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How Advanced Model Predictive Control Adds Business Value

Model predictive control (MPC) uses mathematical models to predict future behavior of a system based on current and past data. While traditional control systems focus on the current state of a single variable, MPC looks at multiple variables simultaneously and makes real-time adjustments to optimize processes and increase efficiency.

The Journal's Executive Editor Theresa Houck talked with Robert Phillips, Automation Manager and Nick Malott, Analytics Architect at Interstates, Inc. (www.interstates.com), a Rockwell Automation Platinum System Integrator, to learn how MPC helps utilities, energy firms and manufacturers increase productivity and profitability.

Theresa: Why is Model Predictive Control important?

Robert: MPC is a significant advancement in industrial processes, using predictive models to improve efficiency, cut costs and enhance sustainability. It's an advanced control technique that uses a model to predict a process's future behavior, then optimize control actions to remove variability to achieve desired performance.

This was demonstrated in a soy capacity-increase project we recently completed, in which we used the Rockwell Automation FactoryTalk® Analytics™ Pavilion8® MPC software. We optimized the desolventization process and reduced process variability, leading to a 64% annual steam use cost savings. It also lowered the environmental impact by decreasing emissions.

Theresa: You just won the 2025 Rockwell Automation PartnerNetwork Partner of the Year Award, and that project for the agriculture company was a factor in earning that honor. Tell me more about the role MPC played in the project.

Robert: The ag company needed to reduce steam usage while enhancing temperature control for better product quality, so it required better control of its Disolventizer Toaster (DT). We helped them implement MPC to control variables including control valve and extractor speed, dome temperature, exhaust pressure and gearbox amperage.

By doing that, the company cut steam consumption by one pound per bushel, saving $162,000 annually in steam utilization, or about 63% of their costs. They also decreased DT high temperature set point by 6.8%. And they reached their return on investment in just 9 months instead of the 19 months originally projected.

Theresa: Let's talk specifics about MPC. How does it add value for manufacturers, utilities and energy firms?

Robert: The key is predictability. To maximize process efficiency, minimizing variability is crucial. Human operators can introduce inconsistencies, because their decisions may lack a clear rationale and repeatability. One worker might make the right decision, but you don't know why that decision was made or if the same decision will be made next time.

Nick: Efficiency is a key value of model predictive control. And you can get control of a single unit or on multiple units. Plus, you're optimizing for a specific objective. So, if your objective is to reduce steam usage, for example, then the MPC software will use the least amount of steam, but also within bounds of safety for the process.

Think of it like cruise control — a standard PID loop is like cruise control. The driver has a set point on the cruise control, and it's going to increase the throttle to get the car up to that set point. MPC is like *adaptive* cruise control, where it can also pay attention to hills or cars in front of the driver's vehicle, so it's got additional sensors. So, it's more efficient because it can predict if the driver needs to slow down or speed up because of variable conditions.

But it also reduces the amount of operator control that's needed. With regular cruise control, if a driver approaches a car faster than it's traveling, the driver must make a change, like tapping the brakes. That's operator intervention that reduces the system's efficiency. And it's the same in industrial settings.

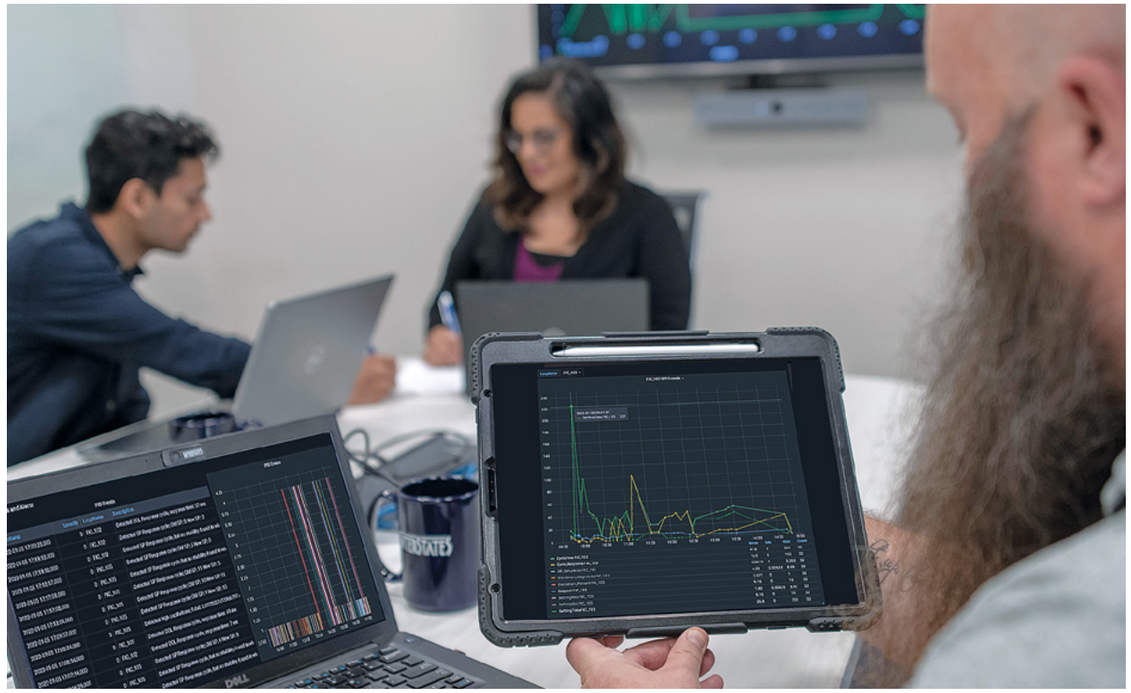
Theresa: So, it's most effective for processes that tend to have variable factors.

Nick: Exactly. The key is removing variability and creating predictability by eliminating manual intervention. The predictability is where you can know how the MPC software will perform — given these variables in your process, this action is going to be taken every single time, and then you can adjust that from there. For predictability, that's important.

For example, maybe an operator makes the right decision, but then the next worker on shift looks at the same situation and does something else, and it's a bad decision. There's just inefficiency and guesswork involved.

Robert: MPC is used heavily in utilities and other energy industries, but it increases efficiencies in any industry — food and beverage, chemical, oil and gas, pharmaceutical, automotive and more — wherever variability can affect a process and profitability. I think those that are using MPC really end up with a competitive advantage. ●

For more information about Interstates, Inc.'s system integrator services, visit www.interstates.com.



Model predictive control uses mathematical models to predict a process's future behavior, then optimize control actions to remove variability. This achieves the desired results while improving efficiency and enhancing sustainability.