

Idhammar Whitepaper – The benefits of OEE Systems

Making every second count in today's production environment

ABSTRACT

MOST PRODUCTION MANAGERS are clear on the areas of major loss within their processes; however getting to the root cause of these issues and doing something about them can be far more challenging. There has never been a more opportune time to seek improvement; to gain visibility of any waste and react quickly to prevent it. This requires the deployment of specialist tools to expose and quantify the potential wins, assessing the most urgent/profitable to pursue, and controlling the cost. This whitepaper examines the significant benefits that can be achieved by using an OEE System to effectively manage losses and improve operations.

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Also available for download from www.idhammarsystems.com/resource_library:

- What is OEE? The concept and calculation of overall equipment effectiveness
- The Business Case for OEE Systems - the operational and financial ROI
- Implementing OEE Systems - delivering on the promise
- OEE, the Great Energy Saver - reducing consumption with OEE Systems



Introduction: the case for OEE



EQUIPMENT FAILURE IS JUST ONE CATEGORY in the total profile of possible failures. In today's high-pressure manufacturing environment, time constraints and lack of data often result in expedient quick-fixes over root cause analysis. Nevertheless, the fact remains that with the right information, each deficiency could be an opportunity for increased productivity, profitability, and staff morale.

Many manufacturers are already using Overall Equipment Effectiveness (OEE), both as a performance indicator and as a catalyst for change. OEE is the standard metric used to "keep score" of manufacturing performance by taking a broad view of all aspects of production. Part of the lean manufacturing toolkit, OEE seeks to drive all elements of waste out of manufacturing processes.

The metric is calculated by multiplying together:

OEE = Availability x Performance x Quality.

- **Availability:** a measure of the time the plant was actually available for production compared to the manufacturing requirements. Any losses in this area would be due to major breakdowns or extended set up time.
- **Performance:** the rate that actual units are produced compared to the designed output. Losses in this area would be due to slow running speed, minor stoppages or adjustments, and material shortages.
- **Quality:** a measure of good quality, saleable product, minus any waste. Losses for this element would be damaged rejects or products needing re-work.

A percentage OEE score is calculated to indicate the relative level of performance against the optimum that can be achieved. Lost opportunity is highlighted, and reducing this waste leads to increased profitability:

- OEE uncovers previously hidden losses. The result is the ability to produce the same volume in less time (SILT), or to produce more volume in the same time (MIST).
- Improved manufacturing efficiency has a dramatic knock-on effect on energy consumption; increases in OEE score are tightly coupled with energy savings.
- OEE can save companies from making inappropriate investments. An integral component of a Total Productive Maintenance (TPM) framework, OEE has become the de facto manufacturing performance metric for manufacturer's intent on maximising their asset performance and operational efficiency.

While a spreadsheet-based implementation of OEE can highlight areas of improvement, a great deal of time is taken up manipulating and analysing data rather than working on actual improvement. More complex manufacturing facilities will outgrow their spreadsheets very quickly and at that point it is appropriate to look for more powerful OEE analysis tools.

Beyond spreadsheets to OEE Systems

WHETHER YOU ARE NEW TO OEE, OR ALREADY USING THE METRIC to support your production environment, you will probably start out using spreadsheets to capture your OEE data.

However, after a while, and when you reach a certain level, this approach is severely limited by the complexity of data handling, manual reporting overheads, and the inability to perform root cause analysis. The following table compares the use of spreadsheets to capture OEE data and the benefits of using a dedicated OEE system.

OEE Spreadsheet method	Using an OEE System
Customers typically report that data handling and reporting takes around 20 hours per month, per production line, and output is limited	Data may be manually or automatically captured and flexible, user-defined reports automatically generated at the touch of button
There is no easy way of analysing the detail behind the data	Ability to drill down to the detail behind the data to identify the cause
Errors can creep in through transcription to the spreadsheet; failure to record all stoppages; and estimated rather than calculated waste figures/outages	Every second of production can be accounted for and analysed
Timeliness of reporting and level of detail is dependent on manual processes	Automatic data capture delivers accurate real-time management information
Spreadsheets are limited to a single user access. Concurrent users will be faced with "Read Only" access barriers	Multi-user access to an easy to use system with information available on-demand
Data security and potential data loss due to erroneous delete/ copy-paste activity threatens the integrity of the data	Built in features prevent unauthorised access and data repository is secure and backed up

Improving management information to easily identify the top losses

OEE systems can identify the areas of greatest opportunity for improvement, (or greatest loss), helping to guide and prioritise continuous improvement programmes to start with the areas that offer greatest potential return on asset. Powerful reporting capabilities give clear real-time visibility of what's going on in production, and allow drill-down to the reasons behind processing problems.

Supporting a culture of "Lean"

It is widely recognised that significant manufacturing performance improvement is driven from the shop-floor up and supported by a top-down management ethos of engagement. Organisations that benefit most from lean manufacturing are using OEE to inform, train and motivate their workforce. The clear, visible data that OEE systems provides galvanises action, eliminates guesswork and finger-pointing, and provides the basis for team-based problem solving at all levels of the organisation.

"Small improvements in OEE can result in big improvements to profitability, a 10% improvement in OEE can result in a 50% improvement in ROA (return on assets), with OEE initiatives generally ten times more cost-effective than purchasing additional equipment."

R. Hansen, OEE for Operators

Five key features and benefits of OEE Systems



THERE ARE MANY BENEFITS TO USING AN OEE SYSTEM, with some specific to industry sector and environment; however, the following five headings cover the key benefits that can be experienced by any organisation.

1. Greater accuracy of information through automatic data capture

Implementing a dedicated OEE system will greatly enhance continuous improvement and lean manufacturing programmes regardless of the method of data collection and input. Indeed, the established OEE systems operate independently of how data is gathered; supporting manual input as well as portals linking to online PLCs and SCADA systems.

However, while manual data capture is far better than no data capture, automatic data capture for OEE measurement provides a step increase in accurate, real-time data collection that also leads to the elimination of factory-floor paperwork. The accuracy of manual data capture with paper-based production line logs is limited due to:

- Missing or ignoring product stops
- Operators, busy fixing problems struggling to accurately record lost time
- Manually recording the exact time of production start-up proving too complex
- Paper-work on the factory floor getting lost or damaged and requiring additional manual handling and processing

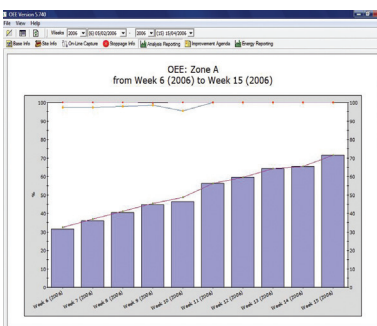
Automatic data collection becomes critical once OEE is above 65%. At this level of OEE, losses are often performance related and generally comprise a large frequency of small time periods. For example 240 stops of 15 seconds each in an 8 hour shift is still an hour lost, but is almost impossible to record accurately on paper logs. As a result the operator receives little feedback on current performance and critical decisions may be made on inaccurate data.

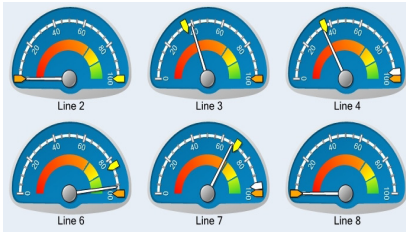
A dedicated data capture system can improve the accuracy and relevance of the data to the OEE system by recording the product, reject counts and failure times automatically and then involving the operator to confirm the reason for the event. This approach includes three significant benefits:

1. **Every loss is recorded**, including minor stoppages to ensure that everything is accurately measured and monitored
2. **The operator is fully involved** and quickly aware of the situation, with real-time management information to support decision making such as 'time to finish this product at current performance', and the 'worst stoppage events this and last shift
3. **Completely paper-less data capture**, removing paper from the shop-floor

Automatic time recording also provides a further benefit - the ability to manage plant start-ups. If we schedule the plant to start at 06:00, at exactly 06:00 the software will check for a running signal and product counts. If none are found the stop is recorded and the operator must select a reason for the 'failure'. One pharmaceutical company has saved almost 20 minutes per line, per day by addressing this type of loss.

Line Data Portal (LDP) systems, designed for touch-screen capability, are available for both manual and automatic data capture, collecting information about product counts, waste counts and a range of stoppage events fundamental to the calculation of Overall Equipment Effectiveness. LDPs enable production specialists to improve factory efficiency through more accurate OEE data and by presenting the information in an easily configurable graphic format for faster, better informed analysis.














Example of Idhammar OEE Dashboard report screen

2. Clear, visible reporting to inform decision making

Clear, accurate and real-time reports provide clear evidence of loss and make action unavoidable. Available at the touch of a button, OEE systems eliminate the need to spend time manipulating data, freeing staff to focus on the improvement agenda. Keeping OEE measurement a simple and standard process enables group-wide comparison of lines, plants and sites. The Idhammar OEE System is already benefiting a number of larger organizations, providing the data from as many as 32 different sites in 10 geographies on a single database.

By clearly and continuously indicating performance against key metrics, dashboards enable manufacturing managers to take greater control of the daily management of plant assets. OEE Dashboards and Andon software modules deliver real-time intelligence on the Overall Equipment Effectiveness of a plant, allowing decision makers to proactively track, monitor and respond. Dashboards provide shop-floor wide display of KPIs, while Andon Boards are placed on the end of the line to provide line-specific KPIs for use by the line improvement team.

- | | | | |
|--|-------------|---|-------------|
|  | Not Started |  | On target |
|  | In Progress |  | Within week |
|  | Deferred |  | Overdue |
|  | Waiting |  | No target |
|  | Completed | | |

Traffic lights used in Idhammar's unique OEE Improvement Agenda

3. Integrated Improvement Agenda to make action unavoidable

Having an industry standard measurement in place to gauge how well you are doing is important, but it is what improvement teams do with the information that counts. Establishing priorities and dealing with them could not be easier if you have the right system in place to facilitate change. Part of the best-practice 'Accountability' process (measure, prioritise, allocate, resolve) is to review the 'Top 5' losses and assign each of them to the individual best able to resolve them. Each time a review session identifies what needs to be done, the tasks are recorded for each participant. Figures for the costs and savings of resolving the loss can be included along with target completion and review dates, so that progress is tracked and recorded accurately.

Whilst the CI teams and front line managers need to see the OEE and loss details, more senior managers can just review the improvement traffic lights to check their teams are making progress and are on target. More importantly, they can check at a glance to see if there are any recent issues without an improvement plan.

Integrated improvement agendas provide a foundation for essential loss management strategies as measuring and analysing OEE is only the first step in the process. Improvement agendas help to structure objectives, providing steps and flags to plan, monitor, and encourage progress.

4. Enhanced quality monitoring facilities

Many organisations today are driven by standards agencies and environmental/customer requirements, to allocate time and resources to the collection, analysis and management of multiple data points. With real-time, paper-less and automated data gathering, Quality Monitoring (QM) software that integrates with the OEE system can make it easier for you to comply with even the most rigorous of audits and enhance your quality assurance.

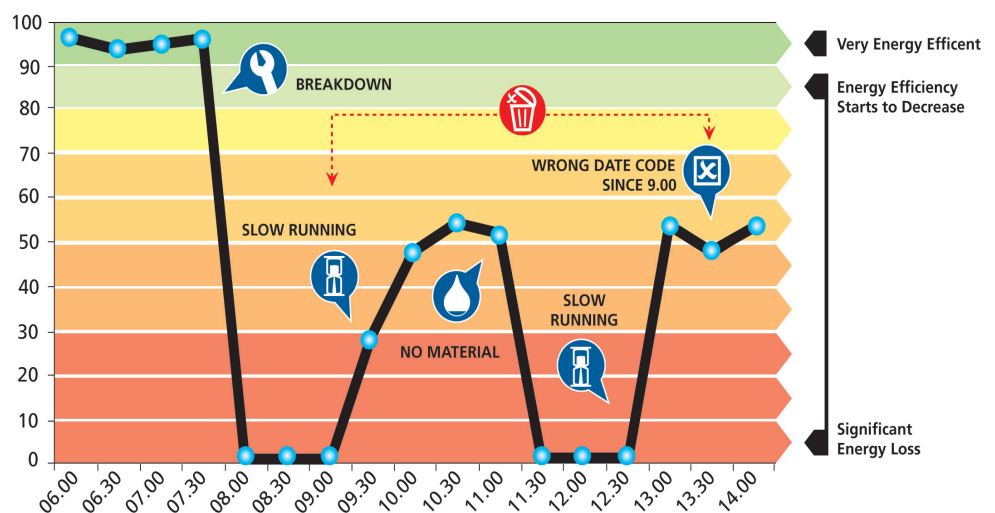
5. Increased energy efficiency

A greater awareness of environmental issues, together with rising energy costs and increased Government targets, has caused manufacturing energy consumption to rise to a board-room level concern. It is no longer acceptable for companies to treat energy simply as a fixed cost of production, there is an urgent requirement to monitor and improve energy-efficiency and reduce consumption.

There are a number of major contributors to wasted energy that go beyond the cost of the normal "turn-off" campaign targets:

- 1 **Break down** - much of the plant; conveyors, pumps, ovens, shrink tunnels, etc. continue to cycle, wasting large amounts of energy.
- 2 **Start-up** - many items of plant use more energy at start-up than at normal operating speed, particularly electricity, so if the plant breaks down frequently, more energy will be used.
- 3 **Slow running equipment** - often uses the same amount of energy as equipment running at full capacity.
- 4 **Rejects and Scrap** - these waste all the added-value used to produce them including labour, materials and energy.
- 5 **Under-utilised capacity** - companies invest in additional capacity, unaware that existing lines are under-performing and could provide the production increase they are looking for. It is well proven that improvements to existing plant are 10 times more effective than the installation of new capacity.

The results of one or more of these factors on a normal production cycle can have a dramatic impact on both the productivity and the energy-efficiency of a production line, as illustrated in the diagram below.



High performance OEE systems such as Idhammar OEE provide the rich functionality necessary to expose exactly what percentage of production time is truly productive and to dig deeper to reveal the causes of lost productivity. Even increasing the OEE score by 1% can lead to dramatic savings and turn-around lost production time into a positive contribution to profit.

Return-on-investment for OEE Systems

The business case for OEE systems

OEE systems can support bottom-line savings by enabling your operation to:

- Produce the **Same unit volume In Less Time (SILT)**, that is using fewer resources (time, materials, labour) to match the current volume of production OR
- Produce **More unit volume In the Same Time (MIST)**, that is to increase production volume without increasing resources (time, materials, labour).

Additional contributions can be made to the bottom-line from maximising asset performance, delaying the purchase of new equipment, and by enhancing energy efficiency which in turn reduces energy bills. Some real world examples include:

A [frozen food manufacturer](#) has calculated that a 1% improvement in OEE across all lines is worth €150,000 per annum and in one year the improvements ranged between 14 and 47%.

A [chemical processing plant](#) increased OEE by 5% resulting in €400,000 increased contribution per year.

A [bread manufacturer](#) harnessed the power of an OEE system to gain greater production efficiency, reducing their annual gas budget by €400,000 a year.

A [bottling plant](#) discovered that each 1% increase in OEE gained €250,000 of contribution per year, they achieved a 22% increase in one key site.

A [pharmaceutical company](#) increased packaging machine OEE by 9% in 6 months gaining €315,000 per year.

A [food company](#) calculated that each 1% improvement in OEE is worth an annual saving of €800,000.

In most cases, an OEE system pays for itself within six months of full operation. An example business case with some financial scenarios is available from: www.idhammarsystems.com/resource_library

OEE Systems vs. MES/ERP Systems

OEE Systems are a foundational element of the lean manufacturing toolkit, supporting a wide range of lean techniques such as VSM, Six Sigma, Kaizen, and SMED, which can be selected and tailored to your specific environment to drive productivity improvements. In this way OEE systems support agility and flexibility of approach.

[Enterprise Resource Planning \(ERP\)](#) is a company-wide system used to manage and coordinate all the resources, information, and functions of a business from shared data stores. They offer functionality for all business departments, but whilst highly effective for desk based financial control, in reality ERPs tend to lack functionality specific to shop-floor activity.

[Manufacturing Execution Systems \(MES\)](#) seek to optimise workflow by imposing strict business rules through computer control of the manufacturing process.

Both ERP and MES approaches are restrictive - they can take a long time to deploy and disrupt normal working practices for some time. Neither solution offers the breadth and depth of a dedicated OEE system specifically designed for purpose. Nevertheless, some OEE systems (including the Idhammar OEE System) can be fully integrated with ERP and MES systems if required.

Why choose Idhammar OEE Systems?

THE IDHAMMAR OEE SYSTEM EXTENDS THE USE OF OEE from a simple measure of effectiveness, to a vital management and decision support tool. From single to multiple production lines, and from one to a number of plants in a group-wide structure, the Idhammar OEE System is all you need to exploit the full power of OEE in achieving world-class lean manufacturing.

Widely recognised as market leaders

Idhammar OEE Systems have already proven their worth to a wide range of manufacturers from mid-size companies to large international corporations worldwide. The OEE software has been designed from the ground-up, and continuously developed over a fifteen year period, in conjunction with experienced manufacturing professionals who have the hands-on experience and practical know-how to ensure that it is easy to use, functionally rich, and fit for purpose.

Implementation by an experienced team

With Idhammar Systems, you are in safe hands. Idhammar understands all aspects of the implementation process, including the need to ensure that your staff understand the concept and benefits of OEE and the way in which the system will help them in their day-to-day activities.

Idhammar also recommends that there is an "OEE amnesty" at the point of implementation. Spreadsheet methods of calculation tend to produce a higher score than when OEE is measured accurately with a system. The point of the amnesty is to accept that the absolute OEE score achieved using the system is not the main point of focus - instead all attention in the first year of operation should be on the improvement opportunities and setting targets and milestones.

For more information on best-practice OEE system deployment and maintaining the momentum of continuous improvement thereafter, see our whitepaper on *"Implementing OEE Systems"*

To find out more about Idhammar's OEE System and complementary products,

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