De-bottlenecking Specific Energy Optimization Aspects of Amine Sweetening Process

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Abstract

The objective of this thesis was to study the possibility of reducing re-boiler duty for pre-combustion amine sweetening processes using two different approaches. These are, operating conditions optimization approach and retrofitting approach. Two existing amine sweetening units have been selected to simulate the proposed approaches using ProMax 3.2 process simulation software. For the first approach, the impact of amine circulation rate, stripper operating pressure and lean/rich heat exchanger outlet temperature have been studied and simulated for the two plants to determine their impacts on re-boiler duty. The second approach focused on effectiveness of retrofitting approach in which various process flow schemes for post-combustion processes have been studied in terms of their applicability to pre-combustion amine sweetening process. Two selected retrofitting schemes namely lean vapor compression and rich vapor compression have been studied in details for the two units. For both selected retrofitting schemes, and both plants, a comprehensive optimization exercise has been carried out to achieve optimum configuration and operating parameters. The results indicate that potential energy saving up to 33% can be achieved by applying lean vapor compression for both plants. For rich vapor compression, potential energy saving up to 28% has been achieved for Unit-A and 11% for Unit-B. The results from this study can be projected to other similar pre-combustion amine sweetening process and can form a starting point for upstream oil and gas industry.