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Performance Analysis of Cryogenic CO2 Capture Methods employed in Post Combustion Systems

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Content :

Cryogenic CO_2 capture is a promising technology to capture CO_2 from the exhaust gas from power plants. It cools the flue gas to de-sublimation temperatures (-100 to -135 0 C) and separate solid CO_2 from the light flue gas stream. In order to cool the flue gas to de-sublimation temperature nitrogen refrigerator based method and direct compression and expansion of flue gas method are used. The processes are modelled in Aspen HYSYS and their performance are evaluated and compared. The results of this study showed that, in order to capture 95 % of CO_2 from commercial power plant with net power output of 500 MW, nitrogen refrigerator based method requires 15.45 % (77.24MW) generated power whereas direct compression and expansion method requires 10.42 % (52.1MW) generated power. It has also been found that, the major parameters affecting the performance of nitrogen refrigerator based method are de-sublimation temperature, compression pressure and mass flow rate of nitrogen. Flue gas compression pressure is found to be the main parameter in direct compression and expansion method of CO_2 capture system. It has been understood that the performance of the direct compression and expansion method of CO_2 capture system may be further improved by employing multi-compression for increasing flue gas pressure.

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