Overall Equipment Effectiveness (OEE) for Achieving Consumer Packaging Excellence

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Introduction

A large, well-known, over-the-counter pharmaceutical manufacturer uses a handwritten logging system of faults on its 32 automated packaging lines. It operates three shifts 24 x 7, so it is important to minimize downtime. The packaging machines that it has in place are not designed to provide a sufficient variety of error code data to give the detailed information required. Inevitably, it is very difficult to try to obtain any true analysis of downtime…

A global consumer products manufacturer responding to increased demand is looking for ways to optimize its 13 automated packaging lines and to plan for future expansion. It is crucial for plant management to understand where bottlenecks exist in its production as well as the cause of stoppages and the operational time spent during every production shift…

One of the largest pharmaceutical companies in the world is faced with global pressures from beyond its own walls, and even greater pressures from within. Global plant consolidation is forcing sites to compete with each other to remain open. Costs are expected to be reduced by a minimum of 40% and manufacturing cycle time reduced by 75%. Its paper-based downtime tracking system is not doing the trick, and it needs an easy-to-deploy data collection solution that can be installed across 12 packaging lines.

The challenges facing these industries are well known. These highlighted situations represent some of the issues that consumer products packaging companies face, including patent expiration, generic competition, counterfeiting, and supply chain challenges. All of these trends drive the need for companies to aggressively improve their operations by reducing changeover time, improving quality and throughput, driving supply chain predictability and reducing costs. As a result, many have turned to measuring Overall Equipment Efficiency (OEE).

OEE in the consumer packaged goods industry is frequently estimated to be in the 40-50% range, while world-class batch operations can be in the high 80% range, and continuous operations can be close to 95% efficiency. This leaves a great deal of room for improvement and provides a significant opportunity for companies to produce more with their existing equipment.

Manufacturers that have the ability to efficiently analyze their data across their plant and to accurately associate events with a specific cause in real time will gain key insight into their operations to achieve packaging excellence and ultimately, a sustainable advantage for success.

What Is OEE?

OEE is calculated by first measuring three factors: Availability, Performance, and Quality. OEE, expressed as a percentage, is then calculated by multiplying those three factors together to come up with a number. This number provides the foundation for improvement by allowing the efficiency to be measured against other plant metrics as well as against other industries for benchmarking. OEE done correctly allows managers to make effective, accurate and objective decisions in real time.

Availability is a manufacturer's actual production time as a percentage of its scheduled production time. Scheduled downtime, for instance, is not included in the scheduled production time, so availability describes only how much of a manufacturer's scheduled production time is being used. Factors causing availability to be less than 100% are usually equipment setup and breakdowns.

Performance is a measure of how much product (boxes or bottles) was produced during the actual production time. Performance is the amount produced as a percentage of the amount expected to be produced when measured against the ideal rate of productivity. Performance is usually affected by reductions in speed of the equipment as well as stoppages.

Quality is the number of good boxes produced as a percentage of the total number of boxes produced. Quality can be compromised by two kinds of yield: setup yield and production yield. Setup yield describes errors that are present from the beginning of the packaging run, like loading the wrong boxes into a cartoner, and production yield refers to errors that occur during production, like damaged boxes resulting from a jam.

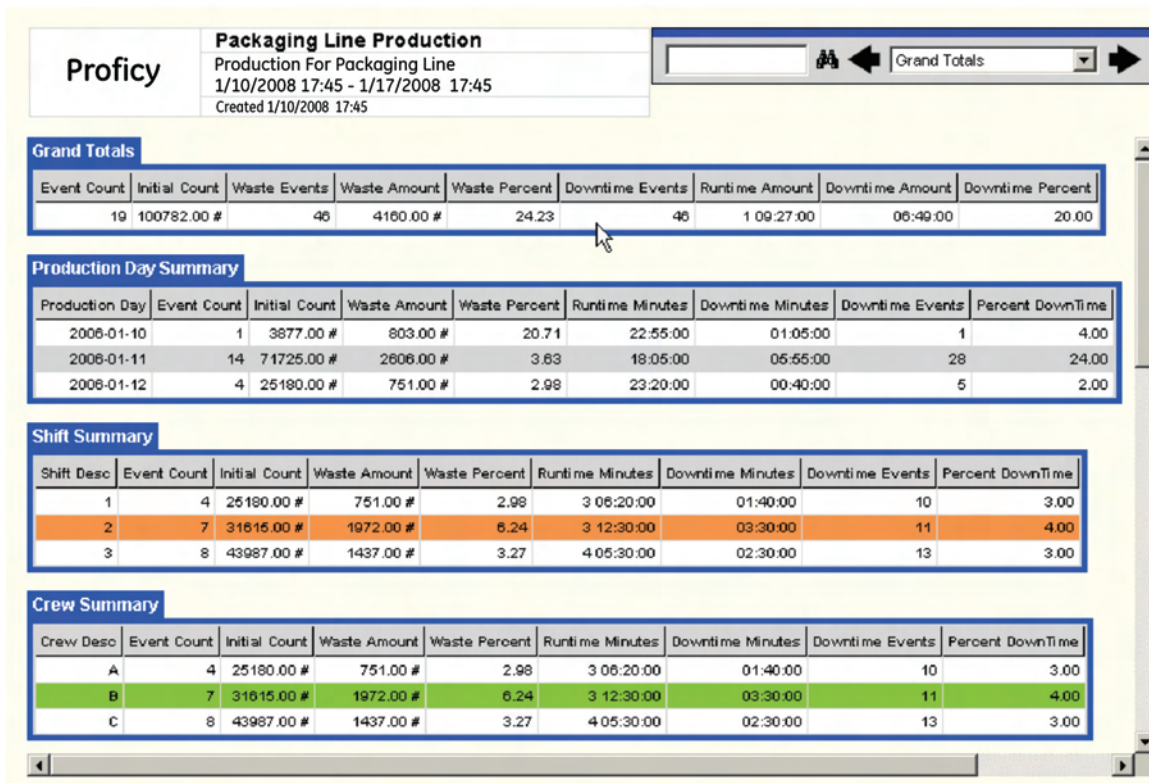## Effective data collection for accurate OEE

There are a variety of ways to calculate OEE but the most efficient and reliable way is to base calculations on automatically collected data as opposed to manually entered information, which is more prone to operator error. To make effective use of the data that exists in packaging, a few recommendations should be followed.

- Data should be collected electronically and automatically when possible. Manual, paper-based data collection is an inefficient means of collecting data such as downtime and reason codes. In addition, if the data is stored electronically, it is available for further analysis.

- Data collection should be fast. Ideally, the system will reflect efficiency and quality data in real time, so a rapid means of collecting the data is necessary for the information to have the greatest impact.

- Data must be accurate. This can sometimes be difficult to accomplish, so an effective process should be applied to the practice of collecting data.

- Data collection should be flexible to allow for different types of analysis as priorities change, and also extensible so the system can grow.

- Data collection should be consistent and aligned with the goals of the business. Different departments may measure things like OEE differently, so it's imperative to have a consistent measurement across the business.
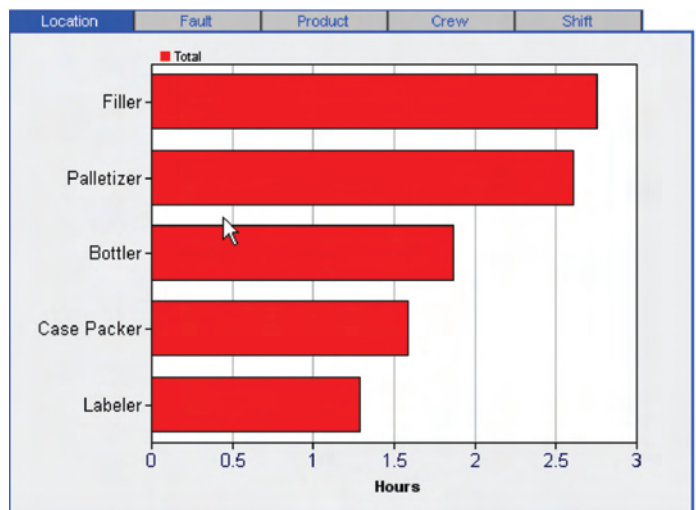
Packaging Equipment Downtime Distribution

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Proficy

Packaging Line Production
Production For Packaging Line
1/10/2008 17:45 - 1/17/2008 17:45
Created 1/10/2008 17:45

Grand Totals

Grand Totals

Event Count	Initial Count	Waste Events	Waste Amount	Waste Percent	Downtime Events	Runtime Amount	Downtime Amount	Downtime Percent
19	100782.00 #	46	4160.00 #	24.23	46	1 09:27:00	06:49:00	20.00

Production Day Summary

Production Day	Event Count	Initial Count	Waste Amount	Waste Percent	Runtime Minutes	Downtime Minutes	Downtime Events	Percent DownTime
2006-01-10	1	3877.00 #	803.00 #	20.71	22:55:00	01:05:00	1	4.00
2006-01-11	14	71725.00 #	2606.00 #	3.63	18:05:00	05:55:00	28	24.00
2006-01-12	4	25180.00 #	751.00 #	2.98	23:20:00	00:40:00	5	2.00

Shift Summary

Shift Desc	Event Count	Initial Count	Waste Amount	Waste Percent	Runtime Minutes	Downtime Minutes	Downtime Events	Percent DownTime
1	4	25180.00 #	751.00 #	2.98	3 06:20:00	01:40:00	10	3.00
2	7	31615.00 #	1972.00 #	6.24	3 12:30:00	03:30:00	11	4.00
3	8	43987.00 #	1437.00 #	3.27	4 05:30:00	02:30:00	13	3.00

Crew Summary

Crew Desc	Event Count	Initial Count	Waste Amount	Waste Percent	Runtime Minutes	Downtime Minutes	Downtime Events	Percent DownTime
A	4	25180.00 #	751.00 #	2.98	3 06:20:00	01:40:00	10	3.00
B	7	31615.00 #	1972.00 #	6.24	3 12:30:00	03:30:00	11	4.00
C	8	43987.00 #	1437.00 #	3.27	4 05:30:00	02:30:00	13	3.00

Packaging Line Production Count

How an OEE solution can impact your operations

An effectively deployed OEE tracking and reporting solution allows a business to track and monitor production and business-driven key performance indicators (KPIs). Utilizing automatically collected data, managers can track downtime, waste, production counts, and user-defined events, and automatically or manually associate events with a specific cause on a real-time basis.

By utilizing an integrated, S95 data reference model, organizations can analyze equipment effectiveness based on reasons and details to identify root causes and summarize and analyze data in the context of production events such as by equipment, by product, or by personnel (hour, shift and day) for improvement. Events and reasons can be correlated to actual production operations, and based on this data, reports and dashboards can be developed for real-time decision-making.

OEE in Practice: Critical features and capabilities

Correlates disparate types of data

Production managers need the ability to make dramatic and rapid improvements in their packaging operations' profitability and efficiency. This requires an advanced solution such as GE Intelligent Platforms' Proficy Plant Applications Efficiency, which can correlate disparate types of data and use out-of-the-box solutions to display and report on that data in real time—providing relevant manufacturing information—and not just "downtime" information like many efficiency solutions on the market today.

Offers flexibility with an open and modular architecture

Proficy Efficiency allows customers to protect and build upon their existing investments in manufacturing and automation systems by enabling connectivity to many different kinds of applications for maximum flexibility. Additionally, the capabilities are modular, allowing users to add only the modules they need to support their operations.

Provides a comprehensive view of OEE

The Proficy Efficiency module allows manufacturers to better utilize packaging assets by providing a comprehensive view of OEE rather than just downtime information. With drill-down capabilities to identify and monitor areas for improvement, Proficy Efficiency is the ideal solution for managers trying to increase packaging throughput in their operations without adding equipment, people and material costs.

Delivers analyses to minimize downtime

Proficy Efficiency can help minimize scheduled and unscheduled downtime events, reduce waste and rework, and perform root cause analyses to make data-driven decisions on capital expenditures and process improvement investments. It also provides insight into production operations by shift, equipment and product, and helps manage production operations in real time through comprehensive reporting, in addition to tracking uptime, downtime and overall plant and machine efficiencies through KPIs.
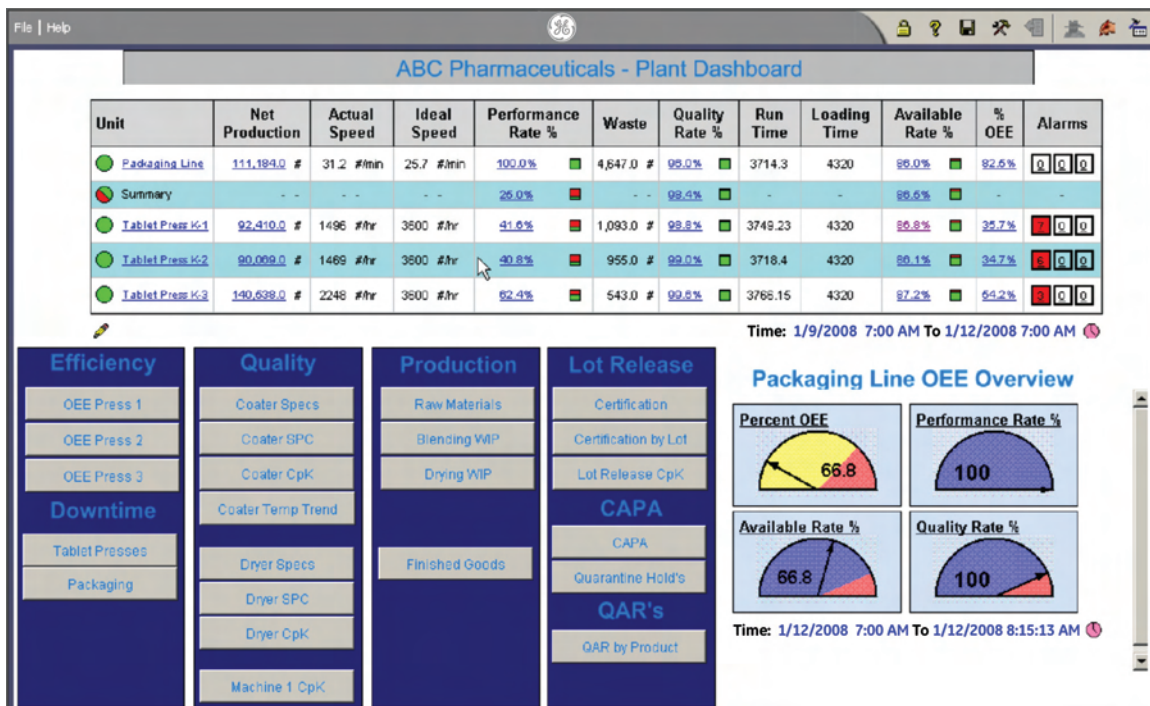
Plant Key Performance Indicator Dashboard

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OEE Results

Let's revisit the well-known, over-the-counter pharmaceutical manufacturer that was using a handwritten logging system for faults on its 32 automated packaging lines. Manual tracking of efficiency data was yielding a calculated measurement of 30% OEE, and likely not accounting for intermittent downtime incidents too brief for manual collection.

After deploying GE's Proficy Efficiency data collection and tracking solution, the company quickly discovered that downtime on two packaging lines was the primary contributor to overall production losses. Having resolved the root causes for downtime on these lines, it was soon operating its equipment in excess of 50% OEE on a consistent basis, which translated to increased production throughput of 40%. The Proficy Efficiency solution quickly became this company's global standard for OEE. Today, they are developing plans and practices to rapidly deploy it across all sites.

As companies in the current competitive environment face rising costs for raw materials, energy and transportation, they are increasingly turning to GE's Proficy Efficiency software to help them achieve more productivity from their existing equipment investment. Proficy Efficiency provides the information needed to take action on equipment bottlenecks, unscheduled downtime and lost production due to material or resource shortages. Manufacturers that take action on this information can increase equipment utilization rates and drive costs out of manufacturing, providing a sustainable advantage.

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