

Efficient recovery of benzene and n-propanol from wastewater via vapor recompression assisted extractive distillation based on techno-economic and environmental analysis

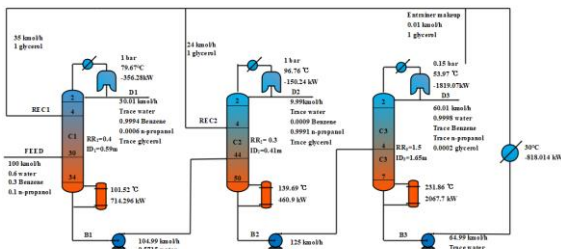
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1 Abstract

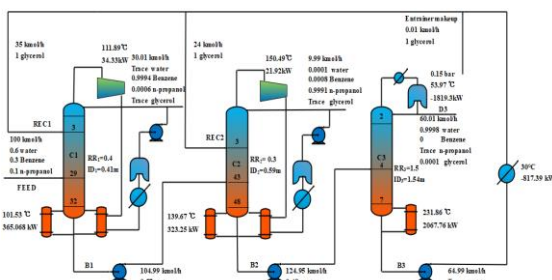
N-propanol and benzene are important chemical organic compounds, which widely exist in wastewater of chemical industry, medicine and other fields. On the basis of vapor recompression assisted extractive distillation, energy integration was carried out according to pinch technology, and the optimal energy utilization method was found.

2 Design of the processes

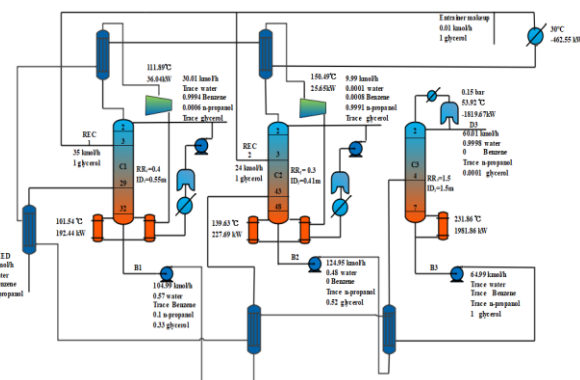
There are many azeotropes in chemical waste liquid, extractive distillation is widely used in this process as an efficient separation method.



Optimal flowsheet using glycerol as solvent



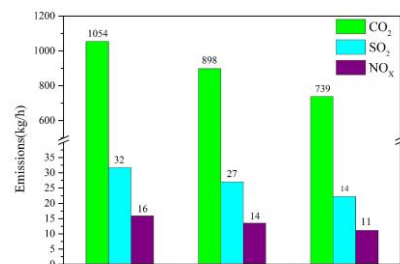
Optimal flowsheet of vapor recompression assisted extractive distillation



Optimal flowsheet of extractive distillation processes with feed pretreating

3 Results and discussion

By adding heat pump process and raw material preheating process to the first two towers, the latent heat at the top of the tower can be realized, which can provide heat for the reboiler at the bottom of the tower and greatly reduce the required condensate and hot steam.



Gas emissions from different processes

	ED	VRAP	FP VRAP
Consumption	6235	5372.88	4461.11
Process energy consumption			

4 Conclusion and Prospect

The results show that the FPVRAP has the advantages of environmental protection, energy saving and investment reduction.

In order to recover the solvent glycerol, a lot of heat is consumed, Membrane distillation can be considered to recover solvent glycerol.