TrendMiner
A SOFTWARE AG COMPANY

INDUSTRY
Energy Generation
Non-Renewable

PROCESS TYPE
Continuous

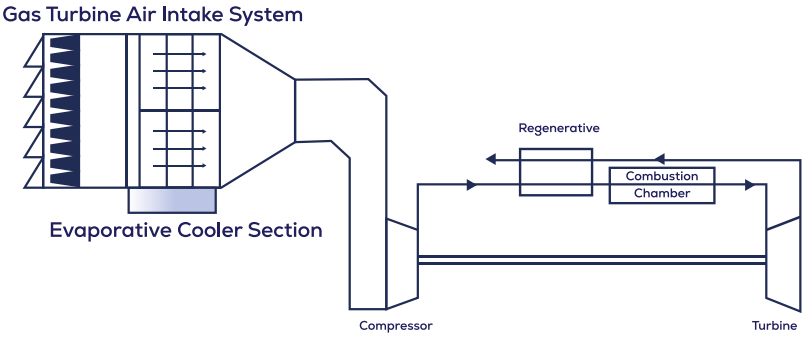
ANALYTICS TYPE
Correlation Analysis

KEY OBJECTIVE
Increase cooler performance

Production Increase Through Correlation Analysis in a Cooler of a Combined-Cycle Plant

BACKGROUND

A combined cycle coal plant has a gas turbine air intake system that includes an evaporative cooler. The cooler is operated depending on meteorological conditions (warm air temperature or high humidity, for example). The cooled airflow then supplies air to the natural-gas turbine. When humidity is high and there are water droplets on the turbine blades, the blades begin to deteriorate. This leads to higher maintenance costs. In extreme situations, the turbine can break and force its replacement. Therefore, it is imperative that the cooler function as expected.



CHALLENGE

At times when the cooler is expected to operate, it has failed to perform. Engineers have hypothesized that adverse weather conditions negatively affect the cooler's performance. However, they have had difficulties correlating weather changes with the cooler's ability to provide better air quality for the turbine. Therefore, they have been unable to prove their hypothesis and determine the root cause of the cooler failures.

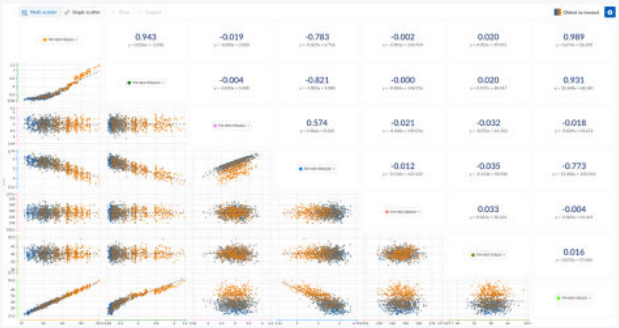
Challenges

- Finding relevant tags to be considered
- Detecting non-optimal cooler operation times

SOLUTION

- Perform a value-based search to identify periods of good and bad behavior of the evaporative cooler with specific operating conditions (normal conditions, high temperature conditions, and so forth)
- Use scatterplots to find correlations among parameters
- Set up a monitor to look for periods when the cooler should be functioning and send alerts to key personnel

RESULT



- Using TrendMiner, engineers could see on a scatterplot that there was a strong negative correlation (-80%) between the ambient temperature and the power output of the cooler
- This correlation shows that whenever the ambient temperature decreases, the cooler needs more power to reach the correct conditions; if it increases, the cooler consumes less power
- Furthermore, they discovered 12 periods where the cooler was not running when it should have been
- By increasing the work time of the cooler and installing a monitor, engineers were able to increase production by 1%
- In the future, engineers will be notified when the monitor detects that the cooler is not performing correctly

TRENDMINER FEATURES USED

DATA VISUALIZATION MODES

TrendMiner offers various visualization modes for analyzing time series data. Besides the common time trend, time series data of multiple tags can be shown in a stacked mode for specific time sequences or can be grouped together in a "swim lane." For multivariate analysis, our software offers a multi-scatterplot that shows tag histograms and multiple histograms of each pair of the selected tags.

ALERTS & NOTIFICATIONS

Process experts can use TrendMiner to create batch fingerprints and monitor production processes in relation to these fingerprints. Automatic notifications can be inputted into our software to alert engineers and operators when patterns of interest are detected. TrendMiner supports various notification mechanisms, including embedded inbox and email alerts. These notifications also include suggested courses of action and can be designated to trigger a webhook to fire a workflow in other business applications, such as the maintenance management system.

DIAGNOSE

TrendMiner's Diagnose feature gives suggestions for correlations and fingerprint deviations based on selected time frames, tags, and layers. Our software provides an almost instant analysis across all indexed tags by combining information from multiple similar situations thus avoiding false correlations. Using automatic time shifts, it helps detect early indicators of deviating behavior.

VALUE-BASED SEARCH

A value-based search is used to find anomalies in the time-series data by analyzing criteria, numerical values, and limits.

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