

## Model Development and Evaluation of Methanol Synthesis Processes from Steelmaking Off-gas

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This study proposes off-gas utilization process to produce methanol because of high global demand of methanol and its facile conversion to other valuable chemicals such as DME and olefin. Off-gases contain carbon monoxide, carbon dioxide, and hydrogen. Therefore, two different reaction mechanisms are chosen depending on the catalyst: CO hydrogenation and CO<sub>2</sub> hydrogenation. Before methanol synthesis, water-gas-shift reaction is considered in order to increase amount of hydrogen, and SELEXOL process is additionally included to remove sulfur compounds and capture CO<sub>2</sub>. The process model is simulated using Aspen Plus<sup>®</sup> and evaluated in environmental and economic aspects. The analysis results of two cases are compared with each other. In terms of environmental effect, CO<sub>2</sub> emission is estimated by the lifecycle assessment (LCA). Moreover, economic feasibility of the proposed system is evaluated through the techno-economic analysis (TEA) by comparing estimated unit production cost of methanol with commercial methanol price.