Trends in Asset Monitoring and Prognostics

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Abstract- This presentation introduces signal processing techniques as applied to specific machine components with a focus on the output and use with prognostics technologies. With properly organized outputs, prognostics algorithms transform the fleet condition and health management challenge into a deployable fleet health management solution. This approach includes data and model driven failure patterns, sensory data connectivity from deployed assets, prognostics analytical applications, and advisory generation outputs which guide the asset owners and maintainers. To illustrate the concepts, a Wind power asset monitoring case study is presented.
A data-driven approach is applied to model power curve continuously, which is entailed within a two-tier framework that employs Prognostics and Health Management (PHM) techniques for wind turbine monitoring. A set of measurements during a known good condition is utilized to setup a baseline model. Regular power curve measurements are then compared while taking into account the multi-regime dynamics of the turbine.
The approach was implemented using NI LabVIEW's Watchdog Agent® Toolkit and was successfully validated using actual SCADA data collected from an on-shore wind turbine.
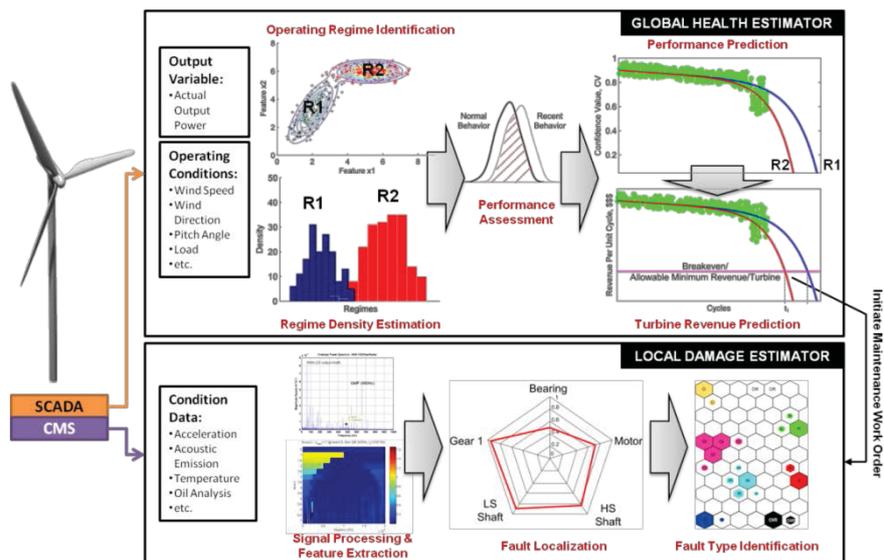
Figure 1. Systematic Methodology for Wind Turbine Prognostics

II. Conclusions

This paper presents an advanced framework for wind turbine prognostics and health management. A Global Health Estimator is proposed to enhance current performance testing practices advised by an IEC standard. It is generated with SCADA data to indicate and predict turbine unit overall performance. A Local Damage Estimator is computed to evaluate degradation status of critical turbine drivetrain components, and locate the fault that is the root cause of turbine performance degradation. A case study is presented where Gaussian Mixture Model and L2 Distance are used to compute the GHE. The implementation of GHE computation is presented with Watchdog Toolbox® in National Instruments LabVIEW.

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