SOLCEP

Online Performance Monitoring System

Westinghouse

The SOLCEP solution provides a monitoring model that efficiently and continuously calculates the heat rate and power of nuclear, thermal, and combined cycle power plants under any operating conditions.

This allows users to automatically record a wide range of data that can be used for analysis and diagnosis, thus optimizing decision making and improving the knowledge and experience of the work team.

The SOLCEP solution optimizes plant operation, identifying possible deviations early to save time and resources. Key benefits of SOLCEP include:

Performance Improvement

- On-line monitoring of plant performance identifies and quantifies performance losses.
- Identification of the causes of system or equipment malfunctions: operational, maintenance or local actions.
- A multitude of historical data can be recorded for analysis and diagnosis.
- Diagnostics provide understanding of the events taking place within the plant, directed by expert knowledge and data science, which allows the plant to operate at the best possible production level.
- Early detection of deviations related to failures in equipment, allowing prevention of critical incidents.

Operations and Maintenance Cost Reduction

- SOLCEP supports decision-making on operations and maintenance strategies, monitoring key equipment and its parameters.
- The quantification of deviations can be obtained in both energy and economic terms.
- Maximizing plant performance, with a return on investment within 6 months.

Human Performance Improvement

- SOLCEP allows plant personnel to diagnose equipment and system malfunctions related to thermal efficiency, thus optimizing the plant's operating strategy.
- Improves fleet operations experience, since information from previous diagnostics can be stored and shared.
- Provides support to experts for decision-making.

Technology Expansion

- Tool is technology-agnostic with specific models created for each plant.
- Designed in Windows environment.
- Easy-to-use interface and great versatility for users.
- Allows different permission levels for different users.
- System is auditable.

Description

The SOLCEP solution allows for either continuous or periodic monitoring, providing effective diagnostics and the quantification of power deviations to obtain maximum performance..

SOLCEP solution is designed to:

• Monitor and quantify current operating conditions based exclusively on plant instrumentation, identifying the equipment that is limiting plant capacity.

• Determine the contribution of each individual deviation (system, component, and operating parameter) in both plant efficiency and maximum power deviations.

• System diagnostics and equipment status for scheduling maintenance stops and ordering spare parts.

• Support the decision process for changes in steam cycle design.

• Generate predefined reports, to a specified cadence or on demand, as well as customizable reports configured by each user.

• Store historical data for analysis and diagnosis, obtained at any time in the form of graphics, reports or offline sessions (Replay).

Some of the causes of global plant efficiency and maximum power deviations which include SOLCEP solutions for diagnosis are:

• Steam generator degradation

• Turbopump degradation

• Steam turbine degradation and seal leakage

• Heater degradation

• MSR degradation

• Condenser or vacuum equipment or circulating water pump degradation

• Cooling tower degradation

• High consumption of electric auxiliary equipment

• Unwanted leakages

• Unwanted recirculation

• Losses in RCS system

## The SOLCEP process is based on the following steps:

Data Acquisition

The plant's data acquisition module is in continuous communication with the data server, acquiring data every 10 to 60 seconds. Calculations are made at time intervals of between 2 – 5 minutes where both arithmetic mean and standard deviation measures are calculated for each of the plant variables collected at that time.

Data Validation

The data validation module is focused on quality of data and also establishes the necessary conditions for calculating efficiency with high accuracy.

Once all the calculations have been finished (both current values and target values), the logical statements for alarm activation must be evaluated. Alarms are activated when their thresholds are reached due to deviations of variables or impacts on specific consumption.
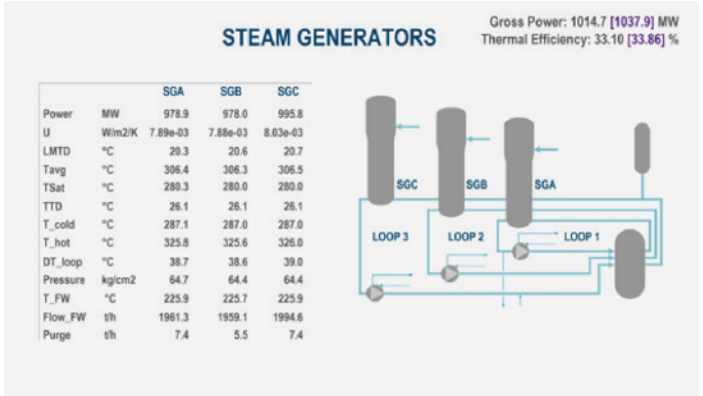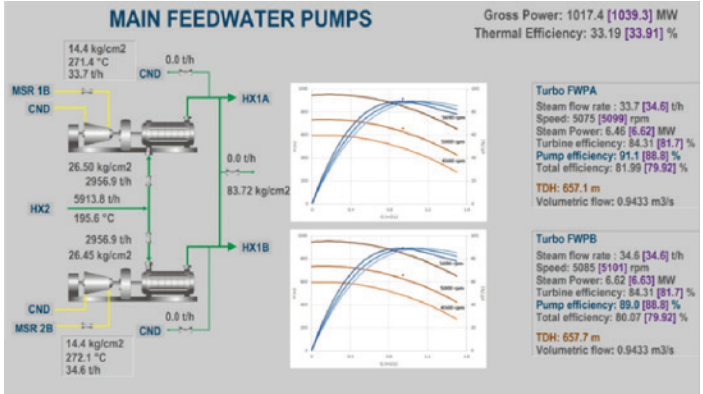
Description (continued)

Mass and Energy Balances (ASME) to calculate plant, systems, and efficiencies
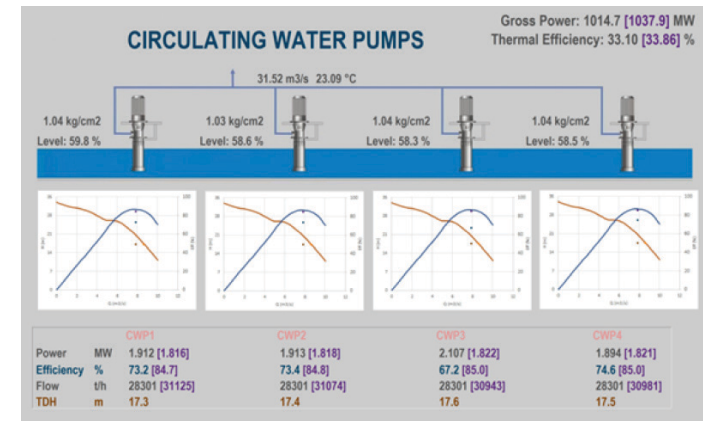
The efficiency calculation module is based on different submodules or components (condenser, steam turbine, etc.). There is a sequential calculation order.

Target Values Evaluation

The target values module calculates global target values, such as turbine efficiency. It also evaluates the primary variables' deviations impact (condenser pressure, cooling water input, etc.) on global specific consumption deviation. Deviation causes are then identified and corrective actions can be taken.
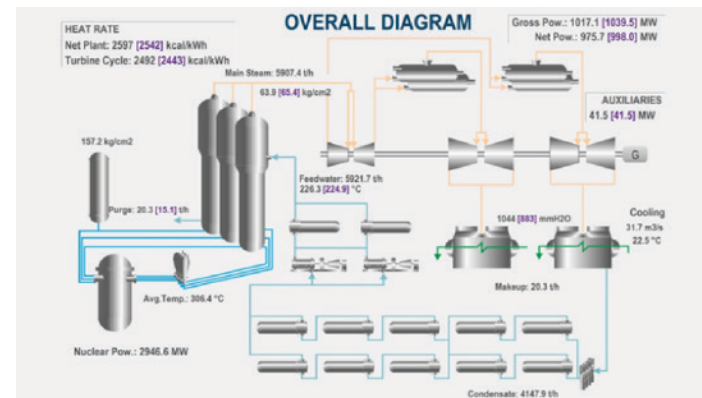
Assisted diagnostics allows the operator to identify the malfunction or degradation that is taking place in the plant. When faced with a malfunction or degradation, the «diagnostic» column will show the possible causes while the «verification» column will show the actions that need to be taken by the operator to limit the problem. The primary objective is to produce a quick and clear diagnostic.

As a last step, both the validated data along with the calculated data in each module are stored in a historical database.
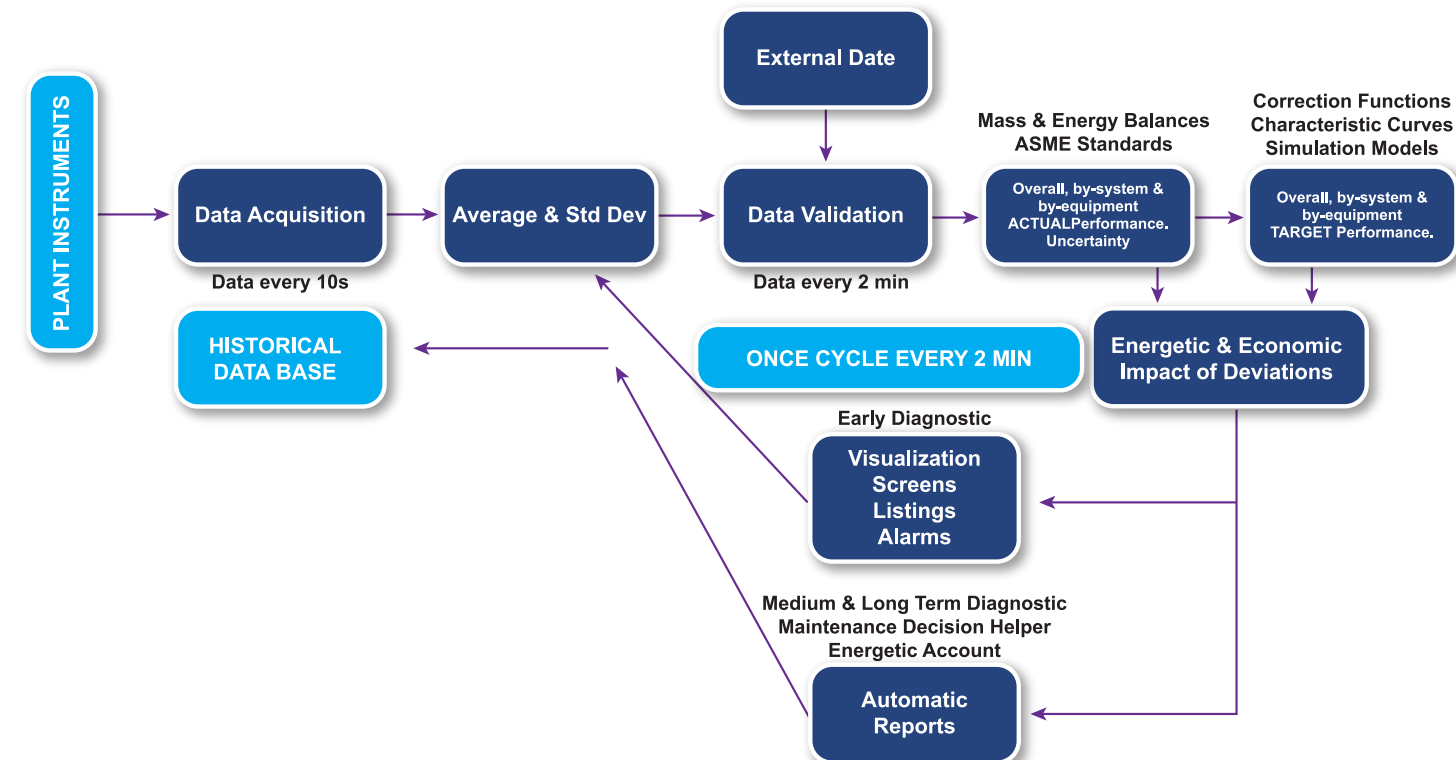

In summary, SOLCEP provides a solid framework for efficient power plant operation by providing online monitoring of plant performance to identify and reduce performance losses.

It is a useful tool for plant personnel to diagnose equipment and system malfunctions related to thermal efficiency. It can optimize plant operation by improving efficiency and safety, as well as avoiding critical failures to save money. This tool brings together all the experience accumulated by Westinghouse over the last 60 years in power plant, thermal-hydraulic and asset management processes and operations.

Over the past 20+ years, SOLCEP has been implemented in more than 65 plants and continues to add new functionalities and features. It is operational in nuclear, combined cycle, coal-fired and cogeneration plants all over the world.

Why Westinghouse?

SOLCEP provides a monitoring model which allows utilities to efficiently and continuously calculate the specific consumption and power of nuclear, thermal, and combined cycle power plants under all operating conditions in order to optimize their performance.

In addition, SOLCEP allows users to automatically record a wide range of data which can be used for analysis and diagnosis to optimize decision making and improve the knowledge and experience of the work team.

The SOLCEP solution optimizes plant operation, identifying possible deviations early which saves time and resources.

Westinghouse SOLCEP solutions have been implemented in more than 65 nuclear, combined cycle, coal-fired and cogeneration plants globally.

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