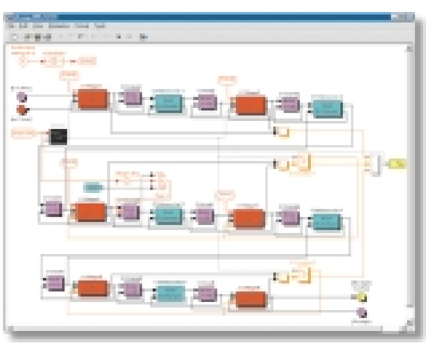
MATLAB in the World
Innovative applications of MathWorks tools across the sciences and industry

INDUSTRIAL EQUIPMENT AND AUTOMATION

Equipment manufacturers, process designers, and developers have a range of responsibilities, from designing a single piece of industrial equipment to analyzing and optimizing an existing process and developing a strategy for controlling an entire plant. This means that they must apply the right balance of technology and know-how to build and maintain systems that are reliable, efficient, and practical. These engineers use MathWorks products to understand and model their processes, design industrial equipment, and tune plant performance. Here are some examples.

Evaluating Chemical Reactor Systems

Engineers at BP Chemicals in the United Kingdom wanted to replace the individual air compressors feeding four chemical reactors with two interconnected machines. First, however, they needed to confirm that the new system would be able to handle swings in demand of up to 25%. They contacted KHACE, a consultancy and MathWorks Connections Partner, who used MATLAB® and Simulink® to perform dynamic simulation studies of the proposed compressors, pipe work, controls, and reactors. The Simulink modeling approach combined chemical engineering (the compression thermodynamics and reaction processes) and mechanical engineering (the multistage compressors) with the design of the control systems. The simulations confirmed the feasibility of the approach, showed which compressor designs would work best, and revealed strategies to improve the performance of the compressors and of individual reactors. **www.khace.com**

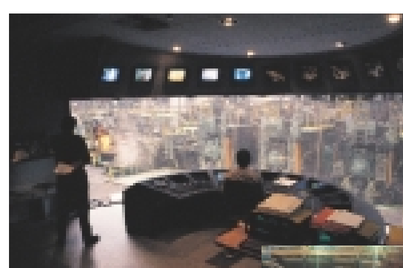


Training Pulp Mill Operators by Simulating Mill Processes

Wood and pulp manufacturer Pope & Talbot recently installed a new chlorine dioxide reactor in its Halsey, Oregon pulp mill. To train operators in the new process, they used Simulink and Stateflow to build a GUI-based simulation of the reactor. The simulation, which interfaces to the DCS system, teaches operators the process and enables them to handle a range of transient situations, such as changes in demand for chemicals or increases in flows. The simulation brings considerable savings in productivity. Training operators on the actual mill takes several months and can cause a production line foul-up that shuts down the entire plant for several hours (at a substantial cost). Using the simulation, an operator can master the reactor in just a few weeks, and without the risk of downtime. **www.poptal.com**

Monitoring Rolling Mill Equipment

BlueScope Steel Limited in Australia uses Simulink to simulate adjustments to their rolling mill equipment before making the actual adjustments. Because the rolling mill is always in operation and running at nearly 100% percent capacity, misadjustments can be disastrous. BlueScope uses the nonlinear simulation capabilities within Simulink to stress their system model and determine whether changes will take their machinery beyond its limit. Modeling and simulating their process before implementing changes has enabled BlueScope to increase the dimensional quality of its steel while avoiding misadjustments. **www.bluescopesteel.com**



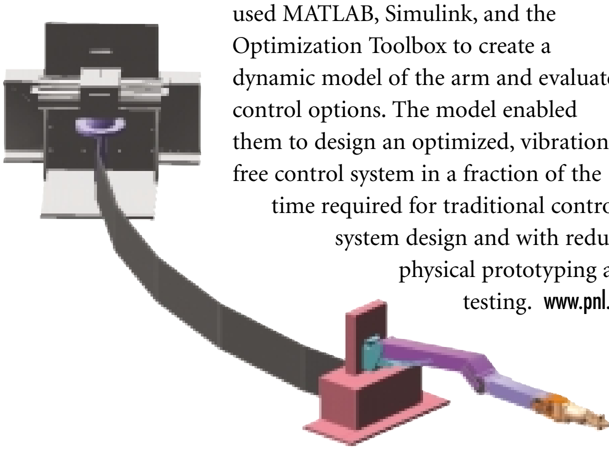
Simulating Refinery Processes

Nabalco Alumina Refinery has boosted production by $2 million a year by using Simulink to design and develop a process simulator. Simulation of the refinery process enables offline modeling

and testing of Process Control Strategies— applications or changes to the refinery process designed to optimize output— before implementation. The ability to design, test, and evaluate control strategies provides a high level of quality and ensures that the right control strategy is implemented the first time and is pretuned to optimize performance. **www.nabalco.com.au**

Modeling Robotic Controls for Nuclear Waste Disposal

Pacific Northwest National Laboratory (PNNL) in Richland, Washington was contracted by the U.S. Department of Energy to develop a 30-foot-long robotic arm to break up nuclear waste stored in tanks buried 40 feet underground. Because access was limited to a 42-inch diameter hole in the top of the tank, the arm's movable end had to be long and thin, with flexible links and low natural frequencies. That design made the arm susceptible to vibration and oscillation. PNNL used MATLAB, Simulink, and the Optimization Toolbox to create a dynamic model of the arm and evaluate control options. The model enabled them to design an optimized, vibration-free control system in a fraction of the time required for traditional control system design and with reduced physical prototyping and testing. **www.pnl.gov**



Simulating Power Quality Systems

Temporary voltage dips caused by disturbances and faults in the power grid can halt an entire production line in highly sensitive industries, such as computer chip manufacturing, oil refining, and textiles. ABB, the Swiss power electronic systems manufacturer, recently developed two power quality systems that solve this problem by means of dynamic voltage restorers (DVRs). With a response time of less than one millisecond, these devices protect against about 90% of all disturbances originating in the power grid, providing a cost-effective alternative to large-scale, uninterruptible power supplies. ABB used simulations built in Simulink and the Power System Blockset to verify the DVR design parameters and component specifications, as well as the control algorithms and the parameter settings. As the largest DVR units built to date, the two ABB systems each serve a load of up to 22.5 MVA. **www.abb.com/powerelectronics**

To find out how other customers use MathWorks products, visit ***www.mathworks.com/nn_userstory***

For demos, application examples, tutorials, user stories, and pricing:

- Visit **www.mathworks.com**
- Contact The MathWorks directly

US & Canada	508-647-7000
Benelux	+31 (0)182 53 76 44
France	+33 (0)1 41 14 67 14
Germany	+49 (0)241 470 750
Italy	+39 (011) 2274 700
Spain	+34 93 362 13 00
Switzerland	+41 (0)31 954 20 20
UK	+44 (0)1223 423 200

Visit **www.mathworks.com** to obtain contact information for authorized MathWorks representatives in countries throughout Asia Pacific, Latin America, the Middle East, Africa, and the rest of Europe.

The MathWorks

91123v00 12/03