



Simulation of Turbulent Lifted Flames Using a Partially-Premixed Coherent Flame Model (PCFM)

Partially-premixed combustion occurs in many combustion devices of practical interest, such as gas-turbine combustors. Development of corresponding turbulent combustion models is important to improve the design of these systems in efforts to reduce fuel consumption and pollutant emissions. Turbulent lifted flames have been a canonical problem for testing models designed for partially-premixed turbulent combustion. In this paper we propose modifications to the coherent flame model (CFM) so that it can be brought to the simulation of partially-premixed combustion. For the primary premixed flame, a transport equation for flame area density is solved in which the wrinkling effects of the flame stretch and flame annihilation are considered. For the subsequent non-premixed zone, a laminar flamelet PPDF methodology, which accounts for the non-equilibrium and finiterate chemistry effects, is adopted. The model is validated against the experimental data on a lifted H₂/N₂ jet flame issuing into a vitiated coflow. In general there is fairly good agreement between the calculations and measurements both in profile shapes and peak values. Based on the simulation results the flame stabilization mechanism for lifted flames is investigated.

Author Name:

R. Rawat

Y. Zhang

Industries:

Turbomachinery [1]

Products:

STAR-CCM+® [2]

Conference Location:

Berlin, Germany

Rights:

2008 ASME

Pages:

329-339

Conference Date:

Monday, June 9, 2008

Paper Reference:

GT2008-50441

Volume:

3

ISBN:

978-0-7918-4313-0

DOI:

<http://dx.doi.org/10.1115/GT2008-50441>

Conference Name:

ASME Turbo Expo 2008: Power for Land, Sea and Air

CD-adapco is the world's largest independent CFD focused provider of engineering simulation software, support and services. We have over 30 years of experience in delivering industrial strength engineering simulation.

Source URL: http://www.cd-adapco.com/conference_proceeding/simulation-turbulent-lifted-flames-using-partially-premixed-coherent-flame

Links:

[1] <http://www.cd-adapco.com/industries/turbomachinery>

[2] <http://www.cd-adapco.com/products/star-ccm%C2%AE>