TRACK 2: PROPULSION

"**APPLICATION OF GAS PATH DIAGNOSTICS
TO GAS TURBINE ENGINES**"
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ABSTRACT

Gas turbine engines are prone to degradation during their operation and availability and maintenance cost are two major concerns for gas turbine users. To ensure high engine availability and low maintenance costs, condition monitoring becomes crucial and maintenance strategy should be moved from preventive (or scheduled) maintenance to predictive (or condition-based) maintenance.

This paper introduces a gas path diagnostic technology called Gas Path Analysis and a gas turbine performance and diagnostic system PYTHIA developed at Cranfield University. The PYTHIA diagnostic system provides a systematic approach for gas turbine gas path diagnostics, including performance model setup, model adaptation, data correction, sensor fault detection and engine diagnostics. It also offers great flexibility to be applied to different types of gas turbine engines in aero, marine and industrial applications, good user friendly interface and a remote access. An application of the technology and PYTHIA to the diagnostic analysis of an aero-derivative gas turbine (GE LM2500+) using field data is also demonstrated. In the application, an engine thermodynamic model is created and adapted to the performance of the engine using field data obtained at different operating conditions. The diagnostic analysis provides promising results for the prediction of compressor degradation and the performance improvement due to a compressor water washing.

BIOGRAPHY OF SPEAKER

Dr Li is the Director of Gas Turbine Performance and Diagnostics Applications and a Senior Lecturer working in the Division of Energy and Power Engineering, School of Engineering, Cranfield University in the UK. He received his PhD degree at Cranfield University in the UK. He used to work as a gas turbine performance engineer in industry for many years before joining Cranfield University in 1999. He has been working at Cranfield University since then. He specializes in gas turbine gas path diagnostics, gas turbine steady and transient performance simulations, performance optimization and application of Computational Fluid Dynamics (CFD) to gas turbines.

He has published more than 60 technical papers in international journals and conferences. He is a member of ASME and a Fellow of Higher Education Academy of United Kingdom.