NUMERICAL STUDY THE EFFECT OF AIR HEATER TEMPERATURE VARIATION TO DRYING CHARACTERISTICS OF COAL IN FLUIDIZED BED COAL DRYER WITH TUBE HEATER ARRANGED ALIGNED

Student Name : ANDI KURNIAWAN
NRP : 2108 100 068
Departement : Mechanical Engineering, FTI-ITS
Academic Supervisor : Dr.Eng.Ir.Prabowo,M.Eng.

ABSTRACT

Demand for coal as a primary energy source is predicted to rise in the future. Government policy through the plan of the national energy mixture is clearly prioritize the use of coal to 33% for the national energy needs. Most of Indonesia's coal reserves is low quality coal. Low quality coal is likely to have a large water content making it less effective in its use as a fuel. Under these conditions we need a technology that can improve the quality of coal by reducing the water content in it. One model coal dryer is a fluidized bed coal drying. Research about coal drying model in particular fluidized bed coal dryer to be interesting to do in an effort to help solve problems related to coal energy.

Limitations in the experimental as well as data retrieval with detailed analysis and visualization is needed in this study, therefore we need the help of computational methods to do this research. This research is done by numerical methods (CFD) with software Fluent 6.3.26. The selection of used models simulating conditions is turbulence model with realizable k-ε scheme first-order upwind interpolation. Modeling of mass transfer is done using the model species transport by setting water on the surface moisture content of coal. In this study the drying air temperature was varied, ie 316 K, 327 K, 339 K.
From this study it can be known drying characteristics at drying chamber on fluidized bed coal dryer with tube heater arranged aligned. Quantitative results in post processing showed that increasing temperature of the air heater is followed by increasing in heat and mass transfer coefficient with mass transfer rate. Greatest reduction in the rate of moisture content obtained at the temperatures air heater 339K followed 327K and 316K. Tube heater arranged aligned cause heating process with humidification. Condition of air around the tube heater have increase temperatures and humidity ratio with decrease in relative humidity. Humidification process caused the concentration of mass transfer moisture content of coal around the tube heater because the relative humidity of air around the heater tube is lower than the surrounding coal.

**Key Word**: Fluidized Bed Coal Dryer, Aligned Tube Heater, CFD, Drying rate, Moisture content, Humidifikasi