Leveraging Workflow Automation in the Batch Environment

The HallStar Company knows about building out functionality. Based in downtown Chicago, with its principal manufacturing and technical center just west of the city's Midway International Airport, HallStar has been manufacturing specialty chemicals for over 50 years. Today, it is one of the world's experts in the development and formulation of esters for the polymer and personal care markets.


"We use esters as vehicles to craft functionality," says John J. Paro, chairman, president and CEO of HallStar. In doing so, the company is able to meet the unique needs of its customers and stay on the leading edge of ester chemistry.

Like many batch manufacturers, HallStar's manufacturing operations historically relied on paper-based processes that give way grudgingly to automated systems. As director of IT at HallStar, it has been an important part of Chuck Redpath's job to facilitate that transition.

"Even as the esters industry has evolved, we retained a lot of paper-based manual processes, such as manual entering of numbers and data, and stacks of paper ended up in filing cabinets that nobody could get their hands on easily," says Redpath. So as part of a lean manufacturing and continuous improvement initiative, he began to investigate software-based manufacturing execution systems.

"We really needed to get our hands on all the data points around our batch manufacturing processes," he says. "We don't have the internal IT resources, or the time, to develop our own execution system, so I began to invite providers to look at our situation and see how their solutions would work for us."

According to Redpath, most of the solutions weren't as flexible as HallStar needed, based on the processes and recipes it uses to make products. One solution, however, stood out because of its flexibility: Symphony IndustrialAI - Digital Manufacturing workflow application.
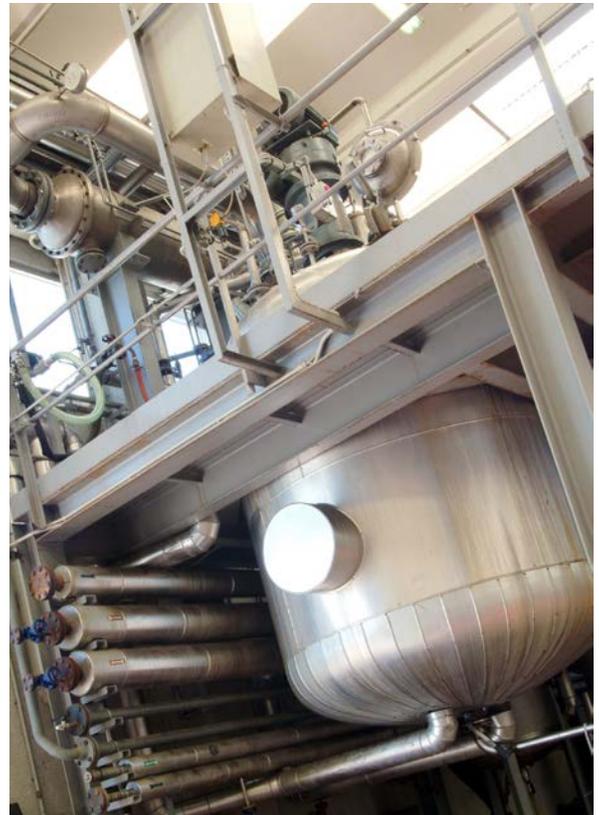
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"It was a really good fit because it allowed us to build out what we needed rather than try to adapt our needs to existing software," he says. That was key. "Our business is growing, and we need to squeeze every ounce of capability that we can out of this facility. We need to become as efficient as possible with the equipment we have."

Redpath adds that HallStar is expanding its equipment assets as well, but needs to be confident that those additions are the right ones. Symphony IndustrialAI will help provide the knowledge necessary to make informed decisions.

"The software is not only an MES system, but really more of a platform to develop on," says Redpath. "We've got our sights on a number of things in the future that we can use this system for as well, from real-time inventory management and enhanced batch scheduling to better materials management and other manufacturing-related processes. I recognized that this solution could be a strong platform to handle all these things, instead of having to reinvent the wheel every time we wanted to do something within the plant."
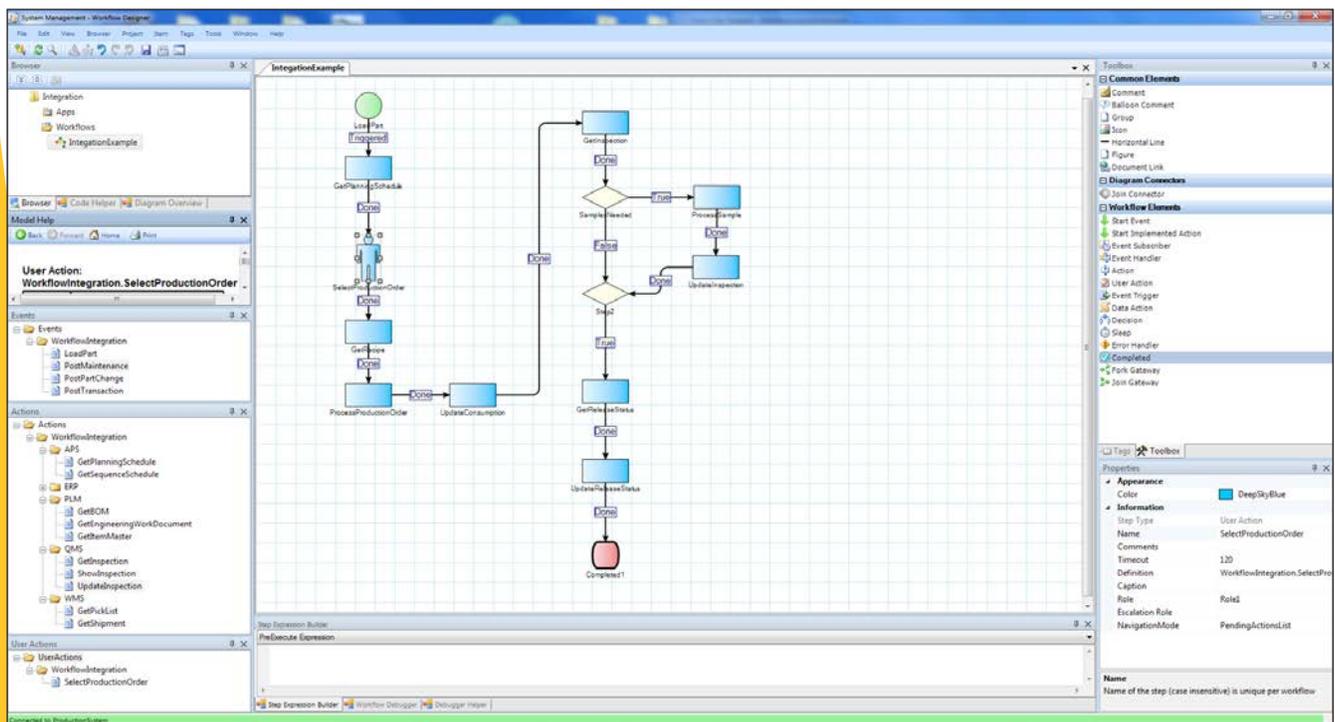
First News from the Front Lines

The system implementation project started in late August 2010 and began running live workflows on November 1, 2010. Redpath notes how operations have changed since the implementation: "For every single one of the batches that go through our plant now, we're capturing very high level pieces of information," he says.

HallStar has multiple major steps in its manufacturing process: a step where an operator prepares to load a batch into a pre mix tank, a step where ingredients that are going into the products are measured, and a transfer stage to the reactor. Once in the reactor, the actual chemical reaction is done: Two or more raw materials are mixed together and heated up, creating a chemical reaction that yields that product. Then there is a transfer from the reactor to a finishing tank where other finishing operations may be done. After that is a further transfer to inventory.

"On a very high level, for every single product that goes through our plant, we capture times, loadings, what's going into the pre mix, how much we're using, how long it takes to transfer, and so on," says Redpath. "Now that we've implemented the system, we're well into developing very specific steps within each one of the major parts of our operation."

Dan Fitzgerald, plant manager at HallStar, says that the workflow system will empower him to plan plant floor activities more effectively. "We'll be able to prioritize optimally," says Fitzgerald. "We have multiple batches reacting simultaneously, so if someone isn't prioritizing correctly, we may finish one batch faster than another, the other may suffer, and the net result is that overall throughput is decreased because we didn't prioritize correctly." The new system is expected to correct this issue and significantly improve throughput.

Fitzgerald anticipates a 10 to 15 percent increase in throughput due to better prioritization and reduced process variation, and Redpath says that using the lesser of those figures will still provide a three-year payback on the system investment.

"Over that three year period, I worked on an expectation of a 10 percent improvement in cycle times and throughput," he says. "I gradually phased in one third of the improvement per year. Even with that very conservative total and way to phase it in, we're still going to see a nice payback."

HallStar anticipates having HMI machine interfaces with operators on the shop floor, so that they're getting instructions directly from the workflow system. Displays will be directly in front of operators, and should support greater speed, greater accuracy, and less opportunity for errors.

"We will also have a computer interface with our QC lab," adds Fitzgerald. HallStar does a lot of in-process sampling, and today it is manual: the sample goes into the lab with a clipboard from the operator, the analysis is done and written, the clipboard is handed back, etc. Communication is time-consuming and inefficient. With the new system, the software will prompt an operator or supervisor to sample a vessel at a particular time, that sample will go into the lab, and the system will prompt the lab chemist to do the analysis and to run the specific tests needed. The results will be entered into the system and then go back into the recipe, and the recipe will determine the next course of action (i.e., give instructions to the supervisor or operator).

Fitzgerald says that after the system has been live for a year, they will have a better sense of what can be achieved; but, after the first few months of operation, his expectations remain high:

- More precise specifications for inbound materials

- Better direction of capital projects (i.e., equipment, heating, cooling, labor)

- Increased product yields

"Another benefit of better prioritization could be increased time for operators to attend to non-manufacturing activities such as safety training, regulatory requirements, and so on," says Fitzgerald. "So there's the possibility that the system won't just deliver operational benefits, but also provide a better working environment."

The Willingness to Work

Redpath says that the system has lived up to expectations at this early date, and that support for the project has exceeded expectations.

"I think the willingness to work with us and to get this system in and do what it takes is important, and Symphony IndustrialAI has done that," he says. "With service agreements there is always, 'here's what's written down and here's what's agreed to,' but they have not only hit those points but gone above and beyond. With this kind of project you are changing people's lives and the way they work. To have that happen and then to have strife between the vendor and the customer just adds to the volatility of the whole thing. We're not experiencing any of that, and for that I'm very grateful."