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Efficiency Extra Edition

T2E3 Newsletter
3rd Quarter 2007

GT Performance: Parameters to Track

Continuing my mission of helping you to improve the efficiency of your equipment, this newsletter includes some specific parameters of interest which you should be tracking and trending as part of a gas turbine performance monitoring program at your site.

Monitoring Parameters for Gas Turbines

Parameters which should be recorded to monitor gas turbine thermal performance relate to **the inlet air stream** for calculating cooling system efficiencies (if installed) and inlet filter condition; **the compressor** for calculating compressor efficiency; **the turbine** for monitoring control limits and turbine efficiency; **the combustion system** for monitoring heat rate and thermal efficiency; and **the unit outputs** for monitoring electric power and exhaust energy.

By breaking the gas turbine into sections, and monitoring parameters within each section, observed losses in performance can be quickly narrowed down to a section of the unit (compressor, combustor or turbine) for further investigation.

Below is a list of parameters which should be recorded for your unit and archived as part of the operating history. If anything should happen which impacts your unit performance, going back through this historical data may help to identify the starting point of the issue and support the investigation into the final root cause.

This list is in no way meant to be comprehensive, and does not include many items which are required by the manufacturer for use in maintenance interval determination and/or service agreements. Items such as vibration and bearing temperatures are not shown here. Refer to the operations and maintenance manuals for your particular units to make sure you are recording all the information required at your site.

The following parameters are recommended to be recorded as part of a performance monitoring program:

- **Ambient site conditions:** dry bulb temperature, station barometric pressure and humidity
- **Control mode** (base, AGC, T48, etc)
- **Generator** output, power factor and frequency
- **Inlet and exhaust losses**
- **Compressor inlet temperature** (*after* air conditioning equipment, such as evaporative cooling, chillers or foggers)
- **Compressor speed**
- **Compressor discharge** pressure and temperature
- **Turbine inlet** temperature (if available)
- **Turbine exhaust** temperatures
- **Fuel** flow, pressure, temperature and composition (%CH4, %H2, LHV, etc.)
- **Water/steam injection** flow, pressure and temperature (all streams)
- **Emissions** (NOx, CO, O2)
- **Counters** (fired hours, starts, trips, etc.)

When recording parameter values for thermal performance and efficiency calculations, an interval of 30 seconds is recommended. Depending on the operating conditions of the unit, the interval can be adjusted to make sure changes in performance are visible, while not impacting the speed of collecting other data required for safe operation. For units operating mostly at base load, a recording interval of 10 minutes may be sufficient to gain the majority of benefits from the performance monitoring system.

If you have any specific question on what you should be recording for your unit, or how, please contact me via phone (425-821-6036) or email (tinat@t2e3.com).

Announcements

- **LM6000 Seminar** Scheduled for April 3rd & 4th 2008; in San Diego, CA

(see page 2 for more)

Products & Services

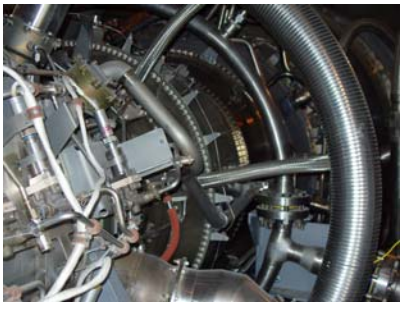
Analysis Tools

Excel Workbooks, Macros and **Add-Ins**:
* Corrected Performance
* Compressor Efficiency
* Steam & Water Flow
* Moist Air Properties

Training Seminars

Performance Test Support

Performance Monitoring Program Design, Support and Evaluation



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http://www.t2e3.com/news.php

LM6000 Performance Seminar to be held in San Diego next April 3 & 4

Learn about the thermodynamic relationships behind Gas Turbine **performance**, and how to apply this to your units and your site.

Delve into the economics and application of correction curves - including an understanding of **Throttle Push**.

Get an overview of **ASME PTC-22**, the standard on gas turbine performance testing.

Learn about performance **monitoring** programs for gas turbines, what you need to look out for, and what to do if you think you may have a problem.

Walk away with information and ideas that you can apply to your operation immediately.

Seminar to be held in San Diego April 3 & 4, 2008.

Scheduled to compliment attendance at the 2008 WTUI conference.

See the T2E3 website for more information:

www.t2e3.com/LM6000.php

T2E3 Provides Services for Power Generators

Including the following:

Analysis Tools & Software – from customized spreadsheets to add-ins for Excel or complete compiled programs, T2E3 can develop software tools and analyses to support all your performance monitoring needs, including integrating your existing tools with available site data systems, to create online systems providing data and results in real-time.

Training – both public seminars and customized options are available. Highly interactive sessions increase attendees' knowledge and understanding of the thermodynamic cycles, instrumentation and analyses needed to improve equipment performance and reliability.

Performance Test Support – if your site is required to perform annual capacity or PPA performance tests, having Tina Toburen from T2E3 on site to direct the testing can lead to a smoother test execution with more consistent performance results. Professional reports can also be produced to communicate the results to all required parties.

Commercial Program Design and Evaluation – For sites interested in a more complete enterprise solution for performance monitoring, T2E3 can support your program planning and design, including evaluation of the various commercial products available within the industry for performance monitoring. Choosing the correct solution will depend on the specific goals and objectives of your performance monitoring program.

Unlock the potential of your operation. Call for more information on how we can work together, today!