Heat Integration of the Commercial Ethylene Process

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Heat integration of the overall ethylene process is essential for an efficient and optimal design. This usually requires simultaneous optimization of energy and equipment costs for each design alternative to obtain the optimal system. However, the evaluation and economic comparison of many design alternatives is usually not practical in terms of the time and effort required. Such an approach can also provide a solution that is quite removed from the true optimum. In this study, pinch analysis is utilized to identify the energy saving potential (*energy and capital targets*) in the ethylene process and assist in the design of the heat exchanger network to achieve the targeted savings. Pinch technology is used as a tool to optimize the entire process and determine the various process design changes that can be made to improve the conventional design. A comparison between the optimized and the existing heat exchanger networks (HEN) for the conventional ethylene process is investigated. The optimized heat exchanger network provides energy savings of 35.13% over the existing hot utilities and 24.1% over the existing cold utilities. Although, the heat transfer area used in the existing HEN is about 79% of the optimized HEN, the optimized conventional ethylene process provides savings in both capital and operating costs. The saving results from a reduction in equipment size associated with the refrigeration systems as well as the steam system. This study shows that the savings in capital compressor costs for the propylene and ethylene refrigeration systems are considerably larger than the added capital costs of the heat exchanger network.