Combustor aerodynamics

Synopsis:

This book describes the new innovation of gas turbine swirler. The novel swirler is a multiple entry swirler which allows the swirl number to vary on the same value of Reynolds number, by regulating the ratio between the axial and tangential flow momentum. Three–dimensional turbulence and isothermal flow characteristics of an abrupt combustor model with different type of swirler (axial, radial and multiple inlet) were simulated with Reynolds–Averaged Navier–Stokes (RANS) using ANSYS Fluent 12 software. Results of the different turbulence models used in swirling flow were reviewed and compared. The different swirler' aerodynamic performance was investigated through Computational Fluid Dynamics (CFD) simulations. The aerodynamics performance includes shape and size of the Central Recirculation Zone (CRZ), turbulence intensity and pressure losses. It was found that the size of then CRZ and turbulence strength is directly proportional to the tangential axial air flow rate ratio. Therefore, proper selection of a swirler is needed to enhance combustor performance and to reduce exhaust emissions.

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