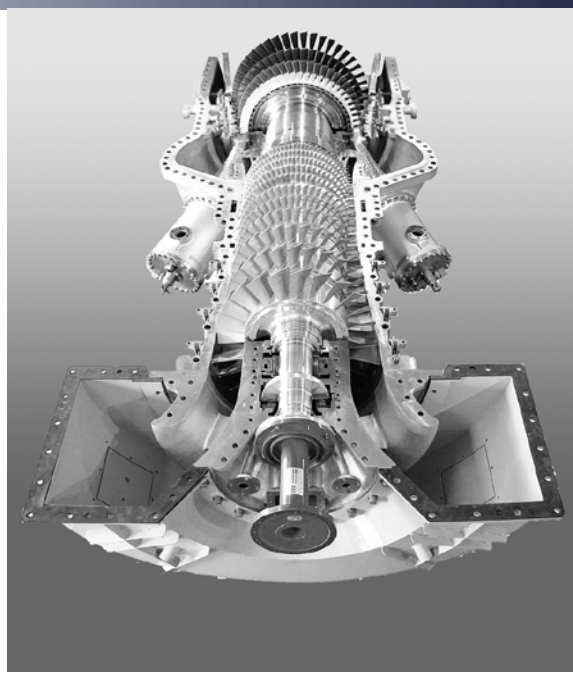
Engine Health Management

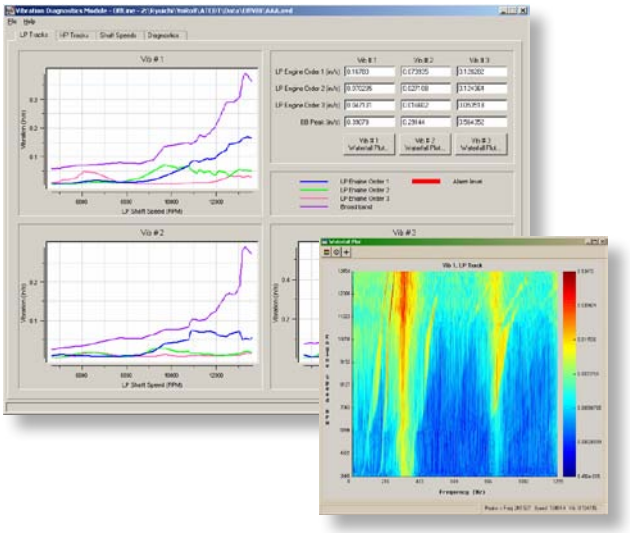
Improved engine test cell diagnostics

Impact Technologies has developed advanced diagnostic software modules that are focused specifically on improving engine test cell diagnostics. The advanced diagnostic modules include sensor fault detection, performance assessment, vibration diagnostics and automated troubleshooting modules. These modules are designed for easy integration into new or existing COTS hardware platforms and will soon be integrated into the F404/414 test cells in Jacksonville FL and the F100 engine test facilities at AEDC.



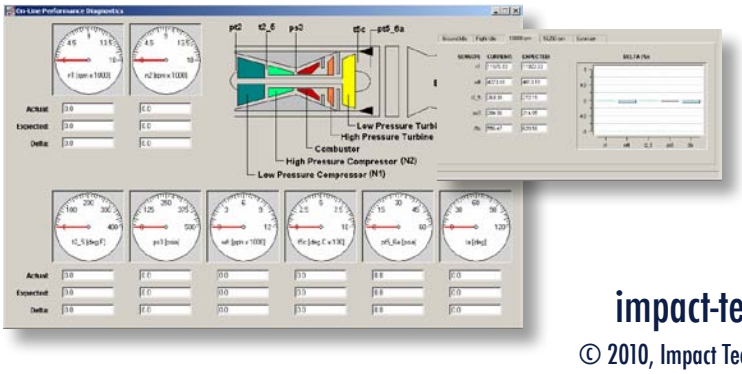
Vibration Diagnostics Module

Real-time assessment of mechanical faults (i.e. bearing, rotordynamic, and structural) using vibration signatures at specified locations on the engine has been developed using feature-based diagnostic techniques. Domain knowledge associated with particular vibration fault frequencies, fixed frequency ranges, per-rev excitations, and structural resonances are extracted from the vibration spectrums acquired from the test cell. For a particular engine type these spectrums are used to develop a knowledge base from which automated reasoning algorithms are customized for diagnosing mechanical faults.



Performance Diagnostic Module

Validated sensor data is analyzed by automated fault detection and diagnostic routines for classification of engine performance faults. These routines are based on extensive knowledge of how healthy engines operate under normal test cell conditions (based on engine test cell data and engine models), and any deviation from this “normal” pattern of expected parameters will be detected and further analyzed.



impact-tek.com

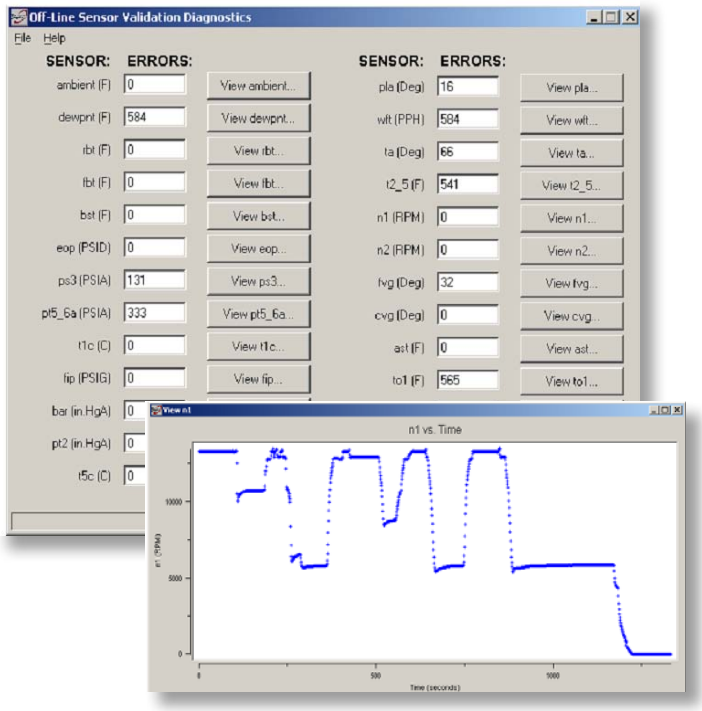
Headquarters
New York Office
200 Canal View Boulevard
Rochester, NY 14623
Phone: 585.424.1990
Fax: 585.424.1177

Pennsylvania Office
270 Walker Drive, Suite 200W
State College, PA 16801
Phone: 814.867.5122
Fax: 814.867.7550

Georgia Office
75 Fifth Street NW, Suite 312
Atlanta, GA 30308
Phone: 404.526.6188
Fax: 404.526.6189

Sensor Validation Module

Impact's test cell sensor validation software utilizes a combination of model-based and generic signal-processing based approaches to ensure the highest possible detection confidences with minimal false alarms. Signal processing techniques such as digital filtering, signal correlation and FFT's are implemented to detect signal spiking, drop-out, noise and short/open circuits. Model-based techniques are used to distinguish between performance faults and signal drift, as well as other sensor faults. Implementing such a comprehensive sensor validity module is a critical first step towards successful downstream analysis processes that utilize the data for assessing performance degradation and engine faults.



Fault Isolation Troubleshooting Module

Inherently, troubleshooting involves determination of the proper maintenance action by evaluating the results of a logical path of observations. Traditionally, troubleshooting is initially performed with a manual then develops into an intuitive process as the maintenance person gains experience. To shorten this learning curve, Impact has developed an artificial intelligence-based troubleshooting guide that allows experience be automatically built in from the start and then updated as the system is utilized.