

# Assessment of Hydrogen-Rich Syngas From Biogas Using Aspen HYSYS

## Abstract

This study aims to compare and assess the quality of two biogas reforming processes: steam reforming of biogas (SRB) and tri-reforming of biogas (TRB). SRB is the conventional method of producing hydrogen efficiently. TRB, on the other hand, is a relatively new innovative way to achieve higher hydrogen yield at less energy expense and lower carbon dioxide (CO<sub>2</sub>) production. Both processes still have room for improvement, so optimizations should be considered to attain higher hydrogen yields and assess the effectiveness of both processes. The process simulation and sensitivity analysis were carried out using chemical process simulator (CPS), Aspen HYSYS, and its built-in sensitivity analysis tool. Direct comparisons of the results and evaluations of specific parameters targeted in the sensitivity analysis were then conducted, where the effects of changing molar ratio, temperature, and pressure were analyzed. The conversion of methane, conversion of CO<sub>2</sub>, ratio of hydrogen to carbon monoxide (CO) produced, and hydrogen yield were also calculated. Since this study was only simulated on Aspen HYSYS, the results should be taken as an estimation of the processes under ideal conditions. The results lack chemical analysis and are limited to the software's mathematical and computational abilities. However, the sensitivity analysis obtained decent correlation with literature and recorded trends that showed the feasibility of SRB and TRB in industrial conditions.

## Keywords

Aspen HYSYS; Biogas; Sensitivity Analysis; Steam Reforming; Tri-reforming