Battery & Fuel Cell IDPS™

Improving Reliability Through Health Monitoring and Predictive Maintenance

Intelligent Diagnostic / Prognostic System

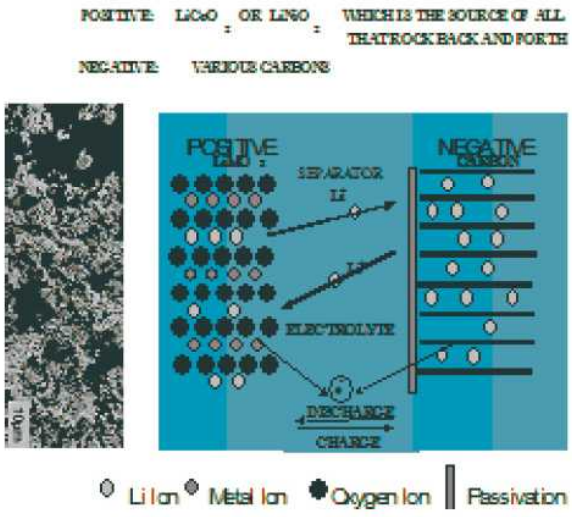
Today's maintenance professional are investigating innovative technologies to improve the efficiency of their existing maintenance operations. Typical preventative maintenance approaches such as run-to-failure, redundant systems, and periodic maintenance are becoming out-dated due to their additional expense and wasted resources

What can IDPS™ do?

- **Diagnostics: Detects & Identifies Impending Battery & Fuel Cell Failures**
- **Prognostics: Predicts Remaining Capacity or Useful Life of Battery & Fuel Cell Systems**

Which technologies does IDPS™ use?

- **Feature Extraction**
- **Fuzzy Logic**
- **Neural Networks**
- **Case-based Reasoning**



IDPS™

Health Monitoring System Benefits

- **Lowered Cost**
- **Efficient Resource Management**
- **Increased Safety**
- **Automated Monitoring**
- **True Predictive Maintenance**
- **Increase Reliability & Uptime**

Global Technology Connection, Inc.
2839 Paces Ferry Rd., Suite 1160, Atlanta, GA 30339
Phone: (770) 803-3001, Fax: (770) 234-4148
Website: http://www.globaltechinc.com
E-mail: athakker@globaltechinc.com

Intelligent System That Learns From Failures

DETECT!

Determine state of charge (SOC) and state of health using a number of intelligent system tools. Neural networks, fuzzy logic and feature extraction are integrated into this Health Monitoring System to provide automated failure / degradation detection & identification of weak cells with a high degree of confidence.

The key features of the diagnostic module are:

- **Off-Line Modeling**
- **Fuzzy Neural Networks for Expert Knowledge Integration & Automated Data-driven Model Training**
- **Impedance Processing based Feature Extraction**

PREDICT!

Once the SOC has been detected, the prognostic modules begin to predict remaining capacity or battery power time taking into account environmental factors [ambient / cell temperatures] and design characteristics [cell voltages, cell imbalances, leakage currents].

In the case of an impending failure, the prognostic modules begin to predict failure time-evolution towards a fault. Virtual sensors convert raw data to a failure dimension that is used in a fuzzy neural network to predict failure growth with time. This information is then used to calculate the remaining useful life (RUL) of battery and fuel cell systems and confidence bounds. This information is used to schedule maintenance.

- **RUL Prediction Which Learns From Offline & Online Data**
- **Self-Learning Model (Parameters / Structure) Using Fast, Robust Adaptive Algorithms**
- **Confidence Bounds Placed On RUL Prediction Through The Novel Confidence Prediction Neural Network**
- **Case-Based Reasoning**

Website: http://www.globaltechinc.com
Phone: 1-800-215-4468