Illuminate NEBRASKA
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NEBRASKA PUBLIC POWER DISTRICT

INSTRUMENTATION

SCADA

CONCEPT SCADA (Supervisory Control and Data Acquisition) is a software system used to monitor and control industrial processes. It collects real-time data from sensors and other devices, which then processes and presents the information to human operators. SCADA systems can also automate processes, such as adjusting the speed of a production line based on demand or controlling the temperature in a chemical reactor.

TERMINOLOGY

HUMAN-MACHINE INTERFACE (HMI) - Graphical user interface that allows operators to interact with the SCADA system. The HMI displays real-time data and alerts for operators.

DATA ACQUISITION SYSTEM (DAS) - This is the hardware and software system that collects data from sensors, instruments and other devices. The DAS is responsible for converting the analog signals from sensors into digital data that can be processed by the SCADA system.

PROGRAMMABLE LOGIC CONTROLLER (PLC) - This is a digital computer used to control industrial processes. It receives input signals from sensors and other devices, and then executes control algorithms to manipulate the process variables.

COMMUNICATION PROTOCOLS - Used to exchange data with remote devices, such as PLCs and sensors. Some common protocols include Modbus, DNP3 and OPC.

HISTORIAN DATABASE - This is a database that stores historical data from the manufacturing process. Enables operators to analyze trends and identify opportunities for process optimization.

ALARM MANAGEMENT SYSTEM - This is a system that alerts operators when abnormal conditions occur in the manufacturing process. This helps operators quickly identify and respond to issues.

SCADA SOFTWARE - This is the software that integrates all of the components and forms the core of the SCADA system. The SCADA software collects, processes, and presents data to operators in a user-friendly way, and enables operators to control the manufacturing process.

BACKGROUND

Make sure it measures up

SCADA has its roots in the 1960s, when computerized systems began to be used to monitor and control industrial processes. In the 1970s and 1980s, the development of microprocessors and programmable logic controllers (PLCs) enabled more sophisticated control and automation of manufacturing processes. SCADA systems began to be widely used in the 1990s, as the Internet and other communication technologies made it easier to connect remote devices and collect real-time data. In the 2000s and beyond, advances in machine learning, artificial intelligence, and cloud computing have enabled SCADA systems to become even more powerful, with the ability to analyze large amounts of data and make autonomous decisions.

REAL WORLD CONNECTIONS

Kawasaki uses a SCADA system to monitor and control its engine assembly line, which produces engines for motorcycles, ATVs, and other recreational vehicles. The SCADA system collects data from sensors and other devices throughout the assembly line. This data is then used to monitor the quality of the engines and ensure that they meet Kawasaki's strict specifications. The SCADA system also controls the assembly line, adjusting the speed and timing of various processes based on real-time data and demand. This has enabled Kawasaki to improve efficiency and reduce waste, while maintaining high levels of quality control.

APPLICATION

SCADA systems are widely used in the electrical industry to monitor, control and manage various aspects of electrical infrastructure. Here are some of the key applications of how SCADA supports the electrical industry:

- At generation facilities, data is collected in real-time from sensors monitoring voltage, current, temperature and pressure, providing operators with a comprehensive view of power generation.
- On the transmission and distribution lines, it monitors the flow of electricity, voltage levels, line loading, and other vital parameters. SCADA systems can detect faults, such as power outages or equipment failures. This feedback enables operators to quickly identify the location and take appropriate actions to restore power.
- Certain substation devices can be remotely controlled, such as circuit breakers, transformers, and switches. Operators can monitor the performance of substation equipment, detect abnormalities, and respond to faults promptly.
- Load Management can be monitored by collecting data on energy consumption patterns. This helps ensure stable and efficient power supply, prevents grid overload, and optimizes energy usage.
- SCADA systems also capture and store large volumes of data which can be used for historical analysis, performance evaluation and regulatory reporting. These generated reports, trends and statistics, provide insight for decision-making, system optimization, and compliance purposes.