



OEE and Spyglass

A Primer for Manufacturing CFOs



Executive Summary

“I know you believe this can really help my company, but why exactly?”

Last Thanksgiving, our National Sales Manager at Spyglass, Mark Adelhelm, was having a conversation over the holiday dinner table with his brother-in-law. Inevitably, their conversation turned to business. Mark’s brother-in-law is a CFO at a midsized manufacturer, and he was intrigued by Spyglass and how IoT and OEE analytics could improve financial performance. The conversation led to an extended email exchange and, eventually, this article which we are pleased to share with you: “OEE and Spyglass - A Primer for Manufacturing CFOs”.

What is OEE?

OEE stands for “Overall Equipment Effectiveness.” This is pretty much to manufacturing executives what EBITDA is to CFOs and investors. See how I did that nice finance tie-in?

Essentially, it is a composite measure of productivity. It is calculated based on three factors:



Availability: what % of the planned running time was a production line or process actually running,



Performance: The % of output against theoretical “full speed” or similar throughput rate achieved,



Quality: The % of production that met minimum quality specifications.

Here is a good website for more explanation of OEE and how to calculate it: <https://www.oee.com/>.

Many of our customers use our solution, Spyglass Connected Factory, to both measure OEE and use it to perform root cause analysis (RCA). RCA identifies what is driving downtime, production slowdowns/ stoppages, quality issues, etc. That is sort of “Stage 1” in the value realization/usage story for our solution.

About the Author

[Mark Adelhelm](#) has spent his 25+ year career with leading global manufacturers driving innovation and operational excellence throughout their entire supply chain. He is responsible for building healthy, sustainable relationships with Spyglass customers and helping them implement successful IoT solutions to achieve their priorities and business results. In his words, “Leading lasting, meaningful change takes vision, passion, and attention to detail. I get that. I love what I do, helping great leaders take their teams to levels of performance and results they didn’t think possible. If you want to harness the power of Industry 4.0 for your enterprise, let’s connect.”

How does Spyglass help me improve OEE?

Spyglass incorporates a condition-based rules engine to detect “events” and trigger responses from those events. This capability is where Spyglass becomes much more than a data collection and OEE reporting tool. I need to clarify “conditions”, “rules”, “events”, and “responses” to make this more understandable.

Condition: A condition would be a signal, change of state, or parameter value from a sensor or other data source. For example, say you had a sensor on a production line that reported the speed of that line, and then reported that value every 1/10 of a second. Each of those messages or speed reports would be a condition. Another “condition” might be a count of items coming off the line, weight of product across a scale, temperature on a bearing, etc.

Rules: A rule is an expression of what set of conditions constitute an “event”. The rule could be as simple as “when speed value from sensor 1234 was >0 and has now been 0 for 10x in a row (1 sec) - event “line stopped” has occurred. Rules can be based on a single condition or combinations of conditions. For example, “if line speed is >0 (the line is running) and the bearing temperature is >120F (overheating) – event ‘bearing excessive friction’ is occurring”.

These are very simple examples, so simple that if you were trying to detect these alone, there might not be a need to monitor and generate an alert away from the machine for this single situation. But imagine a typical production operation with potentially thousands of sensors generating data on one or more variables continuously. Add to this that data from sources external to the production line might also be important. These could be things like weather conditions, order characteristics, materials specifications, etc. This is when the power of Spyglass really stands out. Spyglass can “make sense” out of literally billions of discrete data elements (those “conditions” just described). It can scale infinitely to take all of that input, make connections between them, and identify significant “events” from background “noise”.

Rules can get very granular and dependent on each other in a production process. Let’s say you monitor line speed at multiple points along a production line. Perhaps it is both conveyors in to and out of a forming machine. You wouldn’t want to record multiple “line down” events for a single stoppage (or you might). Instead, you would want to identify where the line FIRST stopped and then filter out the other redundant stoppage events. Spyglass properly configured can identify true “signals” and avoid excess chatter or “noise” that would come from just looking at raw sensor data feeds.

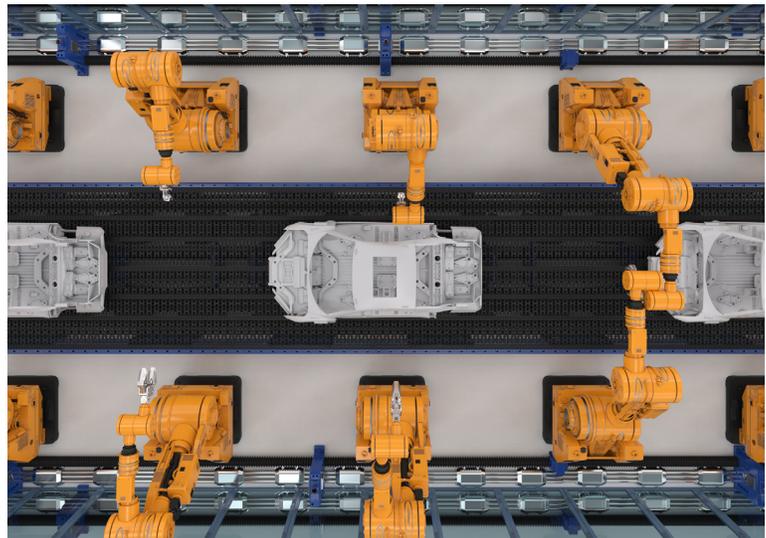
Events: As described in the rules definition above, events are meaningful situations that you want to detect and then trigger a response. Events could be line outages, slowdowns, equipment issues, or an early indication of a potential failure or maintenance need. An event could also be a process control issue. A production variable is outside of desired min/max range, for example. It could even be a quality problem -- a defect detected, excessive scrap rate, etc.

Responses: A response is what you want to do when an event occurs. The mildest response can be to note it and save it to a data repository for future analysis or reporting. Or, it could take the form of an alert - notify someone or something that the event has occurred. Responses can even take the form of actions, like, create a maintenance work order and submit it to the appropriate scheduling queue to dispatch a maintenance engineer. Or, place an order for a replacement bearing in the spare parts order system. Responses can be one-time things, like “tell everyone on distribution list XYZ that Event 1234 just occurred.” Or a series of things, “tell supervisor on duty that Event 1234 just occurred. If Event 1234 is unresolved in 10 minutes, notified plant superintendent XXXX that Event 1234 is unresolved since 00:00”, and so on.

For most manufacturers, they cannot enable this type of “sense and respond” granularly on a broad scale basis. Often their rules engine capabilities are too limited, or chatty, to identify the right events properly and trigger the right specific response automatically. These capabilities are at the heart of Spyglass and competitive differentiators. Conditioned-based alerting and response is “Stage 2” of how Spyglass is used and delivers value.

What about IoT, AI, and Machine Learning? These technologies are all over the news. How do they come in to play?

Spyglass is built on the Microsoft Azure IoT platform – a comprehensive data analytics cloud platform for IoT (Internet of Things). The incorporation of artificial intelligence (AI) and machine learning (ML) into the process automation capabilities of your manufacturing is the Stage 3 usage of Spyglass. At this stage, Spyglass uses the AI and ML capabilities of the Azure platform to autonomously identify events and situations (perhaps even ones that the humans running the process have yet to identify) and recommend or act accordingly (queue the ominous sci-fi soundtrack).



I won't even try to get into all the new possibilities this potentially provides in this note. Suffice it to say that this Stage is when things like "Predictive" Maintenance (anticipating that something is about to fail) or similar forward-looking anticipatory capabilities are truly enabled. There are real-world examples of where this is in place. Watch some of the Microsoft AI, IBM Watson, or other "smart" commercials. Real adoption of this is still in its infancy. The good news is that when a Spyglass user is ready to jump into that end of the pool, the data and all the necessary analytical tools needed to enable it are already in place.

I'm worried that my internal I.T. team may not have the expertise yet to manage an application like Spyglass. What needs to be in place "expert-wise" in order to get this going?

This is a very valid concern. We've all had past experiences where the promise of a new technology was overshadowed by its complexity to implement or the lack of available experts to maintain the deployment once it is rolled out.

Frankly, this concern is part of the core value proposition of Spyglass. If you have members on your team that are proficient at building and maintaining a spreadsheet, you probably have all the technical expertise you need. Spyglass does not require extensive training on a proprietary system or any of the I.T. skills that make daily headlines about being in short supply and high demand. In addition, our delivery team is with you every step of the way – training your team to be self-sufficient but available when needed to troubleshoot or work through obstacles you encounter.

Some of the headlines you read might lead you to believe that IoT solutions are highly complex, require lots of experts you don't have, or infrastructure spending your company cannot justify. Those are yesterday's "myths" of Industrial IoT. Spyglass overcomes these obstacles and more. Talk to your I.T. leadership and listen carefully to their concerns. Then, we can help you address those concerns. Spyglass is a flexible application that can be deployed in a manner that supports the I.T. strategy at your company – not competes with it.

Is there more I should know?

Spyglass also includes a bunch of “techie” components that enable all of these Stage 1, 2 and 3 capabilities:

- 1 Ready-built connectors to gather data from manufacturing sources – sensors, machines, or production systems already deployed in an operation.
- 2 Data storage (in the cloud!) that is elastic, meaning it grows as necessary, infinitely. And data management services to keep it all accessible, organized, backed up, etc.
- 3 Security to make sure that your data and your other proprietary “stuff” (like the rules set you build) are safe. Also, that this data is only accessed or manipulated by authorized people or systems.
- 4 And lastly “outbound” capabilities like PowerBI, Office, Messaging, etc. You can use data visualization and analysis tools like PowerBI to easily build rich, interactive, and intuitive charts, graphs, and dashboards to “see” what’s going on. These capabilities enable reporting, alerting, and even “back-end” integration to other business systems and applications. Do you want your alert to go into the daily briefing report, an iPhone or Android text message, a dashboard view on your iPad or desktop, or a system like your maintenance planning or inventory control application? Spyglass configuration enables all of these integrations.

I know this was A LOT to digest, but I hope it helps. The simple takeaway –

Spyglass helps manufacturing executives and their teams harness the data their operations already produce and applies the advanced analytics necessary to derive insights and timely alerts to address the business priorities they are focused on – whether that’s capacity expansion, quality improvement, cost reduction, or better performance reliability.

It can be a complicated sell at times. It starts with understanding what problem, opportunity, or priority the business wants to tackle. “Operations excellence” or “OEE improvement” are good starting points for addressing multiple manufacturing concerns. But ultimately, you ideally need to start with a single well-defined objective. Then begin understanding the manufacturing process itself and the data that is (or could be) collected from it.

Not to get too “salesy” on you, but we really do see customers who save millions of dollars with even a limited application of Spyglass in their operations, for only tens of thousands of dollars of investment. And while this might seem pretty techie, the use of the Spyglass application does not demand much in the way of I.T. resources from your company to set up and maintain it. A manufacturing team can easily master Spyglass. They can create rules, setup alerts and build interactive dashboards and reporting. You don’t need to be a software developer to use Spyglass.

I hope this helps and welcome your questions.

Thanks, Mark