Abstrak

Kebutuhan energi yang tinggi menjadi salah satu hal yang mendorong perkembangan teknologi *pulverized-coal boiler* untuk mendapatkan teknologi *pulverized-coal boiler* yang lebih efisien. Penelitian dilakukan dengan pemodelan menggunakan perangkat lunak *Computational Fluid Dynamics* (CFD) akademik untuk mensimulasikan pembakaran dengan variasi *inlet temperature*, rasio *air-fuel ratio*, dan rasio *mass flow rate*. Geometri *Pulverized-coal boiler* yang akan disimulasikan adalah geometri *pulverized-coal boiler* dari jurnal" *Numerical investigation on the flow, combustion, and NOX emission characteristics in a 660MWe tangential firing ultra-supercritical boiler*". Data-data yang akan dimasukkan kedalam simulasi Ansys Fluent berupa data *primary air inlet*, *coal-rich burner*, *wall*, dan *outlet*. pemodelan yang digunakan adalah *energy equation*, model turbulensi k-ε realizible, model radiasi P1, dan model pembakaran *non-premixed combustion*.

Hasil dari simulasi variasi *inlet temperature* menunjukkan *inlet temperature* 800℃ memiliki kenaikan *maximum temperature* sebesar 136,4475% dan *inlet temperature* 1000℃ memiliki kenaikan *maximum temperature* sebesar 91,664%. Analisa *maximum temperature* pada kontur *inlet* pada simulasi rasio *air-fuel ratio* menunjukkan rasio *air-fuel ratio* 0,5 mengalami kenaikan sebesar 58,715%; rasio *air-fuel ratio* 2 mengalami kenaikan sebesar 51.997%; dan rasio *air-fuel ratio* 1 mengalami kenaikan sebesar 91,664%. Analisa *maximum temperature* pada kontur *outlet* pada simulasi rasio *mass flow rate* untuk variasi rasio *mass flow rate* 0,5; rasio *mass flow rate* 1; dan rasio *mass flow rate* 2. Menunjukkan rasio *mass flow rate* 0,5 yang mengalami penurunan sebesar 20,69%; rasio *mass flow rate* 1 mengalami penurunan sebesar 10,88%; dan rasio *mass flow rate* 2 mengalami penurunan sebesar 2,67%.

Kata Kunci: Pulverized-Coal boiler, Inlet Temperature, Rasio *air-fuel ratio,* Rasio *mass flow rate, Computational Fluid Dynamics (CFD), Ansys Fluent Academic Version, Probability density function mixture (pdf-mixture)*

Abstract

High energy requirements are one of the things that encourage the development of pulverized-coal boiler technology to obtain more efficient pulverized-coal boiler technology. The research was conducted by modeling using academic Computational Fluid Dynamics (CFD) software to simulate combustion with variations in inlet temperature, air-fuel ratio, and mass flow rate ratio. The geometry of the pulverized-coal boiler that will be simulated is the geometry of the pulverized-coal boiler from the journal" Numerical investigation on the flow, combustion, and NOX emission characteristics in a 660MWe tangential firing ultra-supercritical boiler" The data that will be entered into the Ansys Fluent simulation is in the form of primary air inlet, coal-rich burner, wall, and outlet data. The modeling used is the energy equation, the realizible k-ε turbulence model, the P1 radiation model, and the non-premixed combustion model.

The results of the simulation of inlet temperature variations show that the inlet temperature 800℃ has a maximum temperature increase of 136.4475% and the inlet temperature 1000℃ has a maximum temperature increase of 91.664%. Analysis of the maximum temperature on the inlet contour in the simulation of the air-fuel ratio shows that the air-fuel ratio of 0.5 has increased by 58.715%; the air-fuel ratio 2 increased by 51.997%; and the air-fuel ratio is 1 increased by 91.664%. Maximum temperature analysis on the outlet contour in the simulation of the mass flow rate ratio for variations in the mass flow rate ratio of 0.5; mass flow rate ratio 1; and mass flow rate ratio 2. Indicates the mass flow rate ratio of 0.5 which has decreased by 20.69%; the ratio of mass flow rate 1 decreased by 10.88%; and the ratio of mass flow rate 2 decreased by 2.67%.

Keywords: Pulverized-Coal boiler, Inlet Temperature, Rasio *air-fuel ratio,* Rasio *mass flow rate, Computational Fluid Dynamics (CFD), Ansys Fluent Academic Version, Probability density function mixture (pdf-mixture)*