



## **Process visibility: Scaling real-time OEE from devices to the process level**

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While most modern equipment on the factory floor offers some degree of performance and productivity monitoring, tying equipment and devices together for meaningful and immediate expressions of productivity often remains a hurdle. However, overcoming this challenge pays big dividends. In a landmark presentation of Overall Equipment Effectiveness (OEE), Rohm and Haas Corporation found that OEE is ten times more cost-effective than adding capital capacity.<sup>1</sup> With findings this dramatic, deploying broad performance monitoring measures are easy to justify.



OEE is a vital metric that combines three key performance indicators (KPI) into a single calculation, measured as a percentage against an ideal combination of machine uptime, plus the quantity and of the products being produced. The percentages of each of these three KPI are multiplied together to provide the OEE rate quality (OEE = % Availability X % Performance X % Quality).

If the goal is performance improvement, OEE is a concise indicator that focuses on how effectively a machine or process is running at a given moment. An established benchmark provides a baseline for operators based upon what's actually being produced, tying actual plant floor realities together with the losses that create equipment- and process-related wastes. While it's unlikely that any plant can operate at 100% OEE, many manufacturers set a benchmark of somewhere around 85% OEE as a goal.

### **Two essential requirements for successful OEE**

The true goal of measuring OEE is to improve the productivity of your equipment, and since operators are the ones most directly responsible in this effort, they should have front-row access to OEE data. OEE should be looked at as a plant floor improvement tool, and by definition should be clearly and quickly conveyed to operators. This relationship with the data not only helps operators develop the best “feel” for their machines, but also focuses their attention on maintaining productivity levels. In turn, shift or line supervisors receive better, more timely operator feedback regarding the equipment status—empirical data on which to base actions and decisions.

For OEE to be a truly effective tool for analyzing and improving operations, two conditions must exist:

The first is visual accessibility. OEE statistics must be viewable to the plant floor so that operators in control of the process or machine may respond immediately to the displayed calculations. Large overhead plant floor marquees are often used to display OEE metrics on the whole, while smaller display boards might service an individual work cell or machine.

The second and most critical aspect for successful OEE is that data must be displayed in real time. If performance suffers during a shift but operators are not informed of this shortfall until an end-of-week spreadsheet is generated, reconstructing the cause of the reduction is almost impossible if problematic conditions have already passed or the data is incomplete. By monitoring live performance, an operator can immediately assess declining OEE rates and remedy problems, whether they are mechanical or materials related.

### **The challenge of consolidating data and integrating devices**

One of the best ways to acquire data for OEE is to let the production equipment measure itself, as most machines today have the intelligence to measure one or more of the three OEE parameters. For instance, once a machine is programmed for an optimized production rate, most equipment can monitor throughput against its designed specifications. Many systems can also track first pass yield against the total units started, and as PLCs are time-based, they can easily track the amount of operational time.

Most plants use devices made by various manufacturers, and manufacturers use many different communication protocols in order to support legacy products, accommodate new technologies or restrict customers to their own proprietary networks. For example, a packaging machine may only be programmed to understand how many parts are produced in comparison to its engineered throughput rate, while a piece of inspection equipment would only know how many good and rejected parts were produced. Data from both must be communicated and consolidated in order to calculate OEE.

Today, data management devices can provide seamless communications and protocol conversion to collect data from an array of disparate equipment and PLCs. When used as a host device to drive plant floor marquees, a data management device can be a very effective and versatile solution for delivering real-time OEE output to a desired visual interface.

In addition to data management solutions, a number of human-machine interface (HMI) panels also facilitate communication of data for OEE while providing a control interface for operators to monitor and control processes. Pairing protocol conversion with data collection and math capabilities, as well as providing a direct path from the HMI or operator interface (OI) directly to the plant floor display, ensures operators can monitor OEE values in real time.

Because they are integrated into the process, advanced data management and HMI devices bypass the need for a PC, long wire runs or offline processing. They can also provide advantages including the integrated math function capability required to pre-analyze hard point data, as well as the capabilities to manage multi-vendor equipment (including PLCs, drives, PCs and PID controllers) and perform data logging. Some solutions offer the ability to network- and Web-enable plant floor machinery, including legacy serial devices. These capabilities vastly simplify the acquisition and movement of data to facilitate scalable OEE.

<sup>1</sup> 1999 Society of Maintenance Reliability Professionals conference presentation, Rohm and Haas Corporation.