

Research topics

Retrofitting Distillation Systems

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Abstract

Petroleum, petrochemical and chemical processes are often modified to accommodate increased throughput, changes in feedstocks, changes in product specifications and to improve energy efficiency. In such circumstances, the distillation system often needs extensive changes. This project develops procedures and tools for cost-effective retrofit of distillation sequences.

Project description

This project develops procedures for identifying promising retrofit design options for a distillation system. A process plant is often required to perform quite differently from the original design. For example, the required throughput may increase, the feedstock or product specifications may change, or there may be the need to reduce operating costs by increasing the energy efficiency of the process. The most cost-effective solutions to these requirements maximise the use of existing equipment and make the minimum number of modifications to existing equipment. This work considers retrofit options such as changing operating conditions, reallocating existing units to different tasks, modifying existing equipment to enhance its performance, or possibly making fundamental changes to the process configuration. Constraints imposed by lack of space or safety must be taken into account.

Repeated simulation of the distillation process can allow promising design options to be identified, but this approach is not systematic and is time-consuming for the design engineer. Tools for analysis of retrofit options, when coupled with simplified simulation and hydraulic models, will allow many design options and combinations of design options to be screened with little effort. Design options include modifications to column internals, heating or cooling the feed, changing the feed stage location, adjusting the operating pressure and using intermediate heating or cooling. For a distillation sequence the set of design options increases, since columns may be resequenced or reconfigured, and separation tasks may be reallocated to new or existing columns. Retrofit design is a complex problem that requires a systematic approach to ensure that the most effective solutions are obtained.

This project develops such a systematic approach for the analysis and retrofit design of existing distillation systems.