



SUMMARY



Industry

Nuclear Power

Business Value

- Enterprise Visibility
- Trend Prediction
- Risk Prevention
- Radiation Monitoring
- Information Sharing

PI System™ Components

- PI Server™
- PI ProcessBook™
- High Availability (HA)

Leveraging the PI System to achieve safe and efficient nuclear power management

Founded in 1997, JiangSu Nuclear Corporation, Ltd ("JiangSu Nuclear") is responsible for the construction, commercial operation, and management of the Tianwan nuclear power station. Currently, the 2 nuclear generator units from phase 1 are in commercial operation, construction of units No.3 and No.4 from phase 2 is in progress, and construction of units No.5 and No.6 from phase 3 has commenced. Yang Qiang, Senior Engineer from JiangSu Nuclear introduced how they use the PI System is used to manage data and achieve business intelligence in a large nuclear power plant at the 2016 OSIsoft China Users Conference.

There are three stages in terms of the application of PI System for JiangSu Nuclear. In 2006, they purchased a 1,000 data point PI System to display sensor data from the units. But, the measuring points were not sufficient, the amount of data collated was not comprehensive, and the system also lacked effective tools to analyze data. So, in 2010, they expanded and upgraded the system to 100,000 data points. In 2011, various functional modules were further optimized and upgraded. Now, all the production process data can be extracted in real-time with the PI System and displayed in charts or tables for analysis or cross comparisons.

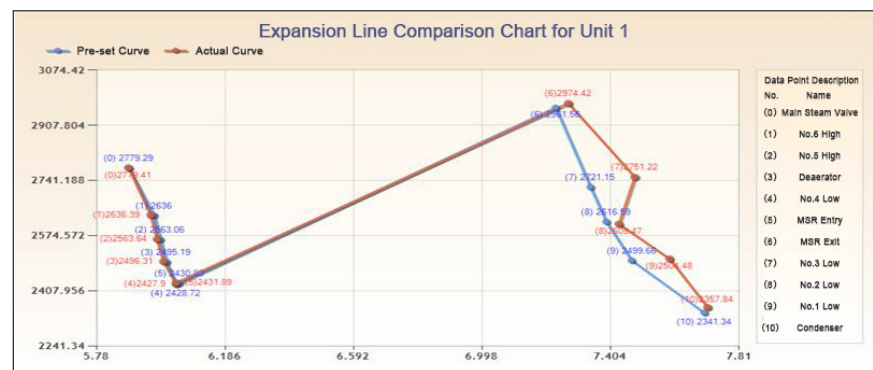
During his talk, Yang focused on the following points regarding the role of the PI System in the production and operation of JiangSu Nuclear:

Real-time production monitoring and analysis with PI ProcessBook

"PI ProcessBook can present data from the various processes in flowcharts to our staff at different levels making it easier for us to understand the real-time data of our power plant." Yang added, "our current measurement frequency is 5 seconds and our staff can independently carry out trend analysis and historical data query on the platform."

Unit performance calculations and monitoring

The power generation units are the core equipment in the nuclear power plant and monitoring their performance closely and precisely is essential for the plant's safe and efficient operation. "Performance calculations are mainly performed at the unit and equipment levels. Real-time calculations and analysis of equipments' specific performance parameters (power, efficiency, energy consumption, output, cavitation, terminal temperature differences, temperature rise, heat transfer coefficient, cleanliness, and so on) are carried out and the various performance parameters are quantified for performance monitoring purpose." Yang continued, "as shown in the diagram below, the blue curve is the pre-set curve while the red curve represents the operating data in real-time. When there is a deviation between the two curves, our engineers are able to analyze and diagnose the issues in time."

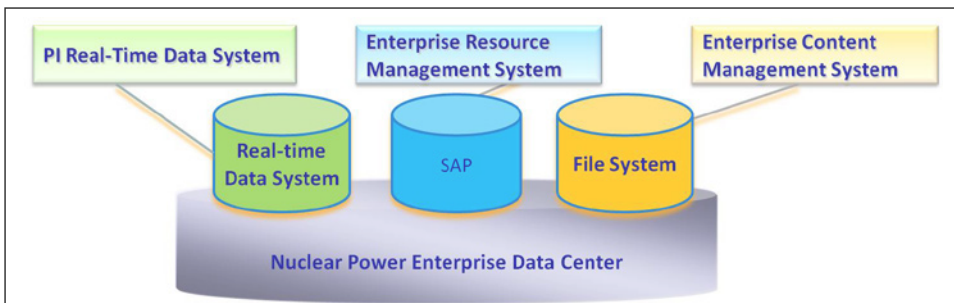


Radiation risk control

Yang described, "radiation risk information can provide real-time and on-site radiation data to staff(s) who are involved in maintenance, operations, and radiation management, so that the person who in charge can make data-driven decisions to take appropriate protective measures to ensure the safety of the staff as well as the units." This includes four key functions: radiation monitoring, data query, data management, and parameter maintenance.

Integration with other data platforms in the data center

The information system in JiangSu Nuclear consists of three basic data platforms, namely: real-time data system (PI System), enterprise resource management system (SAP), and enterprise content management system (ECM). Yang said, "we are going to integrate and associate data from different sources so that our staff can view different data within the same platform. For example, the operators may be concerned about the factory floor plan while the equipment engineers may be interested in the 3D model of the equipments and we can integrate all these data on a single platform."



Integration with CNNC to eliminate information silos and manage equipment reliability

"Next, I would like to introduce the equipment reliability database, it is based on PI System and was implemented by CNNC (China National Nuclear Corporation) throughout the industry. This reliability database concentratedly extracts and displays operation data from all the units in every nuclear power plant under CNNC. For similar equipments (such as steam turbines and transformers) in different nuclear power plants, we can perform horizontal or vertical comparisons so that one power plant can access and learn from the experiences of other power plants and refer to the data and parameters from their industry peers. It helps share information within the CNNC group." Yang continued, "from the perspective of CNNC, this establishes a management system where the group can monitor the reliability of all the enterprises in the group."

Regarding how to leverage PI System more in the production and operations of nuclear power for the future, Yang said, "in terms of the PI System deployment, we will migrate to a high availability architecture and, at the same time, migrate to a virtualized framework in order to optimize the overall information architecture of the power plant." Yang continued, "we are also looking at integration with a big data platform. The PI System, as the source of real-time data, can use the SAP HANA IoT Connector module to integrate with HANA to build the big data platform and eventually implement a closed-loop equipment reliability management system and equipment deterioration warning management system that is based on big data technologies."

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- Yang Qiang
Senior Engineer
JiangSu Nuclear