Simulasi post firing section pada heat recovery steam generator pltgu menggunakan computational fluid dynamics S

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Abstrak

[ABSTRAK
Dalam penelitian ini disimulasikan post firing section dalam HRSG dengan pembakar duct burner, bahan bakar syngas serta oksigen yang berasal dari Thermal Exhaust Gas (TEG) menggunakan computational fluid dynamics dengan program COMSOL Multiphysics. Model menggunakan neraca massa dilengkapi dengan laju reaksi kinetik, neraca momentum aliran turbulen k-ɛ, dan neraca energi. Dibuat variasi geometri ruang bakar, kecepatan syngas, konsentrasi O2 dalam TEG, serta suhu masukan fluida. Berdasarkan simulasi, baffle dan kecepatan alir sygas menjadi faktor penentu bentuk nyala. Kecepatan alir syngas sebesar 8 m/s merupakan nilai yang paling optimum sebab api tidak menempel pada pembakar dan suhu rata-rata yang dihasilkan mencapai 1.500 K. Baffle dengan kemiringan 30o memberikan profil nyala terbaik sebab tidak menyebabkan akumulasi panas di sudut baffle. Konsentrasi O2 serta suhu masukan syngas dan TEG menunjukkan pengaruh terhadap suhu maksimum yang dicapai namun tidak terlalu berpengaruh terhadap bentuk nyala. Suhu tertinggi sebesar 3.151 K dicapai dengan konsentrasi O2 14%. Suhu nyala lebih dipengaruhi oleh perubahan konsentrasi O2 dibandingkan oleh perubahan suhu masukan fluida. Suhu 3.151 K juga dicapai dengan mengkondisikan rasio TEG dan syngas pada stoikiometri.
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ABSTRACT
In this research, post firing section in HRSG was simulated with duct burner as burner, syngas as fuel, and oxygen that came from Thermal Exhaust Gas (TEG) using computational fluid dynamics by program COMSOL Multiphysics. The model is being used with kinetics reaction rate, mass balance, momentum balance, turbulent k-ɛ fluid flow, and energy balance with variation of furnace geometry, syngas inlet velocity, O2 concentration in TEG, and also fluids inlet temperature. Based on simulation result, baffle and syngas inlet velocity relative to TEG velocity do affect flame shape. Syngas velocity 8 m/s is the most optimum since the flame did not stick the burner and distributed temperatur reach 1.500 K. Baffle slope 30o gives best profile for no accumulation occurred. Oxygen concentration as well as syngas and TEG input temperature give impact to the maximum temperature but not to the flame shape. Highest temperature 3.151 K can be achieved by using 14% O2 concentration. Flame temperature influenced more by O2 concentration change rather than fluids inlet temperature. Temperature 3.151 K also can be achieved by putting TEG and syngas in stoichiometry., In this research, post firing section in HRSG was simulated with duct burner as burner, syngas as fuel, and oxygen that came from Thermal Exhaust Gas (TEG) using computational fluid dynamics by program COMSOL Multiphysics. The model is being used with kinetics reaction rate, mass balance, momentum balance, turbulent k-ɛ fluid flow, and energy balance with variation of furnace geometry, syngas inlet velocity, O2 concentration in TEG, and also fluids inlet temperature. Based on simulation result, baffle and syngas inlet velocity relative to TEG velocity do affect flame shape. Syngas

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