358b Optimization of Multiple Effect Distillation with Reduced Production Rates

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With the recent increase in oil prices and swings in product demand, many manufacturing facilities have been forced to optimize utility usage in order to control costs associated with low production rates.

This study investigates optimization of a distillation process used in the recovery of a waste stream when operating at new lower production rates. This process was originally designed to run continuously at peak capacity. Under current market condition, the unit must be operated at lower rates than previously encountered. Campaigning the operation would provide the best energy savings, but the incurred maintenance cost due to frequent shutdowns makes this option impractical. Thus, there exists a need to identify the lowest cost operation of the existing distillation columns for the various throughput and feed water composition encountered under the low rate conditions.

This investigation considers the optimization of the distillation process in terms of minimizing the energy costs by identifying the most efficient set of operating parameters for a given production rate. This is achieved by expanding soft constraints such as changing the overhead quality guidelines and establishing control based on feed water inventory.

The efficiency optimization is carried out using Matlab software (vers 6.5.0) with the aid of a dynamic model constructed in Aspen Dynamics (vers11.1). The method of optimization makes use of known process values for the distillation columns and a variation of an evolutionary algorithm strategy for optimization of the overall system. The final product is a new operational plan that is effective in conserving energy usage. The method of optimization requires the construction of a process efficiency measure. Then, given a set of current parameters, the solver selects new nearby parameters of better efficiency. These values are given to the column simulation, allowing the method to move towards better efficiency until a process constraint is violated.

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