

Improving Overall Equipment Effectiveness in Batch Operations

Featuring Stuart Forrest, Principal Business Consultant, Aspen Technology, Inc.





Stuart Forrest joined AspenTech in 2013 as a business consultant specializing in manufacturing execution system (MES) solutions. He previously worked in the process industries for 20 years, mostly in specialty

chemicals and pharmaceuticals. Over the course of his career, his roles have covered process automation, manufacturing intelligence and MES solutions as a project team leader, solutions architect, consultant engineer and project manager.

Overall equipment effectiveness (OEE) has proved to be helpful for continuous processes, but can the same principles be applied to improve equipment effectiveness in batch operations? The short answer is, yes. With some refocused metrics, manufacturers that run batch processes can shorten cycle times and address their own high-value problems by correlating performance, downtime and quality to products and equipment.

We spoke with Stuart to get the inside scoop on batch OEE and find out what kind of results manufacturers can expect by tracking it through an advanced MES.

What are the differences between batch OEE and OEE for continuous processes?

The main difference is the metrics measured for batch OEE are different than those tracked in a continuous process; cycle time and transitions are of more interest than production rate. Cycle times should be measured against target and transition times to determine how to reduce overall cycle times.

If you take that into account, OEE can add a lot of value to a batch process. In general, organizations with valuable assets need to make sure they are selecting the ideal KPIs to get the best results for their production process.

Why is it important to track batch OEE? And what am I measuring?

OEE in general gives you the ability to identify the causes of unplanned downtime and under-performance. Batch OEE provides the ability to measure the time that the batches take to transition from one operation to another and measure the time when the unit is offline. This information can identify inefficiencies in the schedule — if the process is creating long transitions or if the cycle is not completing in the time planned, it will impact schedules.

In addition, you can make OEE comparisons for a particular product or a campaign of different batches to determine the difference between products and the availability of the unit. You can see if that product relationship impacts the ability to achieve the cycle time against the target, and it gives a different context for the last day, week or month — possibly providing wider implications than OEE for continuous processes.



What is considered a good OEE target?

In general, an OEE of 85 percent is considered world-class. Most companies today are running around 60 percent. Our solution helps customers achieve closer to 85 percent performance. Ideal OEE targets depend on the sequencing of the process. It could be a single unit that you are measuring OEE for, or it could be a process operation over several process units. It's important to have a target that makes sense for your operation.

What type of visibility and tracking would I receive with a batch OEE solution?

Beginning with the standard representation of OEE, there's a waterfall chart that shows the OEE metrics: availability, performance and quality. When drilling down, you are able to see factors such as timing, transition and targets, planned downtime and performance against projections. This delivers real-time visibility into actual equipment performance for batches.

How can an OEE solution assist operations management with improving performance in real time (on the production floor)?

Once the performance level is identified, OEE will allow operational management to drill down and review the root causes for non-productive periods and micro-stops. Once the root cause is identified, action can be taken to change the process operation or to repair the equipment, thereby increasing OEE.

The result of monitoring batch OEE is the ability to identify the transition time and the amount of time a batch takes against target cycle time. This information can be fed back into the schedule, allowing changes in the schedule to improve utilization.

Are there any prerequisites required to execute a successful batch OEE solution?

For successful batch OEE, there should be triggers created when the batch process starts, in transition periods, during micro-stops and when the batch ends. When equipment is running, there should be a cycle time target that is directly related to the product recipe.

To calculate batch OEE, several data points are required. Ideally, the source of the data points would be housed in a record management system. A key component of the batch OEE solution is the ability to improve batch performance and process order tracking in real time with historical contexts, efficient data aggregation, online analytics and sophisticated visualization. All of this makes it easier to optimize production quality and profitability.

What type of results can I expect from a batch OEE solution?

In general, OEE is driven by something. Whether it is yield, production, energy or waste, an improvement of 10 percent can be gained from a number of KPIs — and is achievable in a relatively short time.

Using our solutions, dairy product manufacturer Glanbia **improved OEE by 10 percent in just six weeks**. The company was able to increase product yields between 0.4 and 1.4 percent, and they also reduced energy consumption by 8 percent.

Another customer was able to improve OEE by reducing time spent on capturing data and ensuring data integrity. By capturing batch OEE events in an automated system and putting a process in place, all events were allocated to a root cause before the end of the shift, with a real-time view. This new process allowed for big gains in the time spent capturing the data, as well as more accurate data in general. Before implementing our solution, the organization used a spreadsheet with a calculation for OEE.



How quickly can I expect to see results after implementing an OEE solution?

With a typical batch process, it can range from days to weeks, as several batches are required to go through the system. How quickly you can do that depends on the batch cycle time. Also, it's not a closed-loop system — once the system reports a problem, it is then a matter of how long management takes to address the problem.

OEE provides information that supports decisions. The total time depends on what decisions can be made and when action is taken. Useful output generally takes two or three months to feed into the process. You can expect one to two months will be required to gather the necessary information to make decisions.

How does AspenTech's batch OEE differ from other solutions in the market? What makes it unique?

In terms of functionality, there is a major difference. AspenTech's batch OEE solution is part of our MES platform, not a stand-alone product. It can be fully integrated into historians (Aspen InfoPlus.21® is recommended) as well as batch production solutions, and it does not require any complex integration to function.

With our batch OEE solution, you gain key insights and can drive performance improvements with the ability to visualize, analyze, monitor and access plant operations data in real time. You utilize a single environment with visualization and multiple analysis tools (batch analytics, KPI management, OEE, alerts and notifications, SPC and pattern search) in a web-based environment.

No other MES solution offers a foundation to build upon. By leveraging advanced analytics to run your assets to the limits of performance, you extend optimization to your maintenance and supply chain functions.



AspenTech is a leading software supplier for optimizing asset performance. Our products thrive in complex, industrial environments where it is critical to optimize the asset design, operation and maintenance lifecycle. AspenTech uniquely combines decades of process modeling expertise with big data machine learning. Our purpose-built software platform automates knowledge work and builds sustainable competitive advantage by delivering high returns over the entire asset lifecycle. As a result, companies in capital-intensive industries can maximize uptime and push the limits of performance, running their assets faster, safer, longer and greener.

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