TIBCO Spotfire for Machine Sensor & Maintenance Analytics

This datasheet covers the following maintenance use cases:

- Root cause analysis for proactive maintenance
- Predictive maintenance with automatic notification of impending failures
- Choosing the best maintenance strategy to minimize maintenance costs

The massive expansion of connected sensors promises new business opportunities for monitoring machine performance and failures in the field and on the factory floor. Service organizations have up-sell opportunities to offer options to their customers for maximizing value of their assets. Manufacturers can increase uptime, minimize costs, and optimize processes for expensive equipment on the factory floor.

TIBCO Spotfire® helps organizations optimize maintenance schedules by monitoring and responding to key signals in sensor data. In general, fixed assets—vehicles, plants, and machinery, communication devices and computers, and even buildings, are becoming smarter. But they are also becoming more complex and more costly to repair. Spotfire offers the only analytic platform that will help you understand these machines more fully, monitor them in real time, and react faster to impending issues.

CHALLENGES TO MANUFACTURERS

Increasingly firms are looking for tools to help them make sense of the many and varied data sources so they can reduce operating and capital budgets, maximize return on asset investments, and maintain compliance with safety and regulatory requirements in areas such as emissions and waste.

Constant monitoring of real-time sensor data, and mashup with external data sources, offers the promise of better understanding of the root causes of machine failures and operational variances, and the ability to intervene proactively to minimize failures, downtime, and performance characteristics outside of set norms.

This better understanding of assets should also allow companies to formulate more sophisticated maintenance strategies, moving from run-to-fail or preventive, to new models of predictive and proactive maintenance that better optimize cost and downtime. In turn, there are often associated benefits in terms of better machine performance and reliability, fewer unexpected fails and warranty claims, and increased customer satisfaction.

WHY SPOTFIRE?

Spotfire is an integrated analytic platform that allows users to easily improve decision-making and share critical business insights.

Finding insight from multiple data sources can be difficult when these sources are siloed and in multiple formats. They can be challenging to combine and integrate. Spotfire allows all the relevant data to be mashed up in one place—whether it's historic or real-time, structured or unstructured. This capability allows you bring machine and product performance data together with streaming sensor data, historical data, maintenance costs from your ERP, and environmental data such as weather conditions.

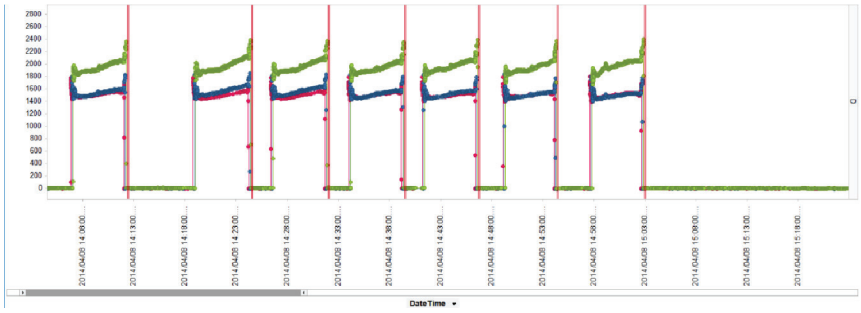
You can now begin to truly understand your assets and the causal relationships among the many factors that affect their performance and potential failures. Spotfire allows you to rapidly visualize distributions and investigate outliers and help you build a model of reliability and performance.

This model can now be used to monitor real-time performance and identify when asset performance begins to deviate from the norm. These deviations can then be used to predict issues such as future asset performance, costs (for example, increased fuel consumption) and failure times. Spotfire can then be used to trigger appropriate interventions and corrective actions.

ROOT CAUSE ANALYSIS FOR PROACTIVE MAINTENANCE

Machines may have a number of sensors that measure parameters like temperature, pressure, flow, voltage, or current. Root cause analysis is used to determine which sensor parameters and trace signatures have the greatest value for predicting machine failure or product quality.

The original sensor trace data—real time or historian—can be retrieved along with machine status data into compelling Spotfire visualizations that bring immediate insight.

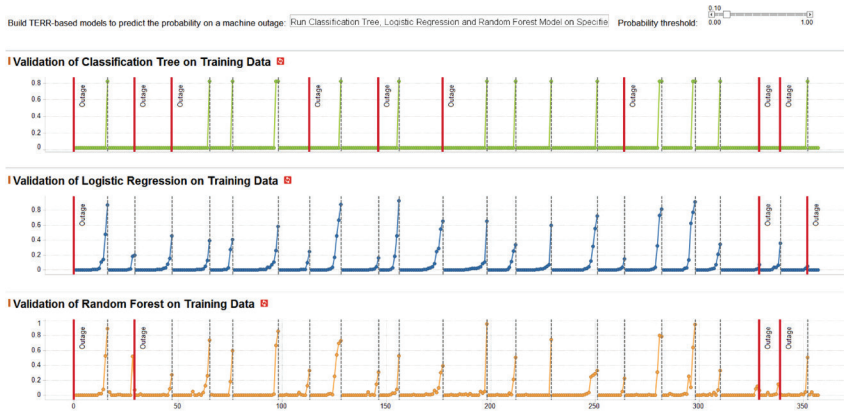


Trace data for 3 sensors

In addition, models can be fitted to gain insight into the key factors that affect machine or product characteristics, and this knowledge used to proactively improve process or maintenance procedures.

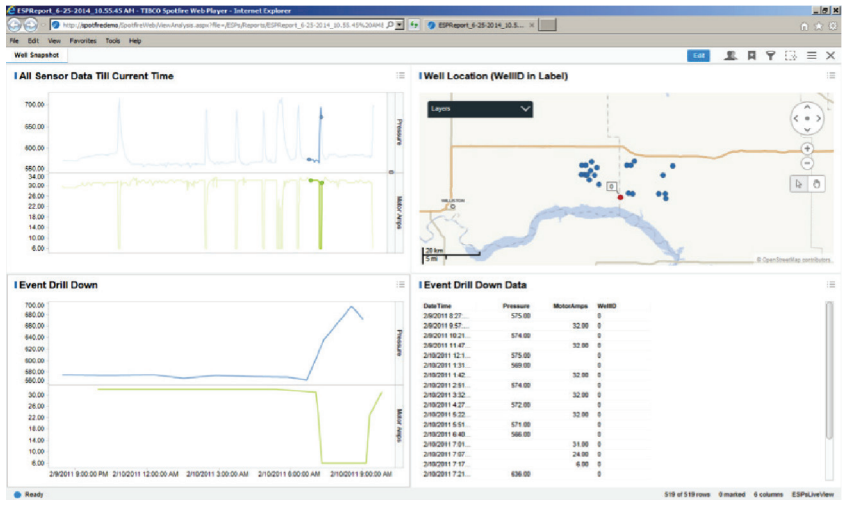
PREDICTIVE MAINTENANCE AND AUTOMATIC NOTIFICATION OF IMPENDING FAILURES

Models that predict failures from sensor data are also used to trigger just-in-time machine maintenance, thus avoiding both unexpected downtime and unnecessary maintenance. Models in Spotfire are built using out-of-the-box regression and classification capabilities or a wide variety of more advanced models deployed with R, S-plus, SAS, Matlab, or Teradata functions. Multiple models can be fitted and then evaluated to select the one with the best ability to predict.



Comparison of classification, logistic regression, and random forest models to accurately predict machine failures.

Once selected, a model is deployed directly from the Spotfire analysis to the event analytics engine. This engine monitors all real-time incoming sensor data, scoring it against the model. When the model predicts that a machine failure is imminent, automatic alerts are triggered.

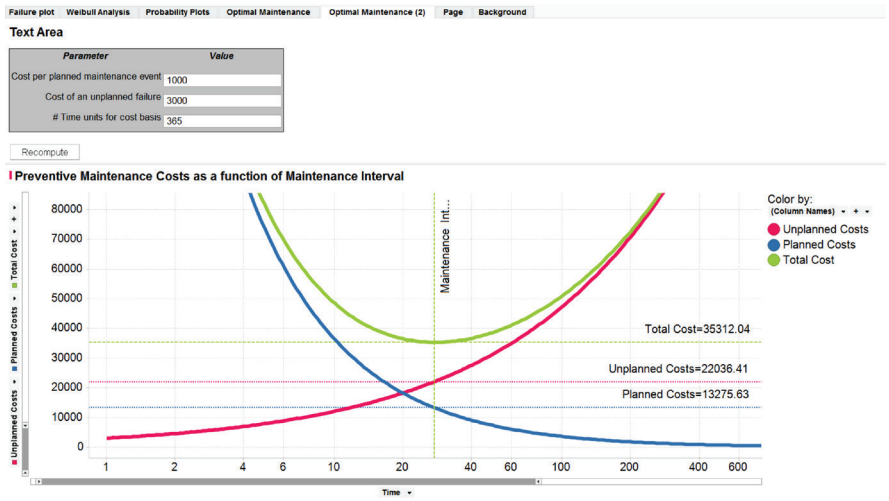


Diagnostic Spotfire analysis showing remote machine location, sensor traces, and values.

MINIMIZING MAINTENANCE COSTS

For any machine or component, estimates of failure probability as a function of time are modeled. The failure probability function is then combined with information on the costs of planned and unplanned downtime to determine the optimal maintenance frequency in order to minimize costs.

When a predictive model has been selected, the analysis can be extended to compare costs of run-to-fail, preventive, and predictive maintenance strategies using baseline historical fail data.



Calculation of optimal preventive maintenance frequency.

TIBCO Spotfire
281 Summer Street,
3rd Floor
Boston, MA 02210
+1 866-240-0491 US
+44-800-520-0443 EUR
www.tibco.com
spotfire.tibco.com

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