

Design, simulation, and experimental studies of halon 1301 separation employing existing batch distillation column assisted by Vapor compression heat pump in industrial-scale

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An existing heat pump-assisted batch distillation was utilized to separate halon 1301 from a waste gas mixture. The heat pump configuration including a vapor compression heat pump with cycles of cold and hot water were introduced for easy operation. To design this separation, where several design variables must be verified, the design methodology proposed by Long et al. (2020) was used. After using shortcut and rigorous methodologies, the existing heat pump-assisted batch distillation was operated to separate halon 1301. The experimented results matched well with the simulated results. Target purity (99.9%) of halon 1301 was experimentally reached after 22hr. The results showed that the heat pump-assisted batch distillation saves up 100.0% of the energy require of the reboiler and 36.5% of operating cost compared to a conventional batch distillation. CO₂ emissions decreased as well by up to 43.7% compared to that of the conventional batch distillation.