

# DETERMINATION OF FLAME CHARACTERISTICS IN A LOW SWIRL BURNER AT GAS TURBINE CONDITIONS THROUGH REACTION ZONE IMAGING

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# CHAPTER 1

## LSB FLAME CHARACTERISTICS

In Chapter FIXME, we introduced the salient features of the Low Swirl Burner (LSB) flow field and discussed the mechanisms by which the LSB flame is stabilized. Further, various characteristics of the LSB flame that can be measured from flame images were outlined. To recapitulate, these are the flame location, flame shape and the flame structure. The first two are quantified by the flame standoff distance,  $X_f$  and the flame angle,  $\theta_f$ , respectively.

In the same chapter, we introduced the four flow parameters that describe an operating condition for the LSB — the combustor pressure,  $p$ , the preheat temperature,  $T$ , the mass-averaged inlet velocity (also called the reference velocity,  $U_0$  and the equivalence ratio of the premixed reactants,  $\phi$ . We further introduced a geometric parameter — the angle of the vanes of the swirler,  $\alpha$ , which affects the amount of swirl present in the flow field.

The LSB flame is imaged over a range of operating conditions and the effect of flow and geometric parameters on the reacting flow field is investigated. This results of the investigation are presented in this chapter.

### 1.1 Effect of reference velocity

Generally, in gas turbine applications, the reference velocity is not expected to be varied with loading. However, its effect on the flame characteristics has implications for the design of future LSB-based gas turbines.

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