 100 percent, to ensure that if an error is made in specifying the Ideal Cycle Time or Ideal Run Rate, the effect on OEE will be limited.