

## Automating Workflows to Optimize Factory Performance

Until about a year and a half ago, one of the world's leading electronics manufacturers had an equipment qualification process that was largely controlled by paper procedures and coordinated by word of mouth. "The problem with this process is that it is open to interpretation," says a senior process engineer at one of the company's European facilities. "There are much better ways of controlling the process by automating workflows and ensuring that procedures are followed with exactitude."

According to the engineer, shortly before the qualification process was changed to minimize the likelihood of human error, a factory technician (who thought he was applying the process correctly) invented a number that didn't exist. This led to a nonconforming product; production was affected to the point that upper management gave the engineer a new task: Do what needs to be done to make sure this never happens again.

"We worked closely with Savigent, who was already working with our company on an overarching workflow and communications system that used their Savigent workflow automation software as a key component," he says.

One specific workflow allowed the manufacturer to access databases, the numbers within which were used as a basis for decision making and input validation. All the factory's chemical analysis data resides in these databases. The workflow also enables the company to create jobs in its equipment control software. This pulls tools up and down from production, and allows the creation of maintenance jobs as well.

"What the system provides—and what Savigent Workflow™ helps us realize—is the ability to make sure that the qualification process is followed as written, from beginning to end," he says.

Consider, for example, the chemical electroplating bath. Once the technician has completed the daily chemical analysis in the equipment control software, the overarching workflow continuously "listens" for evidence that this job is completed. It then

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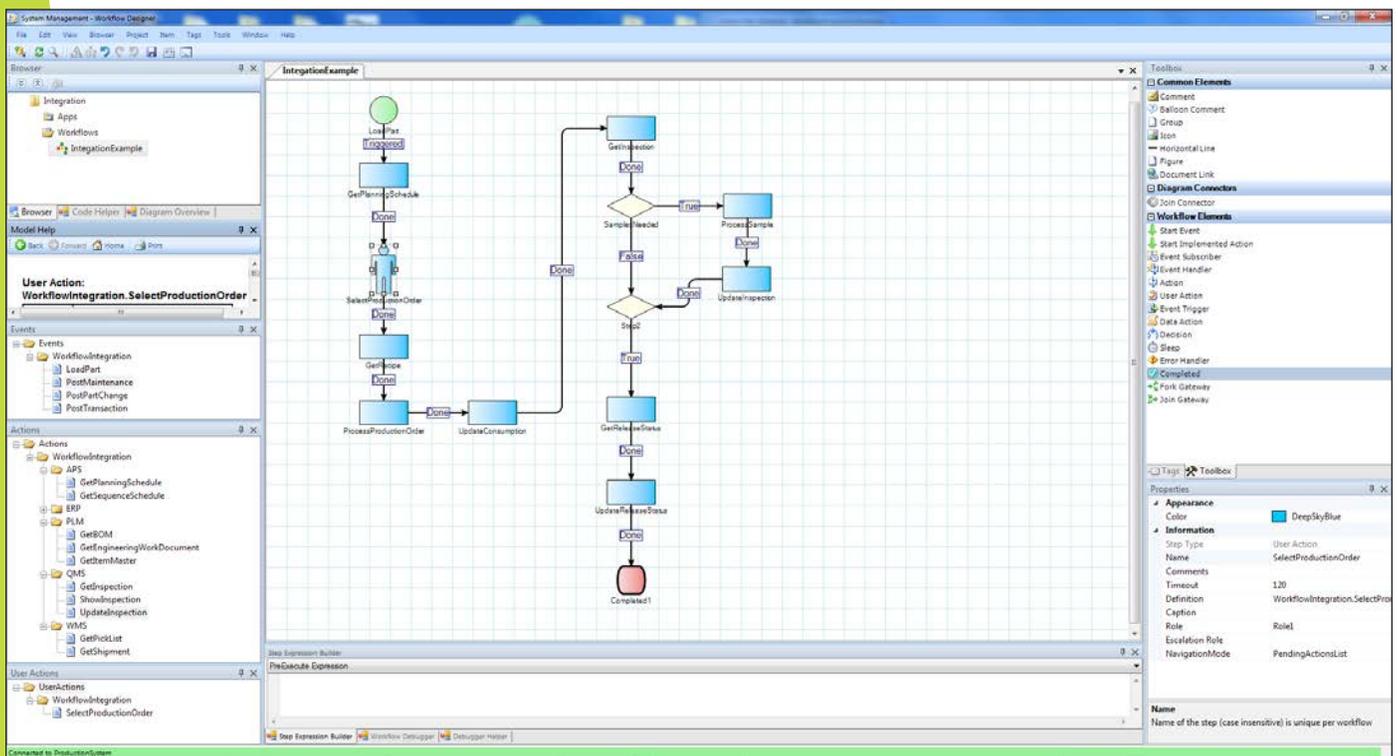
"I explained exactly what I wanted; they created exactly what I envisioned. It's very rare that you sit down with a software guy and tell him what you want and get exactly that. I'm over the moon—and that's a metric!"

consults with the database application and decides whether chemicals are to be removed (called a “bail”), added, or that the bath chemistry is perfect as it stands. From there, a course of action is decided upon.

One action is the “add/bail” job, which means that the tool will be locked for 30 minutes. In this time, the technician may add chemicals, remove a certain level of the bath—basically take the appropriate course of action based on the data.

Another action is the daily “qual wafer job.” Every 24 hours, the manufacturer runs one qual wafer job per tool to assure that the composition of the material being made is correct. Mixtures are made of component elements, and the desired ratio depends on the bath type. Also checked is the thickness of the material being deposited to make sure that plating is done correctly for each layer of the final product.

One application—a plate calculator—was developed internally with the purpose of making sure that the bath analysis is followed by the daily qual wafer job. The overarching workflow makes sure that the qual process is followed exactly. Since the implementation of the workflow automation system, conformance has risen from about 50 percent to nearly 100 percent. This in itself has led to a reduction in downtime for tools used in qualification, from about 14 percent to about 3 percent.



“Now there is only one way that qual wafers can be run,” says the engineer. “At first there was some resistance to change on the factory floor, but over the course of a month, everyone involved saw the benefit. Everyone is far happier. The number of 3 a.m. phone calls has gone down significantly. Before this the first thing I had to do each morning was to look at the qual wafers from the previous evening. Now I don’t have to do that. From an engineering standpoint, that’s a huge time savings for me, and a real benefit for the company in that its assets are better applied.”

To this day, the engineer is impressed with working with Savigent throughout the process. “I explained exactly what I wanted; they created exactly what I envisioned,” he says. “It’s very rare that you sit down with a software guy and tell him what you want and get exactly that. I’m over the moon—and that’s a metric!”

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## Making Communications Cohesive

The overarching workflow and communications system leveraged to automate the factory work process began as a systems integration project, and has had a positive impact on communications between people. “Over the past few years, we had been developing all kinds of stand-alone systems,” says a manufacturing staff engineer at the company. “This led to the development of the overarching workflow and communications system: we started talking about these different systems and how they needed to be integrated. We needed to have systems talking to systems, and to thread them all together.”

According to the engineer, achieving this integration has been a massive benefit that will grow over time. Systems that couldn’t be talked to or controlled—only manipulated manually—are now linked through the overarching workflow and communications system.

The company first applied this new software tool to check input tables in its database.

As noted above, these govern all tool and recipe parameters. Until the development of the integrated system, there was no method for checking or containing any problems that might occur with the tables. The workflow now monitors input tables every 15 minutes, looking for illegal entries.

“If we can see there has been an illegal or erroneous entry into the database tables, we can shut off the factory systems and pull tools out of production so that we don’t run any production lots and chance scrap or rework,” he says.

Since the system has been implemented, there have been five successful “saves,” identification and deflection of illegal table entries. To put that into perspective, the last time an illegal entry resulted in bad runs, the company had an inline scrap event. That is a costly event, so preventing five of those instances via the implementation of the automated system has saved the manufacturer an enormous sum.

## The Power of Savigent

Nothing empowers workflow automation and optimized factory performance as comprehensively as Savigent’s suite of products:

- **Savigent Workflow™** delivers a controlled system for workflow automation, providing guaranteed compliance, unparalleled traceability, and rich manufacturing intelligence.
- **Savigent Historian™** provides real-time, context-aware data collection, centralized storage, and comprehensive analysis, delivering the operational information manufacturers need.
- **Savigent Platform™** dramatically simplifies software development by providing a visually intuitive environment for the assembly of applications from prebuilt software components.

For the electronics manufacturer, Savigent has leveraged the model-based flexibility of Savigent Workflow to provide engineers a workflow development environment that they can use to easily build workflows on their own. “Key for us is that Savigent’s workflows are built out functional blocks: a block that talks to the SPC tool, a block that talks to the equipment control software, a block that handles the data querying, and so on,” says a process engineer.

The company can add functionality to the overarching system in small blocks so that those blocks can be reused from workflow to workflow with only small modifications. This, in turn, allows engineers to use a Visio-like workflow designer to assemble workflows from blocks of functionality.

“I am very particular about who I do business with,” concludes another process engineer. “If I ever go to a different company, Savigent would be one of the first companies that I would contact to work with on projects.”