9th International Freiberg Conference on IGCC & XtL Technologies
Closing the Carbon Cycle
3-8 June 2018
Berlin, Germany

Clean coal technology on hot gas clean-up process with a moving granular bed filter

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Coal is an important primary energy in the global world. The important of coal is sur-passed only that of the oil in our country. For the past few years, coal is an inexpensive and price stability resource with relative to another fuels. However, the global energy conservation, carbon reduction and PM2.5 issues also are very serious problem. For aiming to reduce carbon dioxide emissions from power plants as well as steel factories and petro-chemical, clean coal utilization is one of the most promising technology, among which the core entities are advanced gasification process. This technology is useful not only for emission reduction and pollution improvement in coal-fired plants but also for increasing multicultural fuel flexibility such as the usage of biomass and waste materials. For this reason, one proposal for Clean Coal Technologies focuses on the high-temperature dust filtration.

Dust particulates must be removed before the raw gas is burned in the gas turbine to protect the turbine blade and to control particulate emissions, since syngas from coal gasification contain dust particulates. A syngas cleaning technology of dust particulates was developed. The present work attempts to provide a general understanding of granular bed filters, a promising technology for hot gas clean-up. An experimental method was developed to understand the filtration processing of dust particulates. This study used a newly developed moving granular bed filter system to remove the dust particulates at the high temperature conditions. Between room temperature and 300°C, the filtration technology of a moving granular bed filter was employed to demonstrate the performance for collection efficiency under different filtration superficial velocities and mass flow rates of granular media, and fixed dust concentration. The variations of the outlet concentration and size distribution of dust particulates were measured to evaluate the dynamic characteristics of the process. In addition, important design constraints were discovered for the successful operation of the proposed moving bed granular filter. The results of this study indicate this type of method could be useful for application in different cross-flow filter systems for gas clean-up.