CASE STUDY
PLANT-WIDE ASSET MONITORING NODES
PLANT-WIDE ASSET MONITORING

In support of a National Instruments (NI) pilot program with several Electric Power Utilities, Nexjen Systems provided design, sourcing, assembly and verification services on hundreds of Asset Monitoring Nodes for use in power generation plants. When installed throughout a power plant, these NI cRIO based nodes form a cost-effective, condition monitoring network that collects and analyzes performance from all of the equipment critical to the power generation process.

**BALANCE OF PLANT (BOP) NODES**

'Balance of Plant' equipment refers to generation process equipment (pumps, fans, motors, etc.) other than the generators (turbines and boilers) themselves. Each 'BOP' Node is comprised of commercial off-the-shelf (COTS) NI cRIO data acquisition hardware, configurable to the equipment sensors it is monitoring. Nexjen Systems designed the nodes and installed them in NEMA 3R enclosures with terminal blocks for sensor leads and onboard wired or wireless networking hardware.

- Performs real-time monitoring of all equipment critical to the generation process.
- Focuses technical staff on predicting and preventing failures rather than recording data.
- Utilizes Commercial off-the-shelf data acquisition hardware with NI cRIO.
- Leverages standard wireless networking technology.

**TURBINE MONITORING SYSTEM (TMS) NODES**

The TMS Nodes interface with existing, on-line turbine monitoring equipment to provide turbine performance information in the volume of data collected by the network of data acquisition nodes throughout a power plant. TMS Nodes work off the same COTS, configurable data acquisition platform as the BOP Nodes, but are mounted in a 4U 19" rack-mountable enclosure designed by Nexjen to fit an existing turbine monitoring enclosure.

<table>
<thead>
<tr>
<th>BOP SYSTEM HARDWARE</th>
<th>OVERVIEW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENCLOSURE</td>
<td>NEMA 3R - INDOOR/OUTDOOR</td>
</tr>
<tr>
<td>DIMENSIONS</td>
<td>24H X 20W X 8D</td>
</tr>
<tr>
<td>INPUT POWER</td>
<td>120V</td>
</tr>
<tr>
<td>SENSOR CONNECTIONS</td>
<td>SCREW TERMINALS</td>
</tr>
<tr>
<td>DAQ HARDWARE</td>
<td>NI COMPACT RIO</td>
</tr>
<tr>
<td>PERFORMANCE PARAMETERS MEASURED</td>
<td>VIBRATION, TEMPERATURE, VOLTAGE, CURRENT, SPEED</td>
</tr>
<tr>
<td>COMMON EQUIPMENT MONITORED</td>
<td>ELECTRIC MOTORS, PUMPS, COMPRESSORS, FANS, TRANSFORMERS</td>
</tr>
<tr>
<td>NETWORK HARDWARE</td>
<td>N-TRON WIRED OR WIRELESS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TMS SYSTEM HARDWARE</th>
<th>OVERVIEW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENCLOSURE</td>
<td>4U 19&quot; RACK MOUNTABLE</td>
</tr>
<tr>
<td>INPUT POWER</td>
<td>120V</td>
</tr>
<tr>
<td>SENSOR CONNECTIONS</td>
<td>SCREW TERMINALS</td>
</tr>
<tr>
<td>DAQ HARDWARE</td>
<td>NI COMPACT RIO</td>
</tr>
<tr>
<td>PERFORMANCE PARAMETERS MONITORED</td>
<td>VIBRATION, SPEED</td>
</tr>
<tr>
<td>EQUIPMENT MONITORED</td>
<td>TURBINES, BOILERS, ETC.</td>
</tr>
<tr>
<td>NETWORK HARDWARE</td>
<td>N-TRON WIRED OR WIRELESS</td>
</tr>
</tbody>
</table>

NI TAKES ASSET CONDITION INFORMATION TO THE ENTERPRISE LEVEL

A key feature of the BOP and TMS Nodes is their ability to be added to a plant’s IT network. With a cost-effective solution for plant-wide data collection that openly shares information to the network, utilities can shift their technical resources from data collection to data analysis, and leverage IT advances to transfer large amounts of plant performance data to enterprise level management software.

**IT INFRASTRUCTURE**

- PLANT SERVER
  - ALARMING
  - AGING/ARCHIVING
  - DATA ANALYSIS
  - TRENDING
  - SYSTEMS MANAGEMENT

- PI SERVER
  - CORPORATE DATABASE

**PLANT ASSETS**

- TURBINE CRITICAL EQUIPMENT
  - MOTORS
  - PUMPS
  - GEARBOXES
  - FANS
  - TRANSFORMERS

- BALANCE OF PLANT EQUIPMENT
  - COMMON EQUIPMENT
    - ELECTRIC MOTORS
    - PUMPS
    - COMPRESSORS
    - FANS
    - TRANSFORMERS

**SENSORS**

- EMBEDDED TURBINE MONITORING SYSTEM
  - VIBRATION SENSORS
  - 3RD PARTY SYSTEMS

**NI CRIIO MONITORING NODES**

(DESIGNED AND BUILT BY NEXJEN SYSTEMS)

**TURBINE MONITORING SYSTEMS**

- CONFIGURATION
- DATA CAPTURE
- COMPUTATION
- FORWARD DATA

**BALANCE OF PLANT SYSTEMS**

- CONFIGURATION
- DATA CAPTURE
- COMPUTATION
- FORWARD DATA