

Gas turbine liner combustor heat transfer modelling

Ehizementor Idonije

Riga Technical University, Latvia

The combustion components of gas turbines (GT) are operating under high temperatures and stresses (due to combustion instabilities) and are therefore one of the critical parts in a gas turbine. As a result, they need regular monitoring or condition assessment in order to avoid failures that can compromise the integrity of the downstream hardware. Integrated in a complete life-assessment methodology, the thermal analysis of one gas turbine combustion liner is presented in this paper. The goal is to investigate the effects of changes in the operational parameters on the temperature profile and heat flux distribution at the liner inner and outer interfaces. A steady state computational fluid dynamics (CFD) analysis is performed for a coupled combustion chamber-liner-casing domain. The numerical models used to describe the complete process are evaluated and results are commented. Numerical calculations for different cases are performed and the results are compared and used to determine the most critical parameters for the combustor hardware. The benefit of the application of the Thermal Barrier Coating (TBC) layer on the liner surface is also calculated in order to assess the result of the thermal load on the base material. Modern gas turbines are very compact and have an extremely high energy conversion rate. Today's gas turbine can reach thermal efficiencies in excess of 40% as result of the increased thermodynamic parameters like pressure ratio and turbine inlet temperature. Both of the parameters have a direct impact on the thermal load and hence on the cooling system of the combustor hardware. The highest combustor exit temperatures are approximately 2000K and for the most widely used nickel or cobalt based alloys, the maximum temperature should not exceed 1200 K. The results obtained are consistent with those found in literature and measured during the operations of (GT).

Biography

Ehizementor Idonije has completed his first degree in mechanical engineering at the age of 24 years from Ambrose Alli University, Ekpoma, Nigeria. His bachelor degree has provided him with a rigorous foundation to build upon as an honored student. He was awarded several certificates by being active in competitions, delivering seminars on engineering field. He researches voluntarily aside from studying that gave him vast knowledge in the field of engineering.

ehizementoridonije@yahoo.com