TURBINE DIAGNOSTIC SERVICES INC.

"The Turbine Doctor" ®

Services Publication: TDS-050

In-Service Inspections

STEAM and GAS TURBINE GENERATORS

The extensive start-up engineering and operational background experience of the Turbine Diagnostic Services, Inc. (TDS) engineers and technicians provides the basis for TDS offered In Service Inspection (ISI) Programs. TDS provides competent and knowledgeable engineers specializing in turbine generator equipment. Our specialized in depth knowledge of the design parameters and normal operating conditions of turbine generators, is applied to our ISI procedures to recognize nonconforming conditions with the machine in service.

TDS In-Service Inspections (ISI) are conducted at normal high load steady state operation to evaluate the condition of the turbine generator, subsystems and then a thermodynamic performance analysis is conducted with long term tracking of the operational parameters.

ISI Inspections are intended to improve unit reliability with the identification of impending problems along with the identification of useful recommendations for immediate and planned maintenance activities. Correction of impending problems before they become a forced outage, improves the reliability and availability of the unit.

Most of the insurance carriers and OEM recognizes the importance of such an inspection. The documentation of the ISI program is sufficient justification to the insurance carriers to promote extended operating intervals between outages, based on favorable operating conditions. While the ISI program cannot predict component failure in the steam path, it can certainly document and analyze the changes associated with the symptoms of a failure or change in steam path conditions. The advantage of this program is to document the performance of each turbine section and the generator and justify only sectionalized maintenance based on the degradation of operating conditions.

This program provides an experienced start up engineer and a turbine technician to inspect the unit in service. All the turbine generator available operation information is documented. The subsystem operation is evaluated for proper operation. All functional tests that can be conducted without interruption of the unit operation are conducted and verified to operate properly. Operational data is collected on the turbine, generator and subsystems and monitored for improper operating and degrading conditions. A four hour performance test, at a repeatable high load, is conducted on the turbine. If desired and allowable, the four hour testing is broken up into separate shorter tests of multiple conditions (such as straight condensing only, or with admission in service, or variations with the extractions). The test data is averaged and evaluated to monitor the unit efficiency and the turbine performance long term trends. Unit section efficiency, Flow vs. Stage pressure relationships, and Flow vs. Unit Output conditions are evaluated The performance is evaluated against available design data and design performance curves for deviation of the machine performance from the design intent of the machine. Often start up data is available to compare the unit to as new conditions.

Steady State vibration data is collected on the turbine generator bearings vibration probes or temporary probes (if necessary) and a vibration analysis conducted. Vibration, three phase motor currents, and operating conditions will be monitored on all the subsystem motors, pumps and blowers and the data trended for degrading conditions.

All of the automatic pump start tests will be initiated to verify the proper start sequence of backup pumps. All valve tests and normal on line testing will be conducted to verify proper action of the tests.

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Gas turbine ISI inspections are available and performance models have been developed by our gas turbine start up engineer. All performance data is corrected to ISO condition for uniform performance comparisons. A thorough vibration analysis is conducted on the turbine generator unit and subsystem motors, blowers, and pumps. A complete assessments of all subsystems operating conditions is conducted. An optional oil analysis program is available. All intended to provide predictive analysis of the turbine, generator, and subsystem operation and predict problems to be addressed before becoming a forced outage condition.

This program is generally conducted on a tri-annual or quarterly basis to provide long term trending and documentation of the Unit's Condition. With the long term documentation, degrading and seasonal trends can be identified and corrections made to overcome pending problems before they progress, thus improving customer reliability, availability, and profitability.

TDS is generally on site for two to three days of data collection with the machines on line at a repeatable high load condition. The remainder of the time is spent with data evaluation, analysis and report generation. A complete and well organized report is produced which documents the current conditions, details all findings, and presents the recommendations for immediate action or those intended to be conducted during the next planned outage. The report will contain unit specific data sheets detailing the conditions at each inspection as well as the design parameters. Recommendations will be made for action items that the customer should address either immediately or as part of a planned maintenance activity. These recommendations and the long term trending are intended to drive up the reliability and thus availability of the unit.

TDS does not charge any additional time or cost for the initial inspection and set up of the ISI program.
Minor assistance from the operators will be necessary to start subsystem motors and to initiate operational tests. The intent is to test and inspect the unit but not interrupt the power output or interfere with the unit operation.
The customer will be notified of any conditions requiring immediate attention prior to departure from site. Minor adjustments will be made at the time of the inspection with customer assistance.

The lube oil analysis portion of this service is not a standard offering but available as an extra to the base ISI program pricing. Oil analysis is quoted upon customer request. We recommend customers monitor the condition of their oil closely and accurately. TDS reviews the customer oil analysis results and advises based on the results presented and proper types of oil analysis.

Noise level readings are collected to monitor the noise emissions of the machine and the changes in the sound patterns

The ISI service includes an I&E technician to reduce customer support needs and impact on the operating crew and plant personnel.

If more than one turbine generator inspection can be conducted concurrently, the cost is significantly reduced for the second unit.

Along with the in-service inspection services, Turbine Diagnostic Services, Inc. has knowledge of generator inspection, repair and high voltage testing; turbine generator controls; excitation controls; vibration analysis and multi-plane balancing operation; start-up troubleshooting; oil filtration; and, mechanical maintenance services. This makes TDS a COMPLETE TURBINE GENERATOR SERVICE COMPANY.

Turbine Diagnostic Services, Inc. (TDS) is a full service turbine generator field service organization based in Odessa, Florida. We offer full mechanical and electrical service coverage, outage planning and scheduling, parts procurement, site labor, job staffing and management. TDS maintains an expert and experienced workforce of startup engineers, mechanical turbine engineers, mechanical service representatives, generator engineers/specialists, excitation control engineers, turbine control engineers, control and vibration technicians, and turbine millwrights. **TDS** specializes in conducting steam & gas turbine generator planned & emergency maintenance controls troubleshooting, and vibration analysis & balancing services.

We are available for your planned outages, or immediately to support your emergency assistance with any mechanical or control failure forced outages.

Contact us at:

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