CUSTOMER CASE STUDY

AVEVA power simulation validates controls and trains operators on new DCS

Company name - Intermountain Power Service Corporation
Industry - Power

Challenges

- Validate the control logic against actual operations
- Build operator knowledge and confidence in the new DCS prior to going on-line
- Eliminate unplanned downtime or emergency shutdowns
- New simulator to replicate the actual dynamic response of the power plant process, under any operating condition

Solutions

- Replace outdated existing simulator as part of a DCS upgrade project to help prepare operations for the new user interface and control logic changes
- IPSC selected AVEVA's Dynamic Power Simulation, which includes the plant process model and the simulator executive environment. AVEVA Dynamic Power Simulation is a comprehensive program that applies first-principles techniques and rigorous thermodynamic data to provide accurate and reliable results

Results

- Validated control logic, identified and fixed critical errors prior to going online
- Controls placed in automatic within 24 hours of start-up after DCS Upgrade
- Avoided potential plant losses due to non-scheduled shutdowns estimated at $1 million per day
- Smoother unit start-up
- Increased operator confidence and efficiency on new DCS
- Improved ability to troubleshoot plant control and process issues
- Ongoing ability to pre-check all plant control changes prior to plant implementation
- Operator training and certification is now done in the simulator instead of live unit

Story

The Intermountain Power Service Corporation (IPSC) plant near **Delta, Utah** was constructed in the early 1980s and as part of the project a hard panel simulator was developed to train operators that had little or no experience operating fossil-fueled power plants. Over time, this simulator was no longer adequate for training operators as model predictions became significantly different from actual plant responses. The existing simulator software was also outdated and could no longer be maintained, as the original vendor was no longer in business.

It was decided to replace the simulator as part of a DCS upgrade project to help prepare operations for the new user interface and control logic changes.

Client challenges

With only a four-week window in which to shutdown the plant, install the new DCS and startup the plant, any delays would cost the plant revenue. Any significant lost megawatt production could threaten the ROI of the upgrade project.

Like all major plant upgrades, there are inherent risks with a project. In this case, control system errors, even minor, could delay the unit start-up, and return to service. In extreme cases, control system errors could cause catastrophic equipment damage.

Operator error was also another concern. One of the major changes was the installation of a Windows-based DCS and the removal of the existing control panel. This presented a significant challenge especially for experienced operators who grew accustomed to the existing system.

> "The simulator paid for itself as a result of the DCS-Checkout alone."
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> **Bill Morgan,**
> Project Manager on DCS Project

The decision was made to use a new simulator to validate the control logic against actual operations, prior to upgrading the controls of the real unit. Justifying a simulator was based on risk avoidance. With lost generation revenues in excess of $1 million a day, saving a couple days of unplanned outage time would more than pay for the cost of a simulator, controller validation, and operator training.

However, to achieve their goal, it was essential that the simulator replicated the actual dynamic responses of the operations accurately. IPSC knew that a bad simulator would not only leave doubt on the integrity of the control system, but would also cause operators to lose confidence in the training program which would inhibit their ability to learn the new DCS.

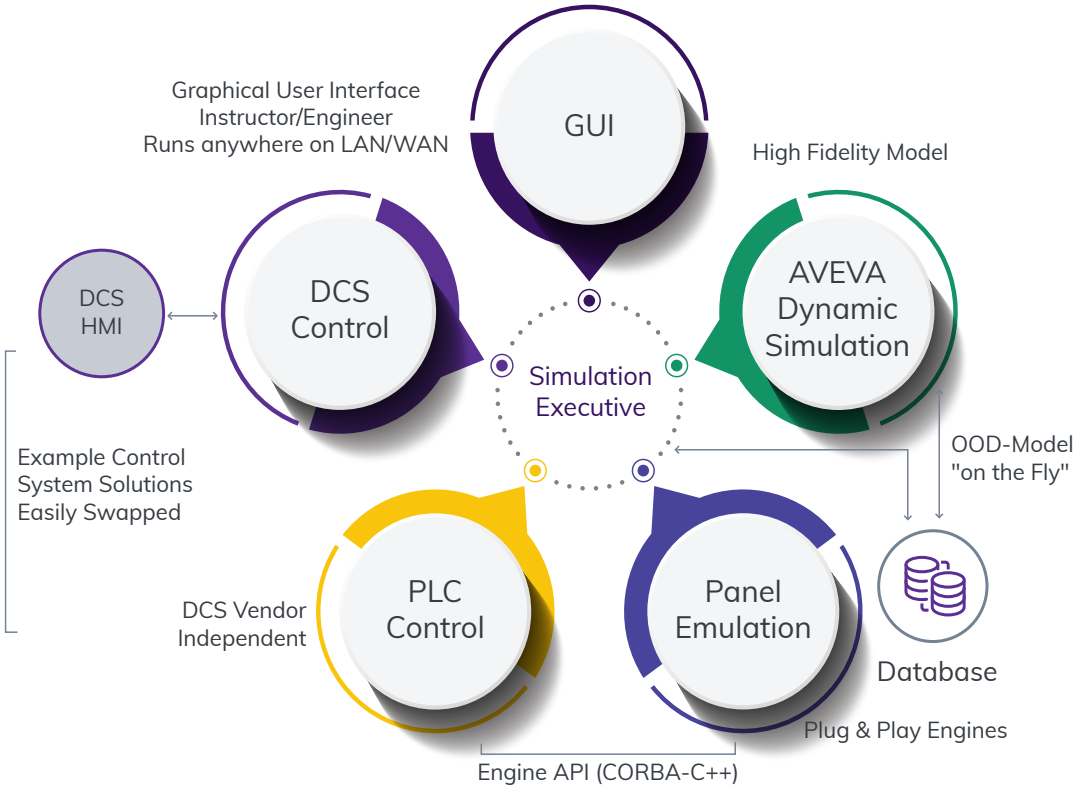
> "The dynamic process is highly accurate. This makes operator very confident in the training"

Solution

The selection of a simulator vendor consisted of an exhaustive process to visit many plants that had similar requirements and training systems. IPSC selected AVEVA's Dynamic Power Simulation, which includes the plant process model and the simulator executive environment.

AVEVA Dynamic Power Simulation is a comprehensive program that applies first-principles techniques and rigorous thermodynamic data to provide accurate and reliable results. The simulator environment features engineering analysis and operator training capabilities as standard such as FREEZE, RUN, PAUSE and SAVE/RESTORE initial conditions. The software is object-oriented with a Java graphical user interface (GUI) that was used to build the boiler, turbine, and balance-of-plant models that has been used throughout more than 100 fossil plant simulators. Validation testing of the process model using data received from the plant prior to the installation of the new control system confirmed the static and dynamic responses.

AVEVA Dynamic Simulation Environment



The AVEVA Power Simulation user environment is intuitive, friendly, and functional. Designed with a model-centric approach, it enabled AVEVA to rapidly tie in the third-party DCS simulator solution, bringing the process models, the DCS controls, and the DCS graphical user interface together for a complete system.

The AVEVA simulation architecture supports the acceptance of repeated control system configuration downloads without requiring repeated compilation and linking steps. IPSC personnel specified the virtual-stimulation simulator where actual DCS software runs in virtual DCS controllers, thus hardware costs are reduced and the simulator still uses the actual DCS control software. In addition, IPSC started simulator development well before DCS installation to allow enough time for DCS logic testing and operator training.

"Following a four-week planned outage, we initiated the unit startup and everything went great. This was due to the check-out of the controls and pre-tuning on the simulator prior to startup. This was a great benefit." Bill Morgan, Project Manager on the DCS project at Intermountain Power. "The simulator paid for itself as a result of the DCS Checkout alone."

"The simulator is used beyond just operator training"

"Maintenance of the simulator has proven to be easy with the AVEVA solution. IPSC staff can make controls changes in the simulator"

Results

Not a single MW of unplanned generation loss occurred as a result of the DCS upgrade. “The startup was not “flawless”, but the problems were more with the controls than with the operators. The newer operators adjusted easier. The controls change was difficult but the simulator helped a whole lot. It would have been difficult to bring the unit back without the simulator,” said Fred Tasker, Simulator Instructor at Intermountain Power.

“The simulator paid for itself as a result of the DCS-Checkout alone.” Bill Morgan, Project Manager on the DCS project at Intermountain Power.

The benefits did not stop at the end of the project. IPSC has initiated a corporate policy that all DCS controls changes be tested on the simulator prior to implementation in the plant. All operators are required to practice running the unit with the new controls on the simulator to gain familiarity and experience.

Furthermore, when plant issues arise on a unit they are addressed and tested on the simulator.

In addition, the simulator has ongoing value related to its design purpose – Operator Training. “The simulator is also used for proficiency testing which is performed annually. Right now, the operators are on the simulator; they are communicating and showing each other how things work. This communication has also been helpful in terms of training newer operators and ensuring they are all comfortable controlling the unit,” Fred Tasker, Simulator Instructor at Intermountain Power.

Maintenance has also proven to be easy. With the DCS virtual controls representation, the same IPSC staff that maintains the DCS system can make controls changes on the simulator. Therefore, there is now less need for a dedicated simulator maintenance technician. The process model can be easily maintained utilizing the drag-and-drop GUI supported features of the simulator.

Changes are made quickly by opening up the particular object and editing the parameters. With AVEVA’s object-oriented capabilities, these changes are completed while the simulator is running and the DCS is interconnected. This feature allows rapid tuning of the controls on the equipment and testing of the integration, in one easy step, reducing maintenance time, and costs.

Using AVEVA Dynamic Power Simulation, IPSC met their objectives by ensuring the control system was completely checked out and the operators were trained on the DCS pre-startup. This avoided delays and/or unnecessary shutdowns, increased operator confidence and satisfaction, mitigated the risk of collateral equipment damage, with more functionality, ease of use and lower maintenance costs going forward when compared to the original simulator. IPSC also found additional benefits in the form of a controls test bed, a troubleshooting tool, and an ongoing highly realistic hands-on training environment.

To learn more, please contact your AVEVA representative or visit us online at aveva.com