**Background**

As operating licenses are extended to 60 years, reliability and failure prediction of critical plant components is an area of focus due to the maintenance and outage costs associated with aging plants. Traditional preventive maintenance is being extended to a condition-based predictive strategy through application of continuous component monitoring for early detection of failures. The goal is to be more proactive to avoid the significant costs of an unexpected forced outage and also reduce the costs of maintenance occurring during planned outages. Westinghouse is using existing methods in combination with new technology to provide cost-competitive, scalable component monitoring with the end goal of anticipating failures to ultimately reduce maintenance costs and increase plant availability.

**Description**

**Component monitoring application**

Westinghouse has developed an open, modular and scalable technology platform for component monitoring by leveraging data acquisition techniques used for AP1000® plants. It can be applied to monitor a single component, expanded to monitor several components or scaled to monitor a complete fleet with multiple units. In its simplest form, data from multiple sensors (existing or installed by Westinghouse) can be continuously monitored for a given component, then sampled and compacted for transmission to a data server via network connections.

**Sensor types supported include:**

- Temperature
- Strain
- Pressure
- Accelerometer
- Velometer
- Linear-variable differential transformer
- Proximity probes
- Thermography
- Radio frequency/partial discharge
- Motor current/voltage/phase

**Plant-wide application to fleet-wide application**

This same technology can be applied to monitor multiple components within a plant and provide reliable data to a central data server for additional processing and analysis. Wireless technology eliminates the costs of new cable runs for added measurements. The inset example shows pumps, but any component can be instrumented for monitoring within the open architecture.

The wireless network approach also enables use of wireless tablets or similar mobile devices on the network. Component data can be evaluated real time on a field tablet at the component of interest. When integrated with Westinghouse computerized procedures, personnel are provided standard actions tied to the component data indications. Our base technology platform can be expanded to meet particular needs via customer-specific solutions, from stand-alone component level up to a total fleet-wide approach.
**Benefits**

- Continuous monitoring of multiple parameters for greater predictability of component failures
- Powerful, small-footprint data acquisition with wireless technology to minimize installed cost
- Modular cost-competitive approach, scalable from a few components to plant-wide or fleet-wide
- Open architecture that easily incorporates existing installed platforms while integrating new technology
- Incorporation of computerized procedures, integrated work management systems for field and outage support
- Direct support of operations, engineering and maintenance personnel for post-event evaluation and reporting
- Improved maintenance planning and efficiency to reduce overall maintenance costs
- Leveraged technology to reduce outage critical path time while increasing operational plant efficiency and availability
- Management of wireless and cyber-security concerns

**Architecture features include capability for:**

- Both low- and high-speed component data event capture and archival
- Enterprise-grade server software for historian and advanced analysis
- User interface for navigation and data presentation
- Broadened scope of plant measurements
- Real-time and historical views to monitor condition and behavior of plant processes and components
- Centralized, remote and mobile access to data

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**Experience**

Westinghouse has over 50 years of experience providing products and services to the global nuclear power plant fleet including a complete range of applications such as protection systems, control systems, information and monitoring systems and operator training simulators. We have a track record in plant computer and vibration and diagnostic systems spanning decades for both domestic and international utilities for existing plants, as well as for new-build AP1000 plants.

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