

Sartrex Power Control Systems Advanced Digital Control Centre

Designed for Safety, Plant Efficiency and Operator Ease

The Sartrex Advanced Digital Control Centre represents a giant leap forward in the control of power generation facilities. Sartrex, in partnership with AECL, designed this complex system and currently manufactures and markets it worldwide.

The stringent requirements imposed by such standards as ISO9001 and CSAZ299 enable this system to operate in all types of power plants, including heavy water nuclear, light water nuclear, coal, gas and others. Its flexible software display engine allows for easy customization to different plant configurations. Its modular design also enables customers to select elements of the system for new installations or selective plant upgrades. For example, they may choose to upgrade the large screen display, and software, and use existing operating desks, or any other similar scenario.

Plants using this system can expect to realize great savings in operator costs and general operating reliability. They also benefit from having an esthetic appeal for public relations.



The Advanced Digital Control Centre is a direct result of Sartrex/AECL's product engineering strengths, and reflects the state-of-the-art technology that is a trademark of these two leading Canadian companies.

New Plant Display System

The Digital Control Computers (DCCs) have been proven highly successful for over more than 70 reactor years of operation. The addition of a Plant Display System (PDS) in concert with the DCCs enhances the process monitoring and diagnostics capabilities of the operator. These two separated systems replace the previous centralized digital control computers, and allow operators and technical staff to access and utilize data more effectively.

The DCC has fewer, simpler components, and is able to perform self-tests, detect failures and take autonomous fail-safe actions. The PDS provides a vital link between the control center operator and the plant, including facilities for alarm reporting, recording and analysis; generating logs and records of station operating data; and maintaining and updating the plant status database.

Improved Emergency Response

The Advanced Digital Control Centre has improved emergency capabilities through computerized plant-safety-state monitoring, and readily available information that can be transmitted from the Technical Support Centre to the offsite Emergency Operations Facility.

Some improved Advanced Digital Control Centre features were designed to reduce operating and maintenance costs. The advanced center also boasts features designed to minimize unplanned outages, as well as to improve recovery as the reactor returns to power.

Advanced Alarm Management

The Advanced Digital Control Centre incorporates a new AECL-designed software program: the Computerized Annunciation Message List System (CAMLS). CAMLS has two distinct functions to provide a central overview of plant status, and to allow easy desktop enquiry. It quickly alerts operators to changes in plant conditions so that they can efficiently and effectively respond to any event.

Development of CAMLS was extensive for five years of research and development, and two years of formal validation in full-scoped simulators.

Enhanced Plant State Awareness

When designing the control center, a wide range of human performance issues were addressed. These include human cognitive issues such as plant-state monitoring and situation awareness, diagnosis and decision-making, catching and reducing errors, communication, teamwork, vigilance, and mental workload.

New process monitoring displays have been designed, and are now included in a new plant display system to better support human cognitive issues.

Physically Comfortable Space

Human physical issues were also addressed, including physiological effects of shiftwork, fatigue, readability and detectability of information, and distances travelled to perform tasks. It was factors such as these that influenced the design and locations of controls and displays, as well as lighting and colour choices. Operators will appreciate the speed and precision with which the center delivers vital information. At the same time, they will benefit from the physical and psychological comfort the center provides.

Performance Benefits

The advanced control center reduces operating and maintenance costs by:

- Making it easier to monitor for technical specifications, operating policies and procedure compliance
- Increasing component and equipment protection from abnormal events
- Improving human performance in vital areas
- Reducing downtime from unanticipated transients
- Increasing monitoring of processes and equipment
- Minimizing or reducing staffing requirements by reducing the number of routine manual tasks
- Providing obsolescence protection through technology and electronic choices, along with equipment configuration

Single Sit-Down Console for Operator Ease

The control center incorporates a main Video-Display-Unit-based sit-down console where a single operator can monitor and control plant operations, from hot shutdown to full power. This reduces the need for moving around the room to gather information during key operating situations.

The individual control panels and integrated PDS are augmented by a sophisticated annunciation-alarm processing system and large overview display screens. These enhance the operator's supervision of the plant, particularly during plant transients and outage maintenance, when demands on operators are most intense.

Staging of the Advanced Digital Control Centre before delivery to China at the Scintrex Concord, Ontario facility.

Human Factors Components

Some of the human factors considerations featured in the advanced control center:

- Control panels with improved visibility
- Larger work surfaces that allow sufficient working space during critical procedures
- Large overview displays that improve operator ability to monitor plant state and team performance
- Rotating “carousel” that keeps manuals at the fingertips of operators
- Touch-screen multi-function keypad that increases task efficiency and minimizes errors
- Natural Circadian lighting system that eases physical and psychological demands of shift work
- Floor layout to optimize traffic patterns
- Improved acoustics to reduce ambient noise
- Matte finishes to reduce glare
- Component colours that provide visual relief from computer screen “afterimage burn”
- Décor colours that improve aesthetics and psychological comfort



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