CAER Heat Integrated Post-combustion CO₂ Capture Process

Carbon dioxide is one of the major greenhouse gases impacting climate change. Nearly one-third of man-made CO₂ emissions result from combusting fossil fuels for electricity. UK-CAER has developed an advanced, solvent-based plant-wide heat-integrated carbon-capture process to control CO₂ emissions from power plants affordably.

Two-stage Stripping

1. The first key component of the process is a two-stage stripping unit for solvent regeneration. This innovative approach includes the addition of an air-based second stage stripping process inserted between a conventional rich-lean crossover heat exchanger and a lean solution temperature polishing heat exchanger. The secondary stripper outlet stream is used as boiler combustion air, thereby enriching the flue gas with CO₂.
Integrated Cooling Tower

- The second key element is a heat-integrated cooling-tower which recovers waste energy from the carbon-capture system. The conventional cooling tower is redesigned to include two sections. The top section contains 100% cooling water for the conventional cooling function; the bottom section removes moisture from the cooling air using a liquid desiccant before entering the top section for cooling recirculating water from the steam turbine condenser. Reducing the relative humidity of the cooling air lowers the turbine condenser cooling water temperature and thereby reduces the steam turbine backpressure, improving efficiency.

Advanced Solvent

- The third part of the process is the solvent. Compared to a baseline solvent of 30% wt monoethanolamine (MEA), the CAER solvent has:
  - Higher mass-transfer flux (1.4-3.0 times higher reaction rate) in the conventional working carbon-loading range;
  - High net cycle carbon capacity (30-40% less recirculation); and
  - Less energy demand for CO2 stripping (10-12% less).

Contact

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