

## **CARBON CAPTURE IN STEAM METHANE REFORMING THROUGH TECHNO-ECONOMIC, SAFETY AND ENVIRONMENTAL OPTICS**

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Carbon dioxide emissions associated with hydrogen production are expected to rise with continuous transition to hydrogen economy. The steam methane reforming as the most frequently used technology to produce hydrogen is heavily investigated for options to reduce its carbon footprint.

In this work, three possible carbon capture (CC) approaches for steam reforming of natural gas are studied from techno-economic, safety and environmental point of view. The considered CC techniques are post-combustion CC of flue gases, pre-combustion CC of offgases from pressure swing adsorption (PSA) and oxyfuel combustion. Both pre- and post-combustion CC were realised by reactive absorption with monoethanolamine. For each investigated CC technology, mathematical model and process simulation were developed in Aspen Plus.

Simulation data supplemented by safety data sheet data were used to assess all simulated case studies by multiple criteria. CAPEX and total production costs were used to determine economic feasibility. E factor and Specific Energy Consumption were selected to assess efficiency of the use of resources. Environmental impact was determined by evaluation of Eco-Indicator 99 and C factor. Process route index and Comprehensive Inherent Safety Index were used to determine inherent safety level of studied processes. Oxyfuel combustion was identified as the best option considering all criteria simultaneously.