Simulation and optimization of salt-production process from desalination brine

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Abstract

A novel multi-salt crystallization process is presented to separate the salts from the desalination brine and is optimized using the gradual optimization integration strategy based on T-H diagram. Firstly, the process is simulated by Aspen Plus software to obtain the cold and hot load curve and the bottlenecks and unreasonable heat transfer processes are analysed. Secondly, considering the energy utilization and conversion procedure, the turbine and/or heat pump are introduced to improve the process. Then the parameters of production process and utility system are adjusted. Thirdly, the new stream information is obtained by process simulation and the new composite curves are drawn, which will guide the further adjustment of the system. If the new composite curves do not satisfy the process demand, then the above steps are repeated. Through several improvements, two approximate parallel hot and cold stream curves are constructed. The hot streams and cold streams are maximum possible matched, and the amount of utility and power consumption is significantly reduced. In a case study, two optimization schemes are adopted: the feed brine is preheated by the flash steam and the heat pump crystallization technology is introduced. The results show that the energy consumption of two optimized processes is 94.8 kW and 90.1 kW, and the total energy loss decreased 86.7 % and 87.3 %.