



## The OEE Scorecard

This white paper is intended as a guide for professionals in the pharmaceutical, medical device, life sciences and other regulated manufacturing industries who are searching for software to improve Overall Equipment Efficiency (OEE).

It provides a balanced scorecard, identifying the essential criteria and features to ensure that you find the best software for your OEE (Overall Equipment Effectiveness) Program.



# BALANCING THE ODDS IN YOUR FAVOUR WITH AN OEE SOFTWARE SCORECARD

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## **INTRODUCTION TO THE SELECTION CRITERIA**

Having identified the need for OEE software, one of the first hurdles for the manufacturer is the preparation of a shortlist. A brief internet search shows many potential OEE suppliers; even free software downloads but little insight on choosing a software supplier to partner with. Before downloading or trialling any OEE software it is important to decide on the selection criteria for your particular requirements.

The objective of this paper is to share some of our experiences from working in the pharmaceutical, chemicals and process led manufacturing sectors based on OEE software selection, and, to help create a decision making matrix that helps you choose the right OEE software solution for your organisation.

First a practical definition of OEE (Overall Equipment Effectiveness) will help set the scene. OEE as a key performance indicator (KPI) is a measure of effectiveness that takes into account availability, performance and quality. Normally expressed as a percentage, the higher the figure the more effective use is being made of manufacturing resources.

Typically figures OEE will vary between 30% (poor) to 80% and beyond (excellent), though manufacturers have also to take into account that there are different definitions and ways OEE can be measured and used. Continuous high volume production in simple process plants should always deliver high levels of equipment efficiency, which will fall as more variables are introduced.

The best OEE software highlights the underlying root causes and reasons for any particular OEE loss – and allows operational management to take the appropriate steps to improve OEE by taking specific actions.

Various software suppliers offer OEE solutions based on their own particular area of expertise. These include MES (Manufacturing Execution Systems), CMMS (Computerised Maintenance Management System), ERP (Enterprise Resource Planning) and BI (Business Intelligence). These suppliers adapt their standard software to attempt to deliver an OEE solution. The limitations of such systems lie in the heritage they've been developed from. For example, it's easy to report a machine failure but far harder to identify the root cause of the failure – and unless the software has a full and comprehensive drill down capability to analyse the data, production managers are forced to make decisions based on suspect data.

If OEE is a key measurement for your company then the best approach is to use a company that understands operational performance management requirements and specialises in OEE software solutions.

## **THE PROBLEM OF SELECTION**

### **- SETTING CLEAR OBJECTIVES FOR THE ORGANISATION**

In terms of scope any OEE solution has to be developed and implemented from an operational perspective rather than being engineering or maintenance centric.

Therefore, the project team responsible for the selection process of an OEE software solution needs to be able to articulate the technical and operational requirements that need to be delivered in developing the initial selection criteria. Equally the evaluation process and the way the balanced scorecard will be used to assess the individual tenders needs to be agreed well in advance.



## **TEN MAJOR SELECTION CRITERIA FOR OEE SOFTWARE**

Once the infrastructure by way of the project team has been established, then discussion over selection criteria can begin. In our experience these are the ten key criteria which need careful consideration when evaluating which OEE software and vendor to work with.

### **1) EXPERIENCE AND EXPERTISE IN SIMILAR PROJECTS**

If OEE is a key measurement for your company then the best approach is to use a company that understands operational performance management requirements and specialises in OEE software solutions.

Various other software suppliers offer OEE 'solutions' that simply reflect their own particular area of expertise. These include MES (Manufacturing Execution Systems), CMMS (Computerised Maintenance Management System), ERP (Enterprise Resource Planning) and BI (Business Intelligence). These suppliers adapt their standard software to attempt to deliver an OEE solution.

Given the complexity of process manufacturing in sectors such as pharmaceuticals, medical equipment and high grade chemicals, most OEE software suppliers need to complement the skill sets found in-house. Not only does this simplify integration and training, but, since the insights the software exposes are largely based on previous experience and knowledge it helps that the right questions are asked before any answers are provided.

Another strong reason for choosing this as a key parameter is the suitability of the software package itself, since it's only the brave or foolhardy that would volunteer their manufacturing plant as a pilot project for their software supplier.

Clearly cost is not the only driver in the manufacturing equation; quality is of

paramount importance in many sectors. Given the importance of compliance for many manufacturers to gain access to global markets, the ability to maintain standards whilst extracting more value from production plants provides vital headroom for managers choosing on future plant investments.

Johnson & Johnson recognised the importance of using a specialised OEE software solutions after trialling a modification to their CNC software product.

### **2) REAL-TIME DATA COLLECTION, ANALYSIS & REPORTING**

Key to the success of an OEE programme is the ability to capture and report on real-time information. If the information is outdated by the time it reaches key decision makers, the opportunity to take preventative and corrective actions is missed.

The OEE software selected must be capable of collecting real-time or as near real-time data as is practical. Data collection should be automated where practical (e.g. counts and alarms directly from equipment) as well as have a practical human interface (e.g. assigning root causes, notes on preventative actions taken).

Being able to view information and analyse data real-time enables staff to identify early deteriorating OEE measurements and allows preventative action to stop the slide. This early prognosis capability results in higher availability and improved equipment performance.

GE Healthcare recognised the need to collect performance information in real-time because of their large product mix and frequent batch changeovers. Real-time reporting allowed them to quickly identify the root causes of reliability problems on their packaging equipment.



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### 3) DRILL DOWN & ROOT CAUSE CAPABILITIES

Arguably the most important issue for OEE software is the ability to resolve issues promptly. It’s important to understand the difference between the ability of a business intelligence tool to allow users to drill down into data and the ability to interrogate the right information to gain answers and insights into operational issues.

It’s all very well knowing that a machine operates at only 60% of capacity and seeing that figure broken down on a daily weekly and monthly basis, but knowing what steps to take to improve it is where the real values of OEE lies.

In some cases it is possible to capture 100% of downtime events directly from equipment. If root causes are not assigned to downtime reasons collected then taking measures to improve say availability are restrictive. It would be better to have 95% data accuracy with root causes assigned because it is on the root causes that management can make real decisions and measure effectiveness.

Stada Production realised the importance of being able to review data on a daily basis and report and trend root causes of both process and equipment issues. Stada Production were initially very surprised at the top contributing root causes highlighted by the software as they were issues that were deemed insignificant in their previous performance reporting applications.

### 4) SOFTWARE USABILITY

For many companies this is one of the key areas to understand. In some manufacturing environments it is simply unrealistic to expect plant engineers to successfully navigate a complex screen simply to input data.

Touch screen interfaces should mean the overhead of data collection is minimised for demanding environments, which in turn will improve the quality and results from an OEE program.

A long time failure in manufacturing remains the ‘disconnect’ between the shop floor and the boardroom, resulting from poor systems integration. The reliance of traditional ERP systems on historic and legacy data sources also suggest its effectiveness as an OEE engine will be limited – simply because of the issues of integrating real time manufacturing data.

Because of these integration issues the industry also retains a reliance on ‘work-rounds’ where data input into a spreadsheet developed in-house provides some knowledge. But the risk of this approach remains rooted in only gaining a partial view of the operation centered from engineering or maintenance biased perspectives from a single plant.

Boston Scientific knew that when relying on line operators to collect real-time data it is imperative that the system is very user-friendly. Otherwise, there is a tendency not to report the data accurately (e.g. inadvertently selecting the wrong root cause). Boston Scientific ensured that the OEE software they selected used touch-screen technology and this technology guaranteed data accuracy.

### 5) IMPLEMENTATION TIME

The enterprise sector for ERP solutions is well versed in relatively long and painful implementation and training schedules.

The potential impact and ROI an OEE software solution provides should dictate the priority of the lead time for the implementation, from initial consultancy through to implementation a three month time frame is realistic for most companies.



However quotes for lengthy implementation cycles also introduce other variables for customers to be wary of - such as hidden costs and a need for greater customisation and even product development of the software solution.

Abbott Nutritionals required OEE reporting to support a Business Excellence program and needed rapid implementation to deliver improved business results. By using experienced OEE consultants to provide support and training during the implementation of the OEE software, Abbott were able to measure plant performance within 3 weeks.

## **6) CONFIGURABILITY**

Different companies have different requirements. Even within a single plant there may be different requirements from different areas of the plant (e.g. Production and Packaging). For this reason the implementation of an OEE software solution may be different within different work centres and the selected OEE software solution must be able to cater for this.

When reviewing OEE software solutions it is important to understand how configurable the product is and that it will meet the requirements for each data entry point (work centre).

One point to note is that OEE software products designed specifically for regulated industries (e.g. medical device, pharmaceutical, food processing) are much more functional and configurable than other products because of the regulations such as CRF Part11 etc.

With a wide variation of equipment and processes in their plants, Boston Scientific accepted that the OEE software selected needed to be highly configurable so that the application could work in a number of different ways for different value streams.

## **7) AUTOMATION INTEGRATION COMPATIBILITY**

More and more companies want to collect information directly from equipment. This means collecting event stop and start times with associated equipment fault codes, against which a user will associate a true root cause code, it also means the collection of information relating to product counts, scrappage counts and line speed information.

At a basic level the equipment has to collect information on Stop, Running, Idle modes.

When selecting OEE software, the package must be able to collect data from differing types of equipment. The OEE software should be able to interpret and process this data. Also key is that, if required, the OEE software can communicate and send information back to equipment.

Other levels of automation to consider are the ability to send and receive information from ERP or CMMS products,.

By integrating the software directly to the equipment, GE Healthcare got real benefits and time savings. By linking to the equipment, they got 100% accuracy on equipment availability/utilisation and by using the OEE software they were able to assign true root causes and have data at an acceptable accuracy level to make effective decisions on. In one case, by linking into the equipment on one of the packaging lines, OEE increased 10%.

## **8) CUSTOMISATION**

As a rule of thumb Pareto's law applies to most plants, in that off the shelf software provides an 80% fit with 20% of customised components.

A degree of customisation is inevitable given the spread of equipment used



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across process plants and it's important to understand the nature of customisation that's being undertaken. Writing APIs for slightly different shop floor machinery is relatively trivial compared to the bespoke development of a functional module.

Ideally the OEE Software vendor will also be the OEE software developer and not a 3rd party reseller. When the vendor is also the developer customisations can be deployed much quicker as the company effectively has a direct line to the developer.

Johnson and Johnson knew that the OEE software solution they were to select would not encompass all their specific requirements both for the current process and for future requirements. They specifically were looking for a product that would best fit their business requirements but could also be customised to meet their precise requirements. As a result they made a strategic decision to select a provider who has complete control over the code so that development lead times would be much shorter and that direct access to the software designers and developers was important.

#### **9) CAPITAL COST**

It's important to separate cost and value, given the huge impact improvements in OEE can have on plant profitability from the right functionality.

A low cost solution without the full functionality that is required will add little overall value to the organisation. Functionality will always have more bottom-line impact than cost if the software cannot provide the right answers.

Individual costs for OEE software solutions must also be viewed on a like for like basis, covering not just software licensing costs, but training support and installation consultancy fees.

Given the incremental costs of management consultants and project engineers plus bespoke software development it's little wonder some providers can afford to be generous with software license fees.

#### **10) SOFTWARE TECHNICAL SUPPORT AVAILABLE**

It's important to differentiate between software resellers and software companies. In terms of support, particularly where customisation is involved, direct manufacturer contact will have distinct advantages particularly during implementation. Equally where continuous 24-hour plant operations are involved the need for rapid resolution of any issues will have to be factored in.

Given the choice available in the market, fitness for purpose is an important requirement. Different manufacturing disciplines have different business drivers. Equally differing economic and social factors will have their own issues.

Taken as a whole the common drivers of cost reduction and fully capitalising on expensive assets involved in plant operations are shared with quality goals and a move to leaner manufacturing practices. Corporate social responsibility programmes and environmental agendas are other issues faced by the senior management, which again may alter the overall expectations from OEE software.

For Pharmaceutical companies compliance is a key issue for any company operating Globally. Increased global competition for some will mean that European manufacturing plants have to operate at optimum productivity to remain economically viable.



### WEIGHTING FOR KEY ATTRIBUTES

These weightings were developed for a specific tender for an OEE software solution to identify the strongest fit. A total of four packages were considered in detail after extensive market evaluation

from UK, US and European software providers, here the overall qualification criteria was to provide a genuinely operational perspective on OEE opposed to an extension of current engineering or maintenance management tools.

Balanced Scorecard			Product X		Product Y		Product Z		PerformOEE	
			Score	Weighted	Score	Weighted	Score	Weighted	Score	Weighted
1.	Experience and expertise in similar projects	16%	3	0.48	5	0.80	3	0.48	7	1.12
2.	Real-time Data Collection, Analysis & Reporting	21%	5	1.05	7	1.47	3	0.63	7	1.47
3.	Drill Down & Root Cause Capabilities	17%	5	0.85	7	1.19	3	0.51	7	1.19
4.	Software Usability	11%	3	0.33	5	0.55	3	0.33	7	0.77
5.	Implementation Time	8%	5	0.40	7	0.56	3	0.24	10	0.80
6.	Configurability	7%	3	0.21	3	0.21	3	0.21	7	0.49
7.	Automation & Integration Compatibility	7%	3	0.21	5	0.35	7	0.49	7	0.49
8.	Customisation	5%	3	0.15	5	0.25	3	0.15	10	0.50
9.	Capital Cost	5%	5	0.25	5	0.25	3	0.15	3	0.15
10.	Software Technical Support Available	3%	7	0.21	7	0.21	7	0.21	7	0.21
			<b>4.14</b>		<b>5.84</b>		<b>3.40</b>		<b>7.19</b>	
<b>Scoring:</b>			<b>10 = Excellent</b>	<b>7 = Good</b>	<b>5 = Average</b>	<b>3 = Fair</b>	<b>0 = Poor</b>			



[www.oeesystems.com](http://www.oeesystems.com)

**OEEsystems**

Gurtnafleur Business Park,  
Clonmel,  
Co. Tipperary,  
IRELAND

Tel. : +353-(0)52-70384  
Fax : +353-(0)52-81987

**OEEsystems**

Stansted Centre,  
Parsonage Road,  
Takeley, Essex,  
CM22 6PU

Tel. : +44-(0)1279-874240  
Fax : +44-(0)1279-874347



**OEEsystems**  
Operational Excellence Solutions