Pre-Flash Crude Fractionation

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Executive Summary

Since there is a rising demand of energy, and a depleting supply of energy, energy conservation is becoming extremely important. Analyzing processes or methods that can be improved in energy efficiency is becoming extremely important. One process that consumes much of the energy in this world is crude processing. The current method for conventional crude fractionation requires 2% of the oil that it processes. The increased cost of energy has made it attractive to look at alternative methods to save energy in the distillation of crude even if it requires more capital investment, especially when an entire new plant need not be built to implement the alternative method. It is proposed that a conventional column with multiple pre-flashes could save a notable amount of energy over conventional crude distillation. Simulations of a multiple pre-flash method were created to determine if this method would be an energy saving addition to the conventional model.

Heat integration of conventional crude fractionation by use of a single pre-flash unit has shown to be less energy efficient than conventional units alone when maintaining the same product yield. However, there is a reduction in the heat requirement when the flow rate of gas oil is reduced. Marginal improvements have been shown for heavy crude fractionation while maintaining high gas oil yield. This work shows the results of use of multiple pre-flash units in several configurations. The heat integration of conventional units with multiple pre-flash units is analyzed using both light and heavy crude fractionation and compared to purely conventional units. Multiple pre-flashing increases the minimum heat utility, but reduces gas oil yield making all these options unprofitable.

However, a new design developed alongside this study showed an improvement on energy savings compared to the conventional case. The details of this new design cannot be released at this time due to protection of possible intellectual property. We only report the results of this new design in terms of its product yield and economical impact. The new design reduces the energy requirement by %3.5 for light crude and %1.5 for heavy crude and it increases the gas oil yield by %12.4 for heavy crude and reduced it for light crude.. An economic analysis showed the new design yields a profit increase of $7 million per year from the conventional case for heavy crude (for the light crude it is not profitable). Further studies are therefore warranted.