

The Business Case for OEE Systems

The operational and financial return on investment

ABSTRACT

THERE HAS NEVER BEEN A MORE OPPORTUNE TIME to seek improvement opportunities, gain visibility of all waste, and react quickly to prevent it. This requires the deployment of essential lean tools to expose and quantify the potential wins, assessing the most urgent/profitable to pursue, and controlling the associated costs. This whitepaper outlines the business case for implementing an OEE System to measure, analyse and improve operations, discussing the potential return on investment and business benefits.

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- What is OEE? The concept and calculation of overall equipment effectiveness
- The Benefits of OEE Systems - making every second of production count
- Implementing OEE Systems - delivering on the promise
- OEE, the Great Energy Saver - reducing consumption with OEE Systems



Introducing Paint Pot International (PPI)



IN THE CURRENT ECONOMIC CLIMATE it is tempting for manufacturers to take drastic measures - reducing headcount, shifts, and budgets - to try and control production costs; but it is widely recognised that in the long-run the businesses most likely to survive take a more measured approach. Adopting lean manufacturing and striving for operational excellence will help companies achieve sustainable advantages and emerge as more agile players, ready for the 'Upturn'.

Many manufacturers are already using **Overall Equipment Effectiveness (OEE)**, both as a metric and as a catalyst for change. While a spreadsheet-based OEE tracking system 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 quickly outgrow their spreadsheets and then look to harness the power of dedicated OEE software

Justifying capital expenditure in order to implement any new application is a fundamental first step, particularly in the present climate, so using an amalgamation of genuine data from existing Idhammar clients, the following pages set out a detailed business case for implementing an OEE System in the UK plant of a fictitious organisation - introducing *Paint-Pot International (PPI)*.

We start by outlining the typical issues faced prior to the implementation of an OEE system before looking at the return-on-investment and the improvements gained from having an OEE system in place.

Paint Pot International (PPI)

For the purposes of this business case, PPI is a large international corporation which manufactures a wide range of market-leading industrial paints. In the UK, PPI produces paints and coatings specifically for the agricultural market, sold through specialist outlets worldwide. These paints are carefully formulated and the chemical properties of the paint are highly regulated.

With global competition from other manufacturers, and to some extent from other plants within the PPI group, the Manufacturing Director of PPI UK is looking for a way to increase productivity, improve efficiency and consequently deliver more profit to the bottom line. The challenges for the plant include:

Static volumes: the demand for paint in the agricultural market is slightly down on the previous year; however it is expected to recover over the next 24 months.

Competitive Pricing Pressure: to retain its market leading position, PPI must maintain competitive prices on its agricultural paint. Other suppliers are entering the market with lower priced paint aiming to take market share.

High material cost: the cost of scrap/waste can amount to significant and unnecessary expenditure.

Therefore, the PPI UK management team is looking to maintain the same volume production capacity whilst maximising return on assets and reducing waste at every opportunity.

Paint Pot International's Business Improvement Plan

PPI UK's overall business objective is to make the production of paint more efficient - producing the **Same (volume of paint) In Less Time - SILT**. With a solid reputation for quality, PPI continues to invest in its production facilities worldwide, but at this time the set up and commissioning of new plant and equipment is an expensive option and the Manufacturing Director would much rather maximise the performance of the existing plant wherever possible.

All PPI plants worldwide employ OEE as a metric for performance assessment and as a way of identifying opportunities for process improvement. Currently the data is captured manually in a series of complex spreadsheets. However, this is causing concerns to the PPI UK Management team due to:

Time and resource required - maintaining the spreadsheets requires significant time investment from the Production Team to capture, manipulate and analyse the data (typically two hours in each eight hour shift). Additional data capture time is required by the operators (a further forty-five minutes in each shift).

Insufficient detail - complex as they are the spreadsheets don't contain sufficient levels of detail to really drive the continuous improvement programme.

Lack of timely reporting - to provide any meaningful information, additional time is invested in creating and exporting data into a paper report that is distributed to appropriate staff, often many days after the events have been reported.

Concerns over accuracy - errors can creep in at all levels in this manual process, with transcription from paper records to spreadsheets, failure to record all stoppages, or estimated rather than calculated waste figures/outages. For instance a series of 2 minute stoppages over a shift can add up to a significant loss of production capacity (impacting the OEE score), but they are not all being recorded.

Consequently, the PPI UK management team is looking for an alternative means of informing and driving continuous improvement programmes, having outgrown the spreadsheet system. PPI UK is considering the use of OEE software and automatic data capture systems to improve the accuracy of its production information, using real-time data to effectively drive its improvement agenda.

This business case is intended to provide justification for CapEx in order to implement the system.

The Business Objective = SILT

(Complete the order for the Same number of pots In Less Time)

In the interests of time and simplicity, the illustrations shown below are limited to the paint filling process only, with the following production characteristics:

- Three filling lines
- Three fixed eight hour shifts = 120 hours of production per line
- Design throughput = 300 pots per hour per line
- Target production is 90,000 pots per week
- Paint is produced in 10 litre pots at a factory cost of €8 per pot
- Recommended retail price of a 10l pot of agricultural paint is €20
- Labour costs average €200 per hour
- Energy costs average €300 per hour

Working out the Business Case

Starting point: current OEE Score of 60%

Prior to implementing the OEE System, PPI has an OEE score of 60% based on:

Availability: 77%

Performance: 81%

Quality: 96%

Due to the low availability and poor performance we can work out that instead of meeting the sales order of 90,000 pots in the target 100 hours (at 900 pots / hour), it actually takes us 128 hours to meet the order. This additional 28 hours of production time includes 8 hours of overtime beyond the 120 planned hours of production.

The cost of waste

The cost associated with the wasted production time (of 28 hours), together with the material costs of wasted units, can soon add up to a significant amount of money as shown in the table below:

This means that over the course of a 52-week production year, PPI's Agricultural Paint Plant will have **wasted a total of nearly €2.2m**

Type of waste	Units	Cost per unit	Cost of waste
Labour	28 hours	@ €200	€5,600
Energy	28 hours	@ €300	€8,400
Materials	3,450 rejects	@ €8 per unit	€27,600
TOTAL LOSS @ 60% OEE			€41,600 each week

Is there an alternative?

Thankfully the answer to this is yes. What if we could use OEE as a catalyst for change, accurately identify the losses and improve the OEE score?

Customers implementing an OEE System typically see between 10 and 20% improvement in their OEE score during the first 12 months following roll-out. Exact figures will vary and depend upon the nature of the business, the initial OEE score, the mode of data capture (manual or automatic), and the amount of focus given to the improvement agenda.

By implementing an OEE System and associated continuous improvement programme, PPI UK is able to reduce the waste and meet the sales order in fewer hours.

Impact of a 10% improvement in OEE

INCREASING THE OEE SCORE TO 70%

Based on the following improvements:

Availability: up from 77% to 84%

Performance: up from 81% to 87%

Quality: up from 96% to 97%

PPI can now produce 90,000 pots in 118 hours, **wasting 10 hours less** of target production each week than when operating at 60% OEE. Although production hours still exceed the design target, the result is a reduction in wasted labour, energy and materials which has a positive impact on profitability.

Type of waste	Units	Cost per unit	Cost of waste
Labour	18 hours	@ €200	€3,600
Energy	18 hours	@ €300	€5,400
Materials	2,400 rejects	@ €8 per unit	€19,200
TOTAL LOSS @ 70% OEE			€28,200 per week
Impact of + 10 % OEE = (€41,600 - €28,200)			Saving <u>€13,400</u> per week

This 10% improvement in OEE to the new level of 70% has delivered a saving of over €28,000 each week, that's **nearly €700,000 per year** when compared to the OEE of 60%.

By these calculations, improving the score a further 10% to 80% OEE, PPI UK adds over €1.25m to bottom line profitability.



Simple ROI calculation

OEE SYSTEMS - A CATALYST FOR CHANGE

Deploying an OEE system will help drive the changes required to improve the OEE score. The typical cost of an OEE System is around €15,000 per line, including automated data capture. This means that the installation at PPI costs:

Software license (e.g. 5 concurrent users with automated data capture)	€15,000 per line x 3 PPI lines = €45,000
Typical implementation costs	€15,000
Year 1 support	€3,000
TOTAL initial outlay	€63,000

SCENARIO:

The following ROI is based on a very modest 10% sustained improvement in OEE using the savings we calculated above:

@ **60% OEE** wasted production amounts to €41,600 per week, €166,400 per month

@ **70% OEE** wasted production amounts to €28,200 per week, €112,800 per month

The 10% OEE improvement yields a saving of €13,400 per week which is €53,600 each month. With a system cost of just €63,000 in the first year, we can see that it takes PPI less than two months of being fully operational to break-even.

Note: we are limited here in terms of what we can add into the ROI model; clearly we should add in an element of cost for the initial organisational impact and change management required to support the software implementation. However, it is likely that even with these other costs, PPI's Agricultural Paints would achieve a break-even ROI in 6 to 12 months.

In this simple calculation, we can see that by using the OEE system to inform and drive a 10% improvement from 60% to a sustained OEE score of 70% across the original three lines, PPI's agricultural paint plant will meet its sales order of 90,000 pots of paint in 10 fewer hours than previously required.

By reducing the amount of labour, energy and materials wasted, the plant delivers an additional **€3.4 million to PPI's bottom line over a 5-year time period**. Clearly, a 20% improvement will have an even more profound impact.

By exposing all losses and using the system to drive valuable change improvements, Idhammar OEE customers experience fast ROI and year on year cost savings just like the example case outlined.

"We have seen real and sustainable improvements in our assets through reducing the six losses of OEE. One particular asset was running seven days a week and still struggling to meet customer demands. Now it typically does the same volume in four-and-a-half days. This avoided capital expenditure to increase capacity through another asset." MARK ROGERS, SITE MANAGER, SMITH & NEPHEW

Operational Benefits



The financial model used in this business case is limited as it does not account for inflation/deflation nor other sophisticated variables. Likewise, there are many other operational benefits that are difficult to quantify in financial terms including:

A cultural change - from target driven behaviours to a focus on continuous improvement, teamwork improves as everyone is responsible for the OEE score.

Instant status updates - operators are provided with relevant and useful production data in easy to interpret graphs helping to engage and motivate the shop-floor.

Powerful drill down analysis - OEE software uncovers all aspects of the issue and the root cause of waste, reducing the amount of guesswork and finger pointing.

Automatic, customised reports - empowers managers and frees up resources to work on analysis and improvement rather than data gathering and formatting.

Creative and proactive problem solving - the OEE score can be used to accurately monitor the results of pilot improvement schemes before roll-out to a wider production environment.

“We chose the Idhammar OEE System for a number of reasons; firstly, it has many of the features we were looking for to support drill-down analysis, reporting and continuous improvement monitoring. Moreover, despite its extensive functionality, the straight-forward user interface allows the system to be used by anyone in the plant and supports our culture of ownership and responsibility.”

STUART DRYSDALE, MANUFACTURING DIRECTOR, AUNT BESSIE'S

Despite the limitations of the model, this business case proves that small improvements in OEE can result in big improvements to operations and 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 2001

Conclusion

THE SIMPLE TRUTH IS THAT WHAT GETS MEASURED GETS MANAGED. Idhammar's OEE System software is specifically designed to help you apply OEE to your manufacturing processes. From single to multiple production lines, and from one to a number of plants in a group-wide structure, Idhammar's OEE System is a vital management and decision support tool, providing information on availability, performance and quality; all you need to exploit the full power of OEE and achieve world-class lean manufacturing:

"Measuring performance by analysing OEE means that we can identify exactly where losses are occurring. Right from the start, the Idhammar OEE has identified every opportunity for improvement, some requiring simple, low-cost changes to processes which would have been difficult to identify, and perhaps more importantly, quantify without an OEE System. We installed the system on line 8 first and it's now our best performing line; rolling it out to the other lines was a clear cut decision" PATRICK MROZAK, MANUFACTURING MANAGER, BURTON'S FOODS

Deciding to put an OEE System into operation is a positive first step, but it's only part of the equation. As with anything, it can be implemented properly, or not applied well at all. To achieve a successful implementation and to optimise the success of an OEE System, organisations must focus on ensuring a commitment to using it as a fundamental, organisation-wide tool to drive continuous improvement in an effective manner.

For more on OEE Systems deployment, please refer to our whitepaper - 'Delivering on the Promise of OEE' - which explores best practices for approaching implementation and recommends ways to overcome potential objections and organisational resistance to such a project: www.idhammarsystems.com/resource_library

If you would like to explore a more detailed ROI analysis for your specific environment, please contact us:

Call: [+44 \(0\)117 9209400](tel:+4401179209400)
Email: info@idhammarsystems.com or
Visit: www.idhammarsystems.com