

Efficiency analysis of various carbon capture technologies: Case study in an integrated gasification combined cycle plant

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The integrated gasification combined cycle (IGCC) process is a representative power generation technology because of its high efficiency and environmental advantages over the conventional pulverized coal fired process. In CCS scenario, carbon capture technologies (CCT) emerge as the effectual remediation processes to curtail CO₂ emissions from coal power plants. Therefore, to integrate CCT into IGCC for a demonstration to commercial scale, it is required to minimize technological risks, capital and operational cost.

In this study, as a first step, a 300 MW class IGCC plant without CCT was evaluated through the energy and exergy flow associated with the first and second laws of thermodynamics in major components of the IGCC in viewpoint of overall efficiencies. At last, five single carbon capture technologies, which are commercially available, were evaluated from the technical to economic points of view via process modeling and simulation: (i) a-MDEA, (ii) Retisol, (iii) Selexol, (iv) Purisol and (v) Cryogenic process.

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