

Evaluation of Ash Fouling Behavior Determined by Theoretical and Experimental Method in Coal Gasifier Condition

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The purpose of this study is to evaluate ash fouling behavior in coal gasification condition with using DTF (Drop Tube Furnace), in which behavior of coal particle in actual entrained-type gasifier can be simulated experimentally. The fouling index is also developed to predict the low-temperature ash behavior with ash composition and characteristics, fluid properties of gas, etc. The developed fouling index is refined with the experimental data.

Various coal samples used in the Korean power plant, which are imported from China, Australia, USA, Russia, Indonesia, etc. were injected into DTF under various conditions of deposit surface temperature, flue gas temperature and gas environments to determine the applicability in gasifier. The ash samples deposited at sample collector by the impacting and agglomerating actions of ash were collected, weighed and examined.

Within various physical and chemical properties of coal, mineral component are generally considered as dominant parameter to determine ash deposition behavior at low temperature. In the development of fouling index, deposition rates of deposit-initiating mineral, such as SiO_2 , Fe_2O_3 , CaO , MgO compounds, coal fusion temperature, flue gas temperature; deposited surface temperature, viscosity, density, velocity, Sc. and Pr. No. of flue gas are integrated into fouling index with various conditions. Also, the effect of low-temperature melting component of coal ash on the deposition is coupled with the deposition-initiating rate. Finally, developed fouling index of low temperature ash deposition will be refined with the ash deposition behavior of actual DTF experiment as well as actual fouling phenomena in the heat exchanger section of 3 TPD pilot-scale coal gasifier.

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