Seminar

Institute for Plasma Research

Title : GHG capture by physical solvent DMEPEG at a pre-combustion IGCC power plant (390 MWe net power generation)

Speaker: Dr. Ashok Dave
University of Ulster, UK

Date : 25th November 2020 (Wednesday)

Time : 3.30 PM

Venue : Online - Join the talk: https://meet.ipr.res.in/Dr.AshokDave_PDFtalk

Abstract :

The research work discusses the solubility of GHG (greenhouse gas) compounds in physical solvent DMEPEG (di-methyl-ether of poly ethylene glycol), a proposed novel energy-efficient process configuration for GHG capture by DMEPEG solvent and its integration with the precombustion IGCC (integrated gasification combined cycle) power plant. Solubility of GHG compounds in DMEPEG solvent as per ProTreat software was compared with published data. The Rate-based mass transfer occurring in a packed tower was simulated using ProTreat software. The Thermo-Chemical process of pre-combustion IGCC power plant was analysed using Thermoflex software. Economic assessment was undertaken based on vendor quotes and commercial software. The proposed novel process configuration (for GHG capture) included several energy saving features such as – (a) uniformity of individual packed tower diameter, (b) Recovery of co-absorbed Hydrogen, (c) Solvent depressurization by Hydraulic Power Recovery Turbine (HPRT), (d) Compression of CO2 by Integrally Geared Compressor, (e) Utilization of recovered heat for solvent heating for gas desorption, etc. 138552 TPD solvent was circulate with 10800 TPD syngas to generate 390 MWe power using Siemens SGT5 4000F Gas Turbine. While processing 10800 TPD Syngas, this novel design of AGR achieved to capture 99.5 % H_2S from syngas (from 0.3 % to 3 ppm - mole fraction) using heat input = 30.7 GJ/Ton H_2S capture and 88 % CO_2 capture from syngas (42.3 % to 6.45 %) using power consumption = 50.7 kW-Hr/Ton CO2 capture. Based on the process details, the appropriate commercially available machinery and equipment were identified and plant economics was assessed.