

ABSTRACT:

This paper presents two main contributions. Firstly, a new exergy graphical method is proposed for optimal design of distillation column with minimum exergy lost. The method is applicable to both grass-root and retrofit cases, respectively. The effect of design and operating parameters of a distillation column on the exergy lost is graphically visualized by three-dimensional exergy analysis curves. The curve shows the correlations between exergy lost, design and operating parameters of a distillation column. This technique can be used as an effective method to reduce the simulation effort to search for the optimum design and operating parameters of a distillation column at minimum exergy lost. Besides, visualization also enhances the engineers' understanding of the column performance. The other contribution is a four-level idealization concept, which is based on three-dimensional graphical exergy analysis curves. The concept defines the effect of transport rate and configuration on exergy lost of distillation column. The effectiveness of the method has been demonstrated on a xylene column, which suggested that an implementation of feed pre-heater yields a significant reduction in exergy lost by up to 15.5%.