

EnergiTools Performance and Diagnosis Tools for Finding Lost Megawatts

Background

Lost megawatts continue to be a major issue related to secondary-side plant performance. Recovering these lost megawatts is a cost-effective way to increase the power output of the plant number, while helping the utility to remain competitive in the deregulated marketplace.

Description

EnergiTools™ is online balance-of-plant performance monitoring software that utilizes information from the plant computer via the plant's data acquisition system in order to analyze plant performance and diagnose likely causes of lost megawatts. It uses an analytical model with an intuitive graphical user interface that enables the user to accurately model the state of the plant compared to an optimized model and view it in real time. Engineers, operators, managers and executives can view the resulting information, enabling them to understand the actual plant thermal performance and make informed decisions allowing changes, upgrades and causes of significant lost megawatts.

EnergiTools consists of two main tools: Performance and Diagnosis. The PerformanceTool works online and utilizes measurements from secondary-side plant instrumentation, which are then transmitted to the plant computer in order to determine the performance indicators of the secondary-side components. This tool identifies any location component that has a deficiency

in its performance that would result in a reduction in the overall megawatt output of the plant. Additionally, comparisons are made to the baseline performance, in order to determine the number of megawatts that are lost.

The DiagnosisTool utilizes the results of the PerformanceTool in conjunction with the latest technological advances. Steam turbine, feedwater heater, condenser, and other balance of plant component experts were consulted to determine the symptom-cause relationship associated with equipment performance degradation. The symptoms and root causes are then compared, using Bayesian statistics to determine the probability of each possible root cause. Steam turbine, feedwater heater, condenser, and other balance of plant component experts were consulted to determine the symptom-cause relationship associated with equipment performance degradation. A combined estimate considering real-time plant reactor power measurements and their probability distributions is also available.

The EnergiTools software is designed to run as a client/server configuration on Microsoft Windows. This allows EnergiTools to be easily integrated into the plant IT networks, allowing multiple users in various locations. The software was written with an open architecture design utilizing modern object-oriented C++ programming and an open-standards-based SQL database.

Features

The following services can be easily accessed through icons on the main interface toolbar or through the services menu:

Activity Viewer – Monitors activities within EnergiTools, such as user activities and error conditions

DAS Gateway – Defines the user's data acquisition system for the purposes of mapping and translating information from the plant to the PerformanceTool database. (Standard drivers provided with EnergiTools

allow for the connection of EnergiTools to a variety of popular data acquisition software packages.)

Display Designer – Allows the user to create a number of different types of displays with many customizable features

Display Viewer – Allows the user to view displays built with the Display Designer and dynamically view in real time

Plant Modeler – Offers a palette of components to build a working mathematical model of the user's unit configuration

Report Viewer – Provides access to standard PerformanceTool reports as well as custom reports created with Crystal Reports™ Steam Water Air Gas (SWAG) Calculator – Allows the user to compute various values for thermodynamic properties

Task Scheduler – Allows the user to schedule one of a set of predefined activities for a single period of execution (e.g., user-customized reports that can be generated and printed at preset times or predetermined intervals)

User Manager – Allows the user to set up user names, passwords and user classes with custom display formats

Benefits

- Find lost megawatts from degraded performance of secondary side components
- Evaluate reactor power errors
- Diagnose and prioritize potential causes of component degradation or lost megawatts
- Establish multiple performance baselines
- Quickly do design change evaluations and “whatif” calculations with online or offline data

Why EnergiTools

- Proprietary, advanced, numerical, methods-based
- Data Qualification algorithm. This allows the accurate calculation of plant performance even when using inaccurate or limited plant instrumentation. Other systems are not as accurate or stable, as they often use simple correlations or lookup tables to estimate missing or inaccurate instrumentation.

- Designed specifically for plant performance data analysis; however, it can also be used to evaluate design changes. Other software packages are primarily suited for design evaluations of plant performance. These codes can be cumbersome or difficult to use when evaluating plant performance data.
- Fully iterative heat balance calculation using first principles-based models of the plant's components.

Other codes use simple lookup tables to estimate performance and may not be fully iterative.

- Flexible calculation modes. It's very easy to build a new model based on actual plant data or do a “what-if” calculation with the same data. This type of calculation mode is not available with other products.

Experience

EnergiTools is currently in use at the Ringhals site in Sweden, Comanche Peak, South Texas Project, Ft. Calhoun, Waterford 3 and Kewaunee.

WESTEMS and LIFETIME are trademarks or registered trademarks of Westinghouse Electric Company LLC in the United States and may be registered in other countries throughout the world. All rights reserved. Unauthorized use is strictly prohibited.