

Sensitivity analysis of the process modification and amines in CO₂ capture: Monoethanolamine (MEA), Aminoethylethanolamine (AEEA), and Diethylenetriamine (DETA) solutions

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In coal-fired power plant carbon capture, the amine-based chemical absorption process is known as the most successful commercial technology for many years. In this study, to improve the efficiency of the chemical absorption process, we conducted the performance analysis of novel reactive amine solvents, Aminoethylethanolamine (AEEA) and Diethylenetriamine (DETA). Both absorbents are known to have a high absorption rate with CO₂ and high absorption capacity in post-combustion carbon capture conditions, compared with Monoethanolamine (MEA). Performance analysis of both absorbents was conducted by dynamic simulation based on the rate-based calculation using gPROMS simulator. In addition, by conducting the sensitivity analysis according to liquid-to-gas ratio and lean amine loading of both absorbents, the optimum values for lean amine loading for each absorbent were obtained. Their performance and energy consumption were compared with the traditional MEA process. And a performance analysis of new process configuration was conducted to reduce the energy consumption in solvent regeneration. Cold solvent split (CSS) modified configurations was applied to a stripper.