



SUCCESSFULLY TRAINING PERSONNEL WITH A TWIN

The refining industry has always respected the importance of preparing for critical operational situations such as during startup, shutdown, and process upsets. But as experts retire, one Canadian refinery faced the difficult task of maintaining expertise in their available high-quality personnel.

In an ideal world, the best operators could be cloned. Since they couldn't clone their experts, they opted for the next best thing: a twin, not of their people, but of their plant.

Sustaining Success

At the refinery, automation has been valuable to process improvements over the years, yet it also required strong operators with knowledge of how to reliably respond to situations.

Traditionally, operators were trained by more experienced operators and through troubleshooting during an actual upset or incident. Not only did this kind of training require a long time to develop expertise, but often it did not include training on infrequent procedures or abnormal operating conditions.

As often happens in organizations when experienced personnel retire, management immediately recognized the need for sustainable training. They wanted to provide operators with tools that make the most of their DeltaV™ distributed control system while training them to work fast and effectively in critical process situations. The goal was to

prepare operators to be as skilled in abnormal situations as they are in situations they encounter every day.

Setting Up the Twin

Together with Emerson, the refinery developed a digital twin—consisting of a virtual copy of the production control system integrated with a high-fidelity, dynamic simulator—to train operators on their more complex operations.

The virtual control system, DeltaV Simulate, emulates the operator stations, engineering station, process controllers, and high-level system functions. This provides operators with the same controls, graphics, and alarms as in a real plant, simplifying the application of knowledge to production.

Emerson's Mimic™ simulation software simulates the process, equipment, transmitters, and final control elements, with unit operation-based modeling objects that provide a material and energy balance, pressure-flow solver, and thermodynamic packages. By providing an IO level simulation, Mimic provides an environment where engineers can quickly and easily integrate complex, dynamic process models to the offline controls.

Simulated System, Real Results

The usefulness of the digital twin surpassed expectations. As a safe platform for operators to train, the simulation allowed operators to experiment with infrequent procedures, abnormal operating conditions, and complex interactions such as those seen during a system park or gas-diesel swing. During training, the operators knew they could err without affecting the running process. Then during regular operation, the operators became comfortable making decisions in critical circumstances and avoided costly mistakes.

In fact, operators use the system to practice on the simulator in days leading up to higher risk operations such as startup and shutdown. Fast forward 3 years and since the installation of the digital twin, they have had no incidents or unplanned shutdowns associated with operator error in these areas, and shorter planned shutdowns resulting in higher sustained production.

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