

Cloud Computing OEE (Overall Equipment Effectiveness) for Reducing Production Downtime

Ravi Anand
 SYBEQ

ABSTRACT

Measuring Overall Equipment Effectiveness (OEE) is important for identifying areas of improvement within a Manufacturing Process such as Quality, Performance and Availability losses. In many cases one maybe related to the other.

This paper explores how “OEE on the Cloud Computing platform” offers a unique value proposition that can greatly help reduce Production downtime and other losses. This solution enables the enterprise to monitor the production process in real-time and in a cost effective manner. This paper also analyzes some of the challenges faced in implementing such a solution and means of overcoming these challenges.

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INTRODUCTION

Developed in late Sixties “Overall Equipment Effectiveness” is an important production KPI (Key Process Indicator) used to judge and compare Manufacturing operations across the industry. It is calculated using three factors: Availability, Performance and Quality. (See [Fig 1](#)) (See [Appendix](#) for important data parameters and reports related to OEE)

For the same operating parameters a higher value of OEE implies one or all of these three factors: lower downtime, more parts per hour and/or better first time quality [5].

This results in more productivity and less operating costs.

Although it is well known that there are seven major types of waste in manufacturing (viz. Transportation, Inventory, Motion, Waiting, Extra-Processing, Over Production and Defects) it can be challenging to identify what should be changed in the manufacturing process to eliminate or reduce these wastes. The OEE metric not only helps us to identify the areas of improvement it also helps us set specific targets and to determine where we stand in the improvement process. It is observed that certain manufacturing organizations customize the OEE concepts to suit their work culture.

OEE SOFTWARE SOLUTIONS

Software systems used for calculating OEE occupy a broad range; from spreadsheets to real-time solutions that obtain data from sensors and SCADA devices. OEE calculations are sometimes part of the manufacturing execution Software (MES) solutions. In this paper we explore why cloud computing solutions for OEE data capture, calculation and reporting offer an unparalleled value proposition to the manufacturing operations.

Examples of Legacy OEE Software include the following:

- Client/Server Applications
- Standalone Desktop Software

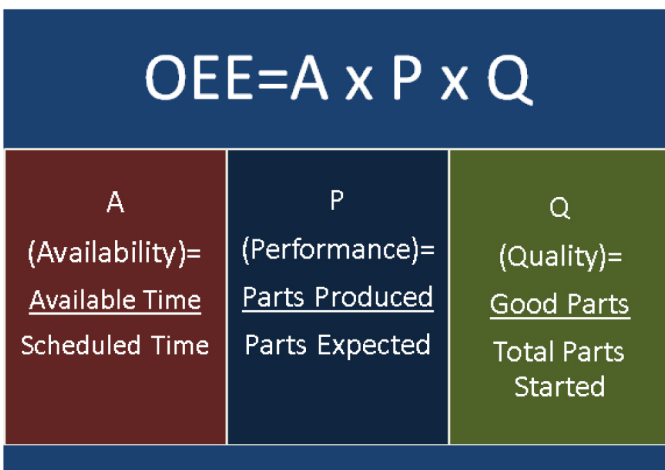


Figure 1. Calculating OEE

- Custom OEE Software developed in house
- Spreadsheets for calculating OEE

COMMON PITFALLS OF LEGACY OEE SOLUTIONS

Traditional OEE Software comprising of Custom Solutions and/or “Commercial off the Shelf” (COTS) products face typical problems such as:

- Hard to maintain
- Become irrelevant due to bad data or low life expectancy of the technology
- Unable to keep up with the Industry Best Practices and Business requirements and other factors discussed below
- High Initial Capital investment in IT infrastructure
- IT infrastructure maintenance Costs and Unreliability
- Hosting Server downtime interrupts data collection needed for calculating OEE. This hampers OEE improvement initiatives resulting in loss of productivity, increased scrap.
- Limited data Access

To overcome the limitations of traditional software platforms more companies are moving toward cloud computing. Use of Cloud computing has increased in the past few years and will continue to grow for obvious reasons of reduced costs, no upfront investment and global access. [6, 7] In the next section we further discuss the problems related to legacy OEE Solutions.

Difficult to Maintain

It is common knowledge that Manufacturing Companies face a lot of challenges when maintaining the Business Software whether it is custom built or otherwise. The challenges arise from various aspects such as obsolete Data Attributes, bad hardware or simply the high cost of keeping up with the latest upgrades.

Obsolescence

Operating Systems running the in-house OEE Solutions become obsolete; the hardware hosting the solutions eventually breaks down, periodically the OEE Software like any other requires upgrade and maintenance. These costs add up and these tasks are ignored or pushed to the back of the priority queue, thereby causing a great disservice to the business.

Limited Visibility of Reports

It is observed that even when the typical legacy “OEE Solution” runs at close to optimal conditions the visibility of the Report outputs and calculations are limited to a narrow set of users. This depends on the architecture of the implemented solution but most often accessing the reports remotely

requires significant efforts and costs. (See [Appendix](#) for important data parameters and reports related to OEE)

High Set up and Maintenance Costs

The Software licensing and personnel costs to maintain the systems delivering the OEE Solution in-house are significant.

Poor Performance

Due to the hardware, software and design constraints the legacy OEE systems display a deterioration of performance over a period of time.

Limited Flexibility in Reporting

Our research indicates that it is quite common for the end users to have a set of reports related to OEE that are not changed after the initial setup. The end users then spend several person hours in consolidating data from these reports and making new reports manually to meet the ever changing business requirements. (See [Appendix](#) for important data parameters and reports related to OEE)

Limited Inputs from Industry Best Practices

Due to the high setup and upgrade costs the legacy OEE solutions typically remain unaffected by the latest lessons learned and the industry wide best practices. This makes the Legacy OEE Solution progressively irrelevant.

IMPORTANCE OF HAVING A GOOD OEE SOLUTION

As mentioned in the previous sections of this paper the OEE Calculation requires three main inputs: Availability, Performance and Quality. OEE solutions categorize each of these (Availability, Performance and Quality) into a hierarchy of sub categories. So the end users know to the fullest extent why the losses due to each of these factors occurred.

For example the Availability loss could occur due to lack of resources (parts, people, system failures, etc.) The loss of availability could also occur due to poor maintenance of tools and equipment. The loss of availability may be intentional because the quality of the product was not acceptable.

Similarly the performance and quality losses could be due to many reasons such as poor maintenance, lack of training or due to bad product.

Observing these trends offers useful insight into the efficacy of the procedures and the system.

A good OEE solution not only offers the users visibility into these performance characteristics but also adapts to the lessons learned over a period of time.

Performance Metrics and Industry Comparison

The OEE is a Key Performance Indicator which helps us judge and compare the operation with other operations in the