Simulation of Coal Gasification in an Entrained-flow Coal Gasifier using Computational Fluid Dynamics (CFD) Approach

Thanh D.B Nguyen, 임영일*, 송병호[1], 김시문[2], 주용진[2],
안달홍[2]
한경대학교; [1]군산대학교; [2]한국전력연구원
(limyi@hknu.ac.kr*)

The gasifier is a key component to produce a high-quality gas in Integrated-coal Gasification Combined-Cycle (IGCC) plants. The entrained-flow coal gasifiers have been widely used in IGCC plants due to the high gasification rate achievement and a relatively clean gas production.

In this study, a comprehensive three-dimensional computational fluid dynamics (CFD) model is developed to predict the performance of coal gasification in an entrained-flow gasifier using a CFD code, Fluent (Fluent, Inc., Lebanon, NH). The kinetic model is built by dividing the coal gasification into sub-models such as pyrolysis, char gasification, and gas phase reactions. The discrete phase model (DPM) is used to examine the behavior of coal particles inside the gasifier. Carbon combustion and char gasification are taken into account by using the Multiple Surfaces Reaction (MSR) model, and the gas phase reactions are considered as the Turbulent Reacting Flow (TRF) model.