CFD-based process modeling and simulation of n-heptane pre-reformer

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Hydrogen is attracting attention as a future energy because it is clean, environmentally friendly and can be produced from a variety of sources. Hydrogen can also be produced from renewable energy sources such as solar and wind energy, but the most economical way to date is to use hydrocarbons from fossil fuels. There are three ways to obtain hydrogen from hydrocarbons through chemical reactions : steam, air, and both. In this study, we focus on the pre-reformer (PR) method in which hydrocarbons and steam react. In the case of PR, the reaction takes place at a relatively low temperature, which can reduce heat loss and require less fuel for heating. In addition, because only steam is fed, it boasts a high yield of hydrogen.
However, safety studies for high pressures should be carried out because of the characteristics of the reactions that occur at higher pressures, and design studies for operating conditions such as temperature and steam to carbon ratio (SCR) are needed sequentially. Therefore, this study focuses on observing internal flow and physical changes for various operating conditions and designs using Computational Fluid Dynamics (CFD).