

# Real-Time Simulation

## Shorten Commissioning Time

Embed lets you easily and rapidly construct models of small and large systems. This ability, coupled with a very fast and efficient execution engine, lets you run high-fidelity models in real time. You can run your plant model against real-world inputs from a PLC or DCS. This allows you to tune controllers off-line, shortening commissioning time. It also lets you perform off-line operator training.

## Perform Operator Training

Once you have a good high-fidelity plant model running in real time, you can use the Embed OPC client interface to connect to your PLC/DCS HMI to perform operator training. The Embed modeling interface allows you to easily inject fault conditions to test operator response to extreme operating conditions. Embed allows automatic state check-pointing to allow operators to restart from any prior checkpointed state. This allows you to explore the effect of different responses to a given situation. Another feature is real-time scaling. This allows you to speed up or slow down the simulation speed for instructional purposes. For instance, a week of normal operation could be covered in an hour or two.



## Optimize Control Parameters

Another use for your plant model is to optimize common operating parameters such as PID values with off-line tuning. Just insert parameterUnknown blocks for the parameters that you want to optimize; then construct the objective function to be minimized using standard Embed blocks. Typical objective functions consist of integrating the square of the setpoint error with an overshoot penalty factor to ensure system stability. These functions are easily constructed using standard Embed blocks and templates. When you simulate with optimization enabled, Embed iterates your diagram over the specified operating region, trying different values of the parameters. Using sophisticated, tunable, nonlinear, gradient descent search methods, Embed determines the combination of parameter values that minimize your objective function. Embed's fast computational engine is well-suited to speeding up the compute intensive nature of iterative solvers.

## Benefits

- Faster plant commissioning
- Off-line tuning and controller optimization
- Operator training for smoother plant operation

### Authorized Distributors



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