

Salt River Project

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Ron Bewsey,
I&E Supervisor and I/A
Administrator,
Salt River Project

America’s Third-Largest Public Power Utility Quells Nuisance Alarms

by Invensys Operations Management

Goals

- Improve the performance of the Santan and Navajo plants by reducing the number of alarm floods.

Challenges

- Reduce the increasing number and frequency of occurring process alarms while keeping the power plant safe and profitable.

Solutions and Products

- Foxboro Distributed Control System - I/A Series;
- SimSci-Esscor Dynamic Simulation.

Results

- Implementing the alarm system design at the nine Santan units dramatically reduced the frequency of alarms. Plant startup previously took two operators up to four hours to complete can now be performed by one operator in less than two hours;
- New system resulted in a 44% reduction of configured alarms.

Phoenix, Arizona – Salt River Project (SRP) was established in 1903 as the nation's first multipurpose reclamation project authorized under the National Reclamation Act. It is the nation's third-largest public power utility, providing up to 6,500 megawatts (MW) of power to more than 900,000 customers throughout a 2,900 square mile service territory in central Arizona. Its Navajo generating station on the Navajo Indian reservation near Page, Arizona, operates three 800 MW coal-fired generating units. Its Santan station in Gilbert runs nine combined cycle units, providing a combined total of about 1100 MW. Its Kyrene station, located 15 miles away in Tempe, generates an additional 430 MW from one combined cycle and three simple cycle units.

Client Challenge

Process alarms are critical to the safe and profitable operation of a power plant, too many and too frequent alarms can have a major impact on plant operations. To reduce the number of alarm floods that were occurring with increased frequency, SRP implemented an effective alarm management solution from Invensys at its Navajo and Santan generating stations.

SRP began consolidating aging analog plant controls at these stations into a single, modern digital control system in 1990, based on the Foxboro I/A Series Distributed Control System from Invensys. It now encompasses more than 40,000 SRP I/O points, including coordinated control of turbines, burners, plant logic, scrubbers, data acquisition, and performance monitoring. The benefits of switching to Invensys' digital control system have been dramatic for SRP from the initial startup.

Commenting on the startup progress at the Navajo plant, Salt River Project (SRP) Dispatchers said, *"Dispatchers could not believe what they saw when the unit took a 400 MW runback at an average of 200 MW/Min. The boiler and turbine parameters were not only in line, they were 'flat line.' Anyone with any experience operating a once-through unit knows that this is remarkable."*

One benefit of a powerful control system is the ability to generate alarms that notify operations of changing conditions. Unfortunately, the number and frequency of those alarms began to threaten and overwhelm operators.

Commenting on the extent to which the lack of alarm management was jeopardizing the efficiency of the entire plant, Ron Bewsey, I&E supervisor and I/A administrator, said, *"We were getting alarm horns all the time — at startup, shutdown, and during day-to-day operation. In one 18-hour period, operators were confronted with 5,000 alarms, every one of which required intervention of some sort and 98% were designated top priority. The plant had to designate an operator just for alarm management."*

Using Invensys' alarm management solution and proven execution strategy, SRP met this challenge and implemented the solution at all of Santan's nine units and one more Navajo unit.

"Now," Bewsey said, *"we have valid alarms that mean something to operators so they can respond appropriately. This increases efficiency and reliability. Operators now see the alarm system as a tool they appreciate, instead of a necessary annoyance."*

A Three-Phase Alarm Management Solution

Starting with the two units at the Santan station, SRP assigned an I&C specialist and an experienced control room operator to work with Invensys engineers full time to implement a three-phase alarm management solution. In the initial phase, the Santan/Invensys team studied alarm system performance in depth and produced a report, (which defined baseline alarm system performance) established performance targets based on Engineering Equipment and Materials Users Association (EEMUA) best practices, and described the system improvement methodology.



The new system resulted in a 44% reduction of configured alarms.

The second phase focused on system performance improvement. SRP implemented an advanced alarm notification that will *“focus on reducing alarm floods,”* said the SRP alarm management team. This phase included development of an alarm system philosophy, alarm rationalization, execution of alarm system changes, and a human machine interface (HMI) that enabled plant personnel to visualize alarm system performance and history.

SRP’s alarm management team prioritized the alarms (1 – 5) based on economics, safety, environment severities, and the time required to respond to each alarm. Priorities one, two, and three were sent to the operator. Alarms coded as priority four were sent directly to maintenance for diagnoses and repair. Priority five alarms were sent only to the historian for recording purposes. This was all in accordance with SRP’s new alarm philosophy.

Prior to the documentation and rationalization process, 98% of all alarms were assigned a priority 1, with the remaining 2% of the alarms spread across the rest of the priorities. Once the documentation and rationalization process was complete, only 11% of all alarms were set at priority 1, 14% set at a priority 2, and the remaining 75% were set at a priority 3. The new alarm priorities were programmed into the Foxboro I/A Series Distributed Control System, which managed the routing of all alarms to the appropriate location.

Dramatic Reduction of Alarm Frequency

Implementing Invensys’ alarm system design at the nine Santan units dramatically reduced the

frequency of alarms. Plant startup previously took two operators up to four hours to complete can now be performed by one operator in less than two hours.

Rees Scott, Control Room Operator, commented that, *“We can now attend to each alarm instead of just hitting the ‘acknowledge’ button and we also have more time to concentrate on improving the performance of the units rather than just trying to stop the noise.”*

Reducing the noise level and eliminating the number of alarms at the plants freed operators to address plant efficiency in positive ways (such as decreasing heat rate).

At the Navajo station, results were even more dramatic. The alarm management team rationalized and reprioritized Unit 1 alarms according to EEMUA standards and the Plant alarm philosophy. This resulted in a 44% reduction of configured alarms. The rationalized alarms were implemented at SRP Navajo’s SimSci-Esscor® plant simulator.

The Navajo plant is now using the simulator to train operators on the new alarm system and plant alarm philosophy. The simulator models operation of the plant in real-time, and enables a prediction of the impact of the new alarm system design before the changes are implemented.

Once the Unit 1 project is complete, the process will be repeated on the remaining two units and scrubbers.

The third phase of the project will continue to optimize the alarm system and further reduce the frequency of alarms within SRP plants.