Prognostics Framework®

PROGNOSTIC ANALYSIS SOFTWARE

FEATURES

- Real-time health and status monitoring
- Remaining useful life calculation
- Condition-based Prognostics
- Reliability-based Prognostics
- Accurate, Fast, Efficient run-time assessment based on current conditions and symptoms
- Powerful diagnostic fault isolation
- Framework integrates data from any source
- Scalable to any size system
- Flexible framework integrates data from any source
- Practical approach to model development includes many automated data capture tools
- Implements diagnostics and prognostics on mechanical, electrical and hybrid equipment

APPLICATIONS

- Health Management Systems (HMS)
- Embedded Prognostic & Diagnostic Systems
- Condition Based Maintenance (CBM) Systems
- Predictive Anticipatory Maintenance
- Smart Sensor Applications
- Off-platform Time Series Analysis
- Off-platform Preventative Maintenance Solutions

Prognostics Framework® is an analysis software framework that implements real-time prognostics, diagnostics and status monitoring to support embedded prognostics applications, Health Management Systems (HMS) and Condition Based Maintenance (CBM) applications.

Prognostics Framework includes both an Integrated Development Environment (IDE) for developing the prognostic/diagnostic capability and a powerful, dynamic run-time software analysis engine that performs continuous on-line assessment of the system or equipment being monitored.

The Prognostics Framework run-time is deployed as a integral part of the system. During system operation, the system operational data, built-in test (BIT) data and sensor data is input to the software to continuously assess the system's health, identifying existing faults and impending failure events.

The Prognostics Framework software institutes an information framework that organizes relevant data related to 1) the condition of the system, 2) the system's ability to perform required functions over specific time intervals, and 3) the need for maintenance actions and repair parts.

The Prognostics Framework is a framework for integrating data from multiple independent sources and from a wide variety of systems or equipment into one cohesive analysis. This enables maximum use of available data, the ability to augment pre-existing systems already in place, and a system-level view of the condition of all equipment. The software is capable of hosting any mathematical calculation or algorithm to support a wide variety of predictive techniques, as well as usage calculation, data input filtering, smoothing and general pre-processing. The software includes a library of common algorithms.

MATHEMATICAL CALCULATIONS & ALGORITHMS

- Least Squares Best Fit (LSBF) Trend Extrapolation
- Detect out of limit values
- Counts per interval
- Detect sensor failure
- Reduce sensor noise
- Analyze false alarms
- Apply filters (e.g. M of N)
- Auto-Baseline
- Mask input data based on state or other criteria
- Accumulate operating time and stresses
- Projected replacement date

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BENEFITS

Failure Avoidance

- Increased reliability
- Increased security
- Reduced down-time
- Reconfiguration of systems with redundancy

Failure Prediction

- Accurate readiness assessment
- Decision support
- Efficient maintenance based on condition
- Streamlined preventative maintenance
- Anticipates spares and tools required for maintenance

Maximized use of existing data

- Augments existing maintenance systems
- Captures expert knowledge in a format easy to deploy and maintain – every technician can have access to the best expert
- Implements prognostics and diagnostics side-by-side for a complete solution

CONDITIONS ASSESSMENT

The Prognostics Framework analyzes all provided data inputs to (1) predict failures, (2) isolate current failures, (3) monitor equipment state/mode, and (4) calculate Remaining Useful Life (RUL) of key components. Each prediction includes a timeframe (prediction time horizon), a confidence, and distinction between critical and non-critical impact. These outputs are then correlated to the functional capability of the equipment or system and maintenance requirements. The result is a complete and comprehensive assessment that supports both operations and maintenance decision making.

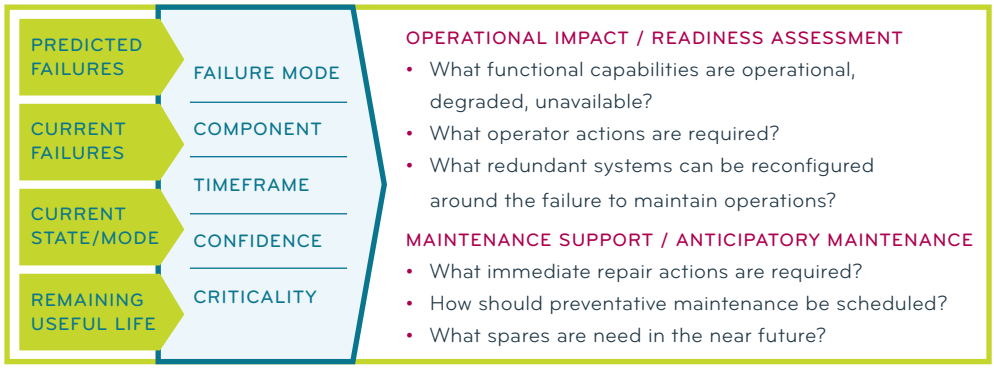
EMBEDDED OR OFF-LINE

The Prognostics Framework is designed to accept streams of real-time data and is optimized for embedded and real-time applications. However, the Prognostics Framework can also be used off-platform as an analyzer of historical or near-real-time data to identify system conditions, anticipate maintenance needs and replacement parts logistics, and optimize overall maintenance efficiency.

PRACTICAL APPROACH & EXPERIENCE

The Prognostics Framework was used to implement a complete Health Management System (HMS) on one of the first radar systems to require prognostics as a key element of its overall solution. Other applications include complex computer networks, power generators, power supply, cooling, and environmental systems.

The Prognostics Framework is also well suited to distributed and remote systems, such as wind turbines and solar power. Remote systems receive maximum benefit from the Prognostics Framework's remote monitoring capabilities.



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