

SLAG MODELING IN COMBUSTION SYSTEMS



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Objective: Oxy-coal combustion, in which air is replaced with a mixture of O_2/CO_2 , is a promising technology allowing CO_2 capture avoiding excessive amounts of CO_2 emissions into the atmosphere. An area of interest is to further analyze the effects of replacement of N_2 with CO_2 on flame stabilities near burner-zone environment. For example, it is necessary to fully understand how the partial pressure of O_2 affects the flame stand-off distance.

Research Project: The first step in this research was to analyze how the flame characteristics such as flame temperature and flame stand-off distance are affected upon replacing N_2 with CO_2 in both primary and secondary burner. It was concluded that the average flame temperature decreased while the flame stand-off distance values increased due to the high heat capacity value of CO_2 in comparison to N_2 .

Also, it was an area of interest to analyze the effects of the secondary preheat burner temperature on the stand-off distance. Based on the data obtained from simulations, an indirect correlation exists between the secondary preheat burner temperature and stand-off distance.

In the last test analysis, the effects of partial pressure of O_2 in the secondary burner on stand-off distance was analyzed. According to the data obtained from simulations, after regression analysis, with a 95 % confidence, it was suggested that the correlation between the stand-off distance was considered to be statistically insignificant.

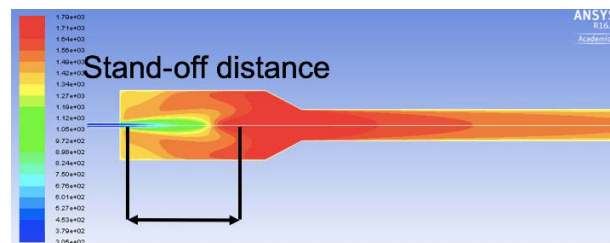


Figure 1 : An illustration of the flame stand-off distance in a temperature contour

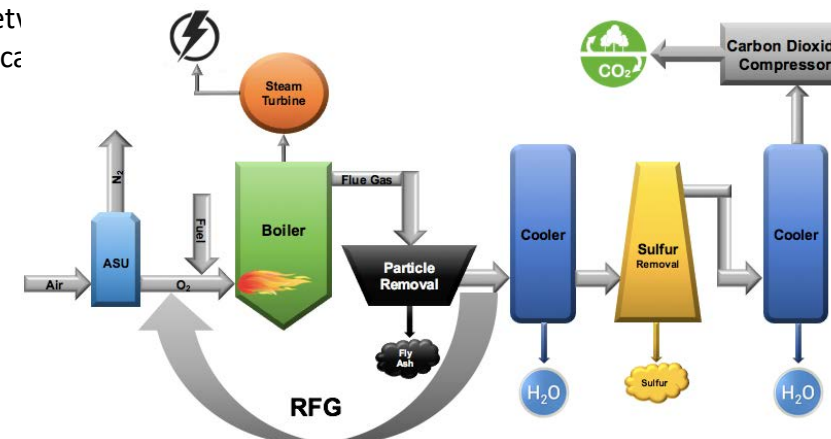


Figure 2 : Oxy-Coal Combustion Process