

# High-fidelity Simulator



## What is a simulator?

A simulator is a training tool that promotes safety and preparedness by enabling operators to practice in a safe environment. A computer simulation system can provide the foundation for ongoing operator training. Simulator training has proven to be the most effective means for teaching plant operations as well as qualifying operators.

A simulator allows for tests of widely varying conditions. Changing from one operating condition to another can take hours on the running unit, but operators can train on a new condition instantly using a simulator. A simulator is critical for a well-trained workforce.

A simulator prepares operators to respond in the safest, most efficient manner to a variety of conditions. Operator training can include startup, shutdown, load maneuvering, rundown/runback, and trip scenarios. Operators can safely experience emergency conditions and practice a response to uncommon events.



## TRAX History

TRAX simulators represent the premier training systems in today's energy marketplace. Since 1987, TRAX has been integrating training tools into our simulators to create comprehensive training systems. With over 300 training simulators delivered worldwide, and covering many types of plants, we have the experience to simulate today's new technologies as well as traditional applications.

TRAX's proprietary, state-of-the-art simulation system, ProTRAX, has become an industry standard for both engineering analyses and training simulations. ProTRAX models have a tremendous user base with hundreds of man-years of independent verification and validation.



## High-fidelity Simulator: Components

A TRAX high-fidelity simulator is comprised of four major components:

- Control Logic
- Human-machine Interface (HMI)
- Process Models
- Input/output (I/O)

### Control Logic

The most common type of simulator is a virtual system, meaning that the controls in the simulator are an exact duplicate of the controls in the plant. The plant files are downloaded to the simulator with no manipulation, translation, or special interfaces required. The control logic is run on a standard computer instead of the hardware controller used in the plant, resulting in the exact same functionality.

### HMI

In a similar fashion, the HMI graphics used in the plant are loaded directly onto the simulator. This means that the HMI on the simulator is an exact reproduction of the HMI in the plant, in both functionality and appearance. Operational skills learned through simulator training are fully transferable to the plant.

Control room hard panels are also represented in the simulator. These emulations combine realistic photo-quality screen displays with dynamic functions.

In addition, TRAX provides local operation screens that allow the operator to perform remote operations. This replicates open/close or start/stop devices that are operated by a roving operator.



### Process Models

Simulator process models are built using the ProTRAX simulation software, providing high-fidelity, engineering-grade models. To be a “high-fidelity” model, three items must be true:

- Equations describing component behavior are based on conservation of mass, energy, and momentum (first principles) along with well-accepted constitutive equations for heat transfer and flow.
- The plant model accurately represents the configuration of the actual plant.
- Each component’s parameters accurately represent the corresponding component in the actual plant.

ProTRAX is comprised of an extensive library of components, or modules. Each simulator is configured to exactly match the simulated plant, and the individual components of a model are tailored to the specific plant, resulting in a high-fidelity simulator that truly represents plant operation. The process models include the main thermo-hydraulic processes and systems, as well as associated electrical buses and auxiliaries as required for the specific operation of the plant.

### I/O

TRAX prepares an interface model to represent the I/O connections between the virtual control system and the simulated process models. This model provides simple operator feedback for most I/O signals.

## Maintenance and Upgrades

To maximize the value of your simulation system, it must be periodically updated to match changing plant conditions. TRAX maintenance services are available to provide simulator updates for changes including:

- New, deleted or changed I/O (e.g., indicating equipment changes)
- Relocated, resized, or replaced equipment
- Changed control logic or parameters (e.g., tuning, timing)
- Changed control panels (hard panels) which correspond to soft panels in the simulation system
- Training material that teaches outdated scenarios

**Please contact a TRAX representative for more information about a simulation system.**