Customized Embedded Monitoring Systems

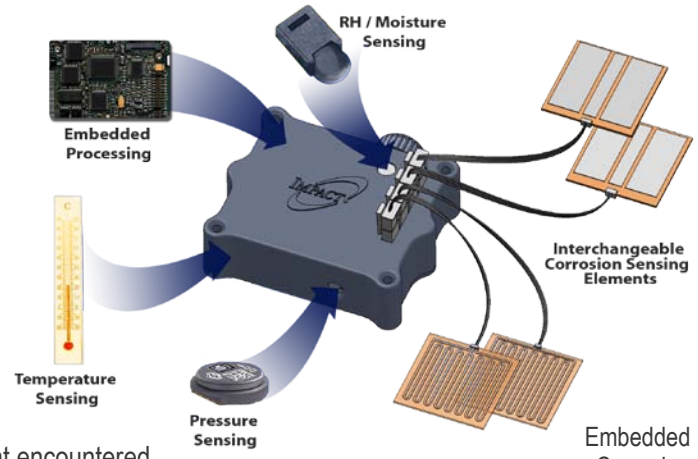
A low-powered monitoring and processing a platform to enable low cost health tracking

Impact Technologies, LLC has developed a low-powered monitoring and processing platform to enable low cost health tracking of a variety of remote or hard to access assets. This platform is integrated into a customized package used to satisfy the end-customer's specific asset monitoring needs. The overall system typically incorporates commercial sensing technologies to feed on-board system health tracking calculations.

Benefits from Embedded Monitoring

Embedded monitoring provides substantial safety, readiness and asset ownership cost benefits by providing a continuous cost-effective assessment of the health and status of critical hardware. These real-time calculations enable the asset owner to:

- Make informed go/no-go decisions through knowledge of the current health status of safety-critical parts.
- Minimize down-time caused by time-based inspections.
- Detect equipment degradation before the failure occurs. Minimize breakdowns between maintenance intervals.
- Optimize maintenance – predict when parts will need to be fixed or replaced by tracking overall life usage and degradation rates. Equipment managers can optimize overall logistics by avoiding "just-in-time" ordering of replacement parts.



Embedded Corrosion Monitoring System

Application Examples:

The embedded platform can be used in a wide variety of asset monitoring applications. Systems utilizing the technology include:

- A lightweight platform for monitoring health of unmanned aerial vehicles – tracks vibration, flight cycles, and the physical environment encountered.
- In-situ corrosion monitoring - for tracking corrosion in locations that are difficult or expensive to inspect. System includes environmental and electrochemical sensors to measure both corrosion drivers and corrosion activity.
- Embedded vibration monitoring – for on-board tracking of the health of stored ammunition and missiles, monitoring of commercial shipping as well as other applications where you need to know how an asset was 'handled'.

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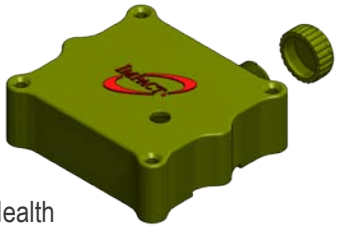
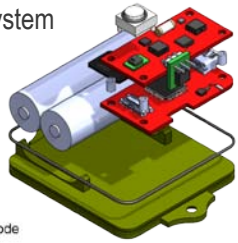
The system sleeps for extended periods, but wakes instantly to record and analyze all vibration activity above a pre-set threshold.

- Bridge health monitoring – networked strain monitoring system tracks bridge loading, bridge response, and environmental factors related to bridge aging.

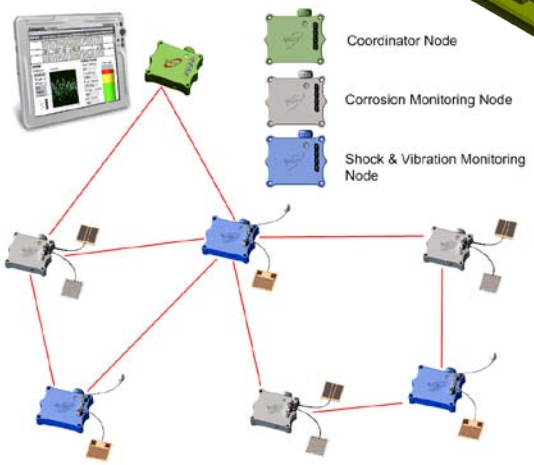


Missile Health Monitoring System



System Attributes:

- Customizable for many types of monitoring applications
- Overall package is small & lightweight
- Low power consumption
- Supports a wide variety of sensor types
- Multiple communications options
- Networkable & scalable architecture
- Embedded processing automatically extracts key summary health values from raw high bandwidth signals
- Long term on-board data storage
- Flexible form factor and mounting possibilities

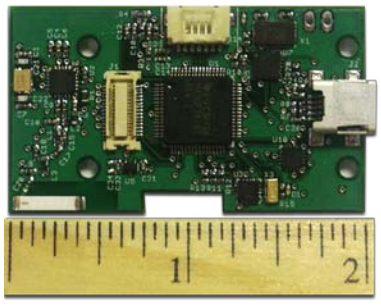


Embedded Processing:

The on-board embedded processing is the heart of the system. The processing enables efficient power usage through optimizing the use of data acquisition, recording, sleep and communication modes. It reduces the data storage, communication times, and off-board processing necessary by calculating application-specific summary health values. The on-board analysis is completely flexible. Examples of health analysis algorithms used across a variety of system applications range from simple 'cycle counting' and summation of usage hours to more advanced rain flow counting and Miner's calculations used in fatigue analysis.

The embedded processing also enables cost-effective implementation of the IEEE 1451 "smart sensors" standard. This is done by including all the data storage (including transducer electronic data sheets [TEDS]), networking and communications functionality necessary to upgrade simpler analog sensors and sensing mechanisms to include the 'digital' features needed to meet the standard.

Other analyses supported by customizable embedded processing include:



- Sensor self-validation – the system analyzes and reports upon its own 'sensor health'.
- Adaptive sensing – automatically increasing data acquisition rates during times of special interest, which is determined by either this individual processing node, or by information received from the network of nodes.