

# OPERATION SIMULATION

WITH SIMULATION, OPERATORS CAN LEARN UNIT OPERATION AND UPDATE THEIR SKILLS WITHOUT EVEN TOUCHING THE UNIT. Article by GSE Power Systems ([www.gses.com](http://www.gses.com)) in Enlargement Europe

Power plant operators have traditionally learned how to operate a plant by working with an experienced operator until plant management feels confident that they can control the plant by themselves. The problem with this method is that the instruction of the student is limited to those situations that are experienced during the time of training. When the new operator encounters a new situation or problem, they are left to operation by trial and error. The error can result in not-so-minor costs, such as operating at a reduced output, a unit trip, or worse, equipment damage that leaves the unit offline for a period of repair.

**Simulation presents the operator with a means of learning unit operation without touching the unit, strongly complementing the value of 'on the job' and classroom training.** A modern simulator consists of an operator interface that replicates the workstations in the plant and a computer running mathematical models that duplicate unit performance. With a prescribed course of training, the new operator can start with normal operations such as unit load changes, unit startup from cold conditions to full load, and unit shutdown from full load to cold iron. Then the student can experience malfunction conditions such as pump trips, turbine trips, faulty instruments and controls, and plant tube leaks to full steam line ruptures.

**When it comes to improving the performance of power plant operators, nothing has made a greater contribution to training than a full scope simulator.**

The benefits of this include the following:

- Training operators on malfunctions, transients and accidents
- Repeat scenarios to promote trainee understanding and retention
- Training on actual plant events



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- Retraining of shift personnel to support team work and effective control room behavior
- Training for mitigation of accidents
- Simulated experience to supplement real world experience
- Reduction of risk to plant personnel and equipment

**Simulation is not limited to new operators. It also provides the ability to keep the skills of experienced operators fresh.**

Operators can practice infrequent evolutions and faulted conditions on the unit, something that can make the difference between keeping a unit online or losing a unit during a plant upset. Almost every plant can benefit from improved operator training, which includes the use of a plant specific simulator. **One very large group of simulator users are power plants with availability and reliability problems.** Frankly, it doesn't take many unit trips related to operator error to convince plant management that there is a training problem.

**A review of resulting lost generation sales can often directly support financial justification.** In response to a changing electric marketplace, simulators are also an excellent tool for developing unit operating procedures where alternate operating strategies can be tested without threatening the unit.

**A second set of simulator users are those plants that are undergoing a major control system upgrade.** In some cases, the plant is moving from hard panel controls to a distributed control system (DCS), while others are changing DCS vendors.

In either case, the interface that the operator uses to control the unit will be different. Rather than a 'sink or swim' method of operation until experience is gained on the new controls, these customers have elected to utilise a simulator to help accelerate the learning curve.

The simulator also helps the plant find 'bugs' in the control system logic, saving time during commissioning as well as improving overall plant reliability. **While the ROI may seem hard to quantify initially, you only need to seek the voice of experience, from those who have used a simulator and those who wish they had.**

**New power plants are the third major category of simulator users.** One would think that the decision to add a simulator is simply 'common sense' given the financial return justified by the above cases. But with the rush and financial pressure to design, build and start-up a new steam or CCGT power plant, training of the operators, the very individuals that will ultimately control the success of that investment, is often left to late planning and secondary importance.

**A simulator provides real benefits, and it provides the extra visibility regarding the issue of operator training, readiness and qualification for the job.** While the initial investment helps a new plant to achieve a shorter, smoother start-up, the simulator remains in place to provide more detailed operator training on plant process relationships and malfunction recognition and response.

**The development of a high fidelity, real-time, dynamic model can also benefit engineers and the management team.** The engineer has traditionally been exposed to steady state, mass balance simulation. Today, with the portability of the training software loaded onto their personal computer, engineers and managers are beginning to appreciate the extra insight of a dynamic model.



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