Kajian Eksperimental Fenomena Reattachment F lame pada Berbagai Variasi Diameter Rod Flame Holder = Experimental Study of Reattachment Flame Phenomenon on Variation in Rod Flame Holder Diameter

Andrea Yusuf Renata, author

Abstrak

Fenomena reattachment flame adalah peristiwa berpindahnya pangkal nyala api dari jarak tertentu diatas ujung burner kembali berada di ujung burner . Fenomena reattachment flame dapat terjadi apabila kecepatan nyala api laminar lebih besar dibandingkan kecepatan aliran lokal. Pada penelitian ini dilakukan pencampuran udara dan bahan bakar terlebih dahulu pada burner (premixed flame), bahan bakar yang digunakan adalah campuran propana 53% dan butana 47%. Rod flame holder bermaterial tembaga digunakan sebagai penyangga nyala api diatas ujung burner dengan tiga variasi ukuran diameter, yaitu 4 mm, 6 mm, dan 8 mm.Selain itu divariasikan pula posisi rod flame holder dari ujung burner dengan jarak 20 mm, 25 mm, dan 30 mm. Pangkal nyala api dikondisikan berada pada flame holder (flame lift-up) dan kemudian suplai aliran udara dikurangi sehingga pangkal nyala api kembali berada di ujung burner . Terdapat perbedaan kestabilan nyala api, tinggi nyala api, dan kecepatan reattachment apabila diameter rod flame holder dan jarak rod flame holder dari ujung burner divariasikan. AFR terjadinya reattachment lebih tinggi pada ukuran diameter rod flame holder yang lebih kecil, dengan Burning Load 2.321 MW/m2 pada jarak rod flame holder 20 mm dari ujung burner AFR4mm = 38.06, AFR6mm = 37.957, AFR8mm = 37.439. Rasio ekivalen terjadinya fenomena reattachment lebih kecil pada ukuran diameter rod flame holder yang lebih kecil sehingga tinggi nyala apinya lebih besar, dengan Burning Load 2.321 MW/m2 pada jarak rod flame holder 20 mm dari ujung burner Lf4mm = 9.645 mm, Lf6mm = 6.667 mm, Lf8mm = 4.116 mm. Sementara itu kecepatan reattachment berbanding lurus dengan kecepatan nyala api yang sangat dipengaruhi oleh pola aliran dan efesiensi difusi termal dan masa diatas rod flame holder.

.....Flame reattachment phenomenon is an occurrence of flame base movement from certain distance above burner tip back to burner tip. F lame reattachment phenomenon can occur when the laminar flame speed is greater than the local flow velocity. In this research, air and fuel is premixed in the burner (premixed flame), the fuel contains 53% propane and 47% butane by mass.Cylindrical cooper rod is used as flame holder with three variation diameter, i.e. 4 mm, 6 mm, and 6 mm .Beside that, rod flame holder position from burner tip are also variated from 20 mm, 25 mm, to 30mm, F irst, the flame base is conditioned to be located on the flame holder (flame lift-up) and then the air flow is reduced so the flame base will move back to burner tip. There are differences in flame reattachment stability, flame height just before reattachment occurs, and reattachment speed when rod flame holder diameter and its distance from burner tip is varied. The AFR is higher when reattachment occurs in smaller rod flame holder diameter, with Burning Load = 2.321MW/m2 when the distance of rod flame holder is 20 mm from burner tip AFR4mm = 38.06, AFR6mm = 37.957, AFR8mm = 37.439. The equivalence ratio of reattachemnt phenomenon is lower when the rod flame holder diameter is smaller, so the flame height is higher, with Burning Load = 2.321MW/m2 when the distance of rod flame holder is 20 mm from burner tip Lf4mm = 9.645 mm, Lf6mm = 6.667 mm, Lf8mm = 4.116 mm. Meanwhile, reattachment flame speed is proportional to the laminar flame speed that is mainly influenced

by the flow pattern and thermal and mass diffusion effeciency above the rod flame holder.