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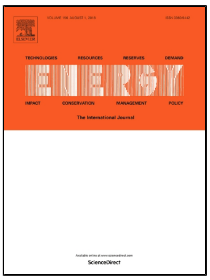

The Effect of Inverse Diffusion Flame Burner-Diameter on Flame Characteristics and Emissions

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THE EFFECT OF INVERSE DIFFUSION FLAME BURNER-DIAMETER ON FLAME CHARACTERISTICS AND EMISSIONS

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ABSTRACT

An experimental investigation was performed to study the effect of change of the IDF burner diameters on the flame characteristics (flame length, axial temperature distribution, and flame appearance) and flame emissions.The study was performed using a coaxial (CoA) circular inverse diffusion flame burners of different diameters. Burners' air diameters (da) were varied from 6mm to 22.5mm. The burner fuel diameters were varied according to the change of air diameter to preserve constant equivalence ratioand constant aspect ratio (0.5).The study is carried out at constant equivalence ratio (Φ =3) and constant air Reynolds number (Re_a=2500). The measured parameters are the flame axial temperature, flame appearance, and emission along the flame center line. The results showsignificant differences in the flame appearance.The smaller diameters produceshorter flame lengths. The visible flame lengths were varied from 170 to 300mm. Also, an early formationof CO & $CO_2$and early depletion of O_2 were obtained by reducing the burner's sizes. For all the experiments conducted in the present study, the centerline temperature distribution produced by the smaller nozzles diameters show higher flame temperature. The Peak temperatures were varied according to burner size, from 1600 to 950 ^oC.

KEYWORDS

Inverse diffusion flame, Emission, Flame appearance, Non premixed flame, Coaxial flame

1. INTRODUCTION

Flames can be divided into two mainclasses'premixed flames and non-premixedflames. The diffusion-flame-based combustion are of tremendous practical importance, being encountered in many combustion systems due to its better stability, safety, and wide operating range, as compared to premixed-flame-based combustion[1,2].But unfortunately the diffusion flame,

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