

## Optimization of synthesis gas production process with multiple reaction path using recycled CO<sub>2</sub>

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Synthesis gas is mixture of CO and H<sub>2</sub> and one of the most important feedstocks in the chemical industry. From syngas mixtures having different H<sub>2</sub>/CO ratios a wide variety of products can be manufactured.

In this paper, the objectives are to determine the optimal design of multiple synthesis gas production process using carbon dioxide. The optimal configuration of the synthesis gas process is obtained by maximizing objective function based on the net of product revenue and manufacturing cost, and environmental and sustainable cost along with satisfying process constraints. We developed a superstructure of the global syngas production process system which includes alternative synthesis gas reactions. The superstructure is the basis for the mixed integer linear programming (MILP) that can be optimized to determine the best alternative reactions and operating conditions of the process. The industrial synthesis gas process problem is presented to illustrate the methodology.