

ADVANCED TRENDS IN PERFORMANCE MONITORING OF GAS TURBINES



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Abstract

The performance monitoring process of gas turbines requires technologies, skilled operators and communication to integrate all available data of the equipment condition, such as diagnostic and performance data, maintenance histories, operator logs and design data, to make timely decisions about the maintenance requirements of major/ critical equipment as well as predict defects. A variety of technologies can and should be used as part of a comprehensive and effective diagnosis of health of the gas turbine. Since mechanical systems or machines account for the majority of equipment, vibration monitoring is generally the key component of most performance monitoring systems. However, vibration monitoring alone cannot provide all of the information that will be required for an effective monitoring of gas turbine performance.

A comprehensive performance monitoring philosophy must be based upon monitoring technologies and diagnostic techniques like Tribology, Thermography and Thermodynamic models (Process Parameter Analysis) in addition to vibration monitoring. When solutions emerging out of these technologies are employed in conjunction with one another as part of a larger system implementation, it enhances the diagnostic capabilities for assessing the nature, severity, location and cause of machinery performance changes. In the Indian Navy, the performance monitoring philosophy of gas turbines includes a combination of vibration monitoring, oil analysis and monitoring of process parameters. While the current system in the Navy is functioning well, there is an inescapable need to induct more advanced techniques as part of continuous improvement. With the induction of LM 2500 gas turbines, Indian Navy is attempting to undertake a typical performance monitoring of GTs using “Cycle Deck Method” software provided by the OEM. The results obtained from the above mentioned software are positive and a good insight into thermodynamic performance of the gas turbine is being achieved. However, when it comes to the eastern origin gas turbines, the performance monitoring is generally limited to trending of thermal parameters and comparing them with promulgated limits. Therefore, it is time the Thermodynamic Modelling and other advanced techniques are adopted for performance monitoring of all the gas turbines targeting higher efficiency and reliability. The aim of this paper is to study certain advanced performance monitoring techniques being used in the aero, industrial and marine applications of gas turbines and evaluate their applicability to the gas turbines operated in the Indian Navy.