CHAPTER 8

Simulation of cyclone separator for particulate removal from syngas

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1. Introduction

Global energy consumption is quickly expanding, and fossil-based fuels provide a significant portion of that need. However, reserves of fossil fuels are decreasing and will be diminished next few decades. For this reason, alternative and sustainable energy sources are being sought [1,2]. Syngas will be the appropriate solution for alternatives of fossil fuels [3,4] which is mainly composed of hydrogen (H_2) and carbon-monoxide (CO) mixtures. Gasification is a thermochemical conversion procedure for changing natural gas, coal, and biomass into syngas via interactions with oxygen and a variety of other sources [5,6]. In certain situations, this syngas is a fuel gas mixture composed of hydrogen, carbon monoxide, carbon dioxide, methane, and other gases [7]. This varies greatly depending on the raw material and gasification technology used; nevertheless, syngas is typically 30%–60% of carbon monoxide, 25%–30% of hydrogen, 0%–50% of methane, and 5%–15% of carbon dioxide, with a lower or greater amount of water vapor [8,9].

Moreover, gasification-based raw syngas includes gaseous components such as CO, H_2, CO_2, and H_2O [7]. As a residual of the gasifying agent, little quantities of Ar and O_2 remain in the syngas. The syngas composition is critical information for defining and calculating the best approach for measuring contaminants in the syngas. The composition of syngas's principal components changes according to the internal conversion from the water gas shift reactions (WGS). Syngas accounts for 2% of total basic energy consumption. The vast majority of syngas

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