Model Predictive Control

Rockwell Automation Model Predictive Control delivers results.

Greater Model Accuracy

Features

- Hybrid modeling based on empirical data, first principles equations, operator knowledge or any combination
- Soft Sensors® integrate with Model Predictive Control providing timely in-process measurements to increase accuracy of control actions
- Patented, Extrapolated Gain Constrained Neural Networks (EGCNN) to ensure model accuracy beyond the normal operating range

Benefits

- Expedites deployment by using all available information to create accurate models
- Minimizes need to adjust models as process range is extended
- •mproves product quality through faster response to target changes or large process disturbances

Tighter Control Over a Wider Operating Range

Features

- Incorporates changing process dynamics (dead-time, time constants and gains) over wide process operating ranges
- Parametric model representation provides compact, computationally efficient controller model without sacrificing accuracy

Benefits

- Improves product quality and flexibility for new grade and product development
- Increases transition efficiency with less off-spec product
- Tightens control over a wider operating range

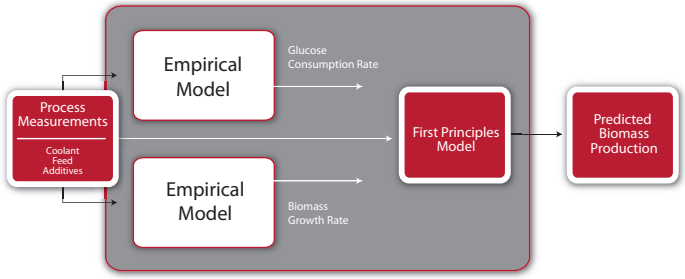
Maintain Controller Performance at Higher Levels

Features

- Controller replay capability maintains a contextual history of control actions and controller trajectories
- Embedded controller performance metrics measure utilization, time at constraints and error from targets

Benefits

- Allows quick identification and resolution of model mismatch or tuning parameter errors for improved controller performance
- Assesses historical controller performance
- Achieves predictable, sustainable performance through continuous controller monitoring



Hybrid Model Used in Fermentation Application

Rockwell Automation Model Predictive Control technology uses multivariable models and current plant measurements to determine future control actions that will result in operations that satisfy all independent and dependent variable constraints. These dynamic, predictive models differentiate MPC from other types of Advanced Process Control (APC) technologies.

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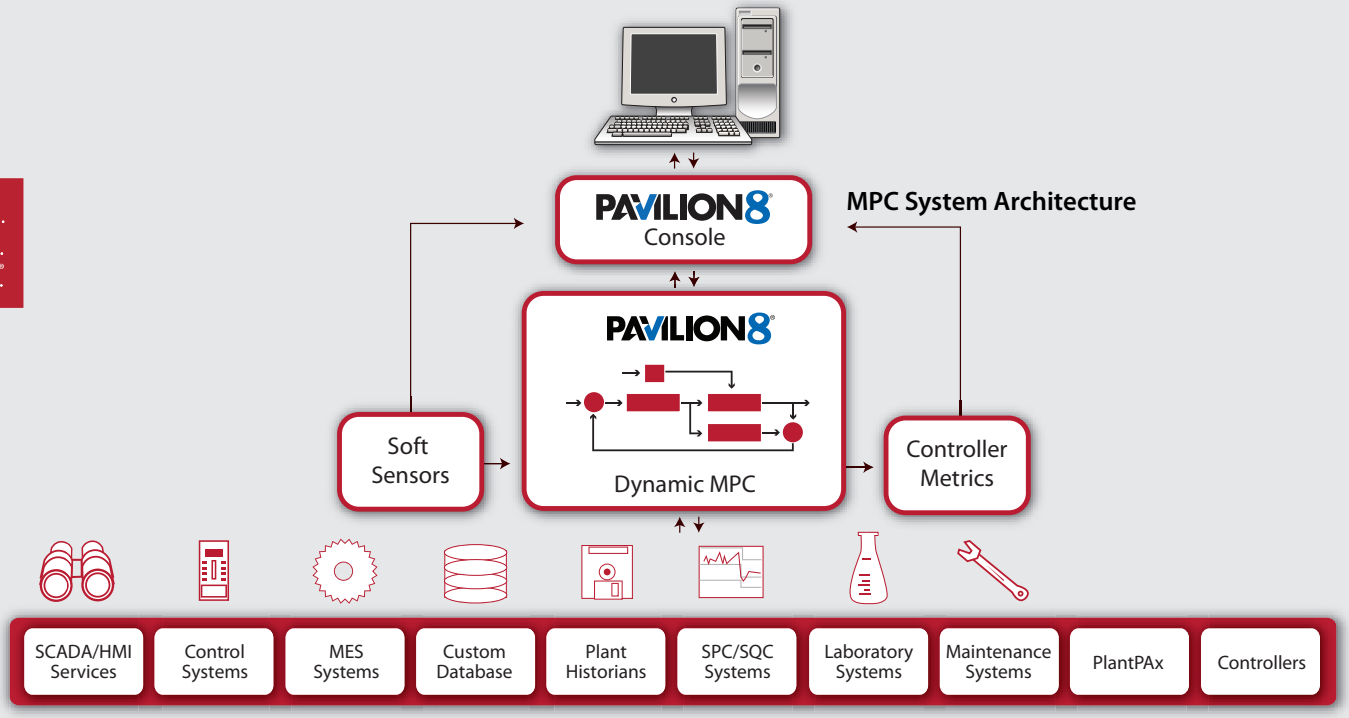
MPC System Architecture



Hybrid Modeling – Key to Robust Process Models

BRobust process models are critical to any MPC-based solution; they define how the control solution should respond to changing process targets and disturbances. Based on innovative hybrid modeling techniques, the Rockwell Automation MPC technology produces accurate, high-fidelity process models, offering an unparalleled ability to handle the full spectrum of simple to complex industrial processes.

MPC models may be fundamental, empirical or a combination of both. In practice, pure fundamental models require hundreds of equations to be solved in an iterative manner at each execution cycle. This requirement limits the control application's size and speed. When little or no first principles knowledge is available, empirical models can be derived using only historical process data. These models are extremely accurate over the operating range represented by the historical data, but they may not perform as well when extrapolated beyond this range.

A hybrid modeling approach combines the best of both techniques. With this type of model, MPC-based solutions use process knowledge in the form of a mathematical equation or known constraints in model development. Rockwell Automation MPC technology combines empirical modeling techniques (such as neural networks), process data and first-principles equations to give manufacturers more robust, accurate models across the entire range of operations. The Rockwell Automation hybrid modeling approach offers a parametric representation of a process that allows for fast control execution even in highly complex manufacturing environments, without sacrificing accuracy.

Dynamic MPC Drives Operational Excellence Across Full Product Portfolio

In today's customer-driven environment, manufacturers are increasing product portfolios and embracing mass customization. As a result, manufacturers are grappling with more product transitions and in-process variability. Unlike solutions that require different technology to solve different phases of production, the Rockwell Automation dynamic MPC technology can tackle the full product spectrum. Built on an integrated, comprehensive control architecture, Pavilion8 dynamic MPC uniquely provides a single, parametric controller architecture that can handle the full range of industrial processes – from simple to very complex (4 to 100+ variables), linear and nonlinear, as well as fixed or variable dynamics. The controller includes dynamic and steady state optimization to ensure any number of objectives and constraints are met at every execution, including hard limits, soft or 'fuzzy' constraints, desired value targets, maximization or minimization of selected variables and rate of change constraints. The MPC technology provides flexibility to adjust production schedules to meet new orders, regardless of what is currently being produced.

Pavilion8's browser –based user interface provides easy access to monitor all aspects of the MPC solution.

Built-in controller KPIs provide easy to understand views of control utilization, time at constraints, model error, and other key metrics to determine effectiveness of the control.

Additional metrics for production, quality, energy usage, and other factors can be easily configured to provide continuous measurements of the benefits derived from the application.

The most successful manufacturers respond quickly to changing customer demands and minimize the impact of rising energy and material costs.

Is your company positioned to capitalize on growth while maximizing operational efficiency?.

Rockwell Automation Model Predictive Control delivers results.

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