Design and optimization of blower based heat pump system for improving the energy efficiency of separation and purification processes in chemical industry

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These days, many chemical engineers pay much attention to apply heat pump system for improving the energy efficiency of industrial separation processes. In distillation process, heat pump system can save energy significantly by upgrading the low-temperature waste heat to high temperature and utilizing it instead of steam for supplying heat to the reboiler. In this study, a blower based heat pump system was proposed to improve the energy efficiency of separation and purification processes in chemical industry. This paper showed the advantages and disadvantages of a blower based heat pump system and figured out when it can be applied. Blower based heat pump system is mainly used when there is only a small temperature difference between the hot and cold streams, where small pressure ratio and consequently smaller blower duty are needed. Several important industrial cases have been investigated to demonstrate the proposed configuration. By applying blower based heat pump systems, the latent heat can be circulated during the process, leading to a substantial improvement in energy efficiency.