# Experimental Description:

Measurements are performed in the well defined recirculation zone which is established downstream of an axisymmetric bluff body. A schematic of the burner and the flow field is shown in figure 9.1(b) [7]. The bluff body has an outer diameter of DB = 50 mm and a jet diameter of DJ =3.6 mm. The co-flow air velocity is fixed at 20 m/s for all experiments. The turbulence intensity of the co-flowing air is low, at ~2%, and it is assumed to have a minimal effect on the highly turbulent recirculation zone. The laser Doppler velocimetry (LDV) technique is used to measure, simultaneously, the axial and radial velocity components. The mixture fraction measurements were made using imaging of Rayleigh scattering technique. For the measurement of flow field data, which comprises of the mean and rms fluctuations of axial and radial velocities, the experiment was performed with using pure air at both fuel jet & co-flow inlets. Flow field data is provided in the form of three data-sets.

 

(b)

(a)

Figure 9.1

Mixing field data, which comprises of mean and rms fluctuations of mixture fraction, have been measured by carrying out experiments using different fuels with different velocities at the fuel jet inlet[6]. The fuel jet velocity is varied in order to investigate the dependence of the flow pattern on the momentum of the jet. The table below lists the fuels used with different velocities:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fuel | CNG | | | Ethylene | | | LPG | |
| Velocity (m/s) | 50 | 85 | 143 | 50 | 63 | 80 | 50 | 70 |

Table 8

Both flow & mixing field data were measured at the axial (X-axis) and radial (radius r) locations behind the bluff body. The bluff body diameter, DB = 50 mm, was used to normalize the axial location (X/DB) and the bluff body radius, RB =25mm, was used to normalize the radial location (r/RB). The following quantities have been measured:

1. Mean axial and radial velocity components (U,V)
2. Mean mixture fraction component
3. RMS Fluctuating axial and radial components (u’, v’)
4. RMS Fluctuating mixture fraction component

The locations at which the flow field data have been measured are shown below:

Figure 9.1(c)

Figure 9.1(e) shows the locations in between which the mixture fraction data was measured.The mixture fraction measurements have been performed, at every 1 mm interval, in between the yellow and red lines

Figure 9.1(d)

Figure 9.1(e)