Studi eksperimental pengaruh swirling intensity terhadap efisiensi termal RFM swirl burner = Experimental study of swirling intensity effect on RFM swirl burner's thermal efficiency

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Abstrak

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Proses pencampuran merupakan faktor penting dalam proses pembakaran untuk mencapai efisiensi termal yang lebih tinggi terutama pada wilayah premix flame, ini disebabkan homogenitas pencampuran bahan bakar dan udara mempengaruhi heat release rate. Tujuan dari penelitian ini adalah untuk meningkatkan efisiensi termal dari rotating fan mixer swirl burner dengan cara menimbulkan aliran pusar (swirling flow) dalam ruang pencampuran. Aliran pusar tersebut akan dihasilkan oleh rotating fan mixer (RFM) dan akan dihitung dengan bilangan tak berdimensi yang disebut swirl number yang merupakan perbandingan antara fluks aksial dari momentum anguler dan momentum aksial. Variasi swirl number yang digunakan pada percobaan ini antara lain 0,46; 1,79; 2,97; 3,93 and 4,66. Komposisi bahan bakar dan udara berada dibawah kondisi stoikiometri dengan menjaga laju aliran udara konstan sedangkan laju aliran LPG divariasikan 9 cc/s; 10,5 cc/s; 12 cc/s; 13,5 cc/s and 15 cc/s. Hasil dari percobaan menunjukkan bahwa efisiensi termal semakin meningkat ketika mendekati komposisi AFR stoikiometri dan peningkatan efisiensi termal untuk setiap AFR yang diujikan adalah sebagai berikut: AFR 7,53 (= 1,29 %); AFR 6,45 (= 1,31 %); AFR 5,65 (= 1,02%); AFR 5,02 (= 1,64 %); AFR 4,52 (= 3,09%). Hasil ini menunjukkan bahwa pola aliran pusar dapat meningkatkan homogenitas campuran yang mempunyai korelasi dengan heat release rate dari suatu pembakaran premix flame.
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ABSTRACT
Mixing process is an essential factor in combustion in order to get the higher thermal efficiency especially in premix flame region, due to the homogeneity of fuel-air mixing which influenced the heat release rate. The purpose of research is to enhance thermal efficiency of Rotating Fan Mixer Swirl burner by generate swirl flow in mixing chamber. Swirl flow will be generated by rotating fan mixer (RFM) and it will be quantified by non dimensional number called swirl number which representing the comparison between axial fluxes of angular momentum and axial momentum. Swirl number used in this experimentation are 0,46; 1,79; 2,97; 3,93 and 4,66. Fuel-air mixing under stoichiometric conditions by using constant air flow rate and LPG flow rate?s variation: 9 cc/s; 10,5 cc/s; 12 cc/s; 13,5 cc/s and 15 cc/s. The results of this research show that thermal efficiency increase when AFR is much closer to stoichiometric and the difference?s value of increasing thermal efficiency based on the variation of AFR as follows : AFR 7,53 (= 1,29 %); AFR 6,45 (= 1,31 %); AFR 5,65 (= 1,02%); AFR 5,02 (= 1,64 %); AFR 4,52 (= 3,09%). This result show that swirling flow can enhance homogeneity and it has correlation with heat release rate of premix flame combustion;Mixing process is an essential factor in combustion in order to get the higher thermal efficiency especially in premix flame region, due to the homogeneity of fuel-air mixing which influenced the heat release rate. The purpose of research is to enhance thermal efficiency of Rotating Fan Mixer Swirl burner by generate swirl flow in mixing chamber. Swirl flow will be generated by rotating fan mixer (RFM) and it will

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