Knowledge based Optimization of Mixed Refrigerant System with Thermodynamic and Nonlinear Programming

칸 모드 샤리크, 이문용*, Hasan Mudassir
영남대학교
(mynlee@ynu.ac.kr*)

Mixed refrigerant (MR) systems are used in numerous industrial applications. High exergy efficiency, compact design and energy-efficient heat transfer are their inherent advantages over process operating with pure refrigerants. However, MR system performance depends strongly on the optimum refrigerant composition that is difficult to find. In this paper, a simple and practical method for refrigerant composition selection is proposed. It is based on graphical targeting approach for getting initial thermodynamic feasible solution and then fine-tuned by nonlinear programing. This proposed method is explained by considering single MR and Propane precooled MR, natural gas liquefaction processes and case studies demonstrated the effectiveness of process by increasing the exergy efficiency. The application of present method restricted not only to liquefiers and can be extended to refrigerators, cryocoolers where mixed refrigerant are involved.
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