Process design and optimization of membrane process for CO_2 removal from NGCC flue gas

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It is accepted that carbon capture from natural gas power plant flue gas is challenge due to a low CO_2 concentration in the flue gas. In order to tackle this issue, we proposed novel membrane process with 3 design options. First, a increased CO_2/N_2 selectivity of membrane module in the cold temperature is contributed to separate CO_2 from huge amount of flue gas. Also, LNG regasification replaces the conventional refrigeration system. Last, the methodology of EGR and S-EGR enhances the feed CO_2 fraction from 4 % to 6 - 10 %. These options finally reduce the CO_2 capture cost to $ 57/tCO_2(- 55.1 %) and parasitic load to 54.8 MW (-70.1 %) against existing sub-ambient membrane process. In addition, the sensitivity analysis is carried out in cases of varied CO_2/N_2 selectivity and CO_2 permeance for analysis of how membrane system can be improved.

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