A Novel Absorption Cooling Cycle Using Waste Heat from Cogeneration

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Abstract:

To make full use of waste heat in the exhaust gas discharged from cogeneration, this presentation presents a new absorption refrigeration cycle with a simple configuration. The proposed configuration consists of the following components (Fig.1): a generator, a rectifier, a solution heat exchanger, a condenser, three throttle valves, two evaporators, a vapor-liquid separator, two solution pumps, a subcooler. Ammonia-water solution is used as working fluid. The solution out from a low-pressure and high-temperature absorber continues to absorb refrigerant vapor in a low-pressure and low-temperature absorber which is cooled by evaporating refrigerant in a high-temperature evaporator. The refrigerant vapor to be absorbed in the low-pressure and low-temperature absorber comes from a low-temperature evaporator. The vapor from the high-temperature evaporator is then absorbed by solution in a high-pressure absorber. This solution pressurized by a pump comes from a low-pressure and low-temperature absorber. Being different from conventional single-effect absorption refrigeration cycle, the molar fraction of refrigerant of the solution into generator is much greater than that of the conventional single–effect absorption refrigeration cycle, leading the temperature of the exhaust gas used by this cycle to be much lower than that used by conventional single–effect cycle. In other words, the new cycle can be effectively used for large temperature glide of waste heat. Theoretical simulation results show that the cooling effect made by the proposed cycle per unit mass of waste gas is about 50% higher than that of conventional single-effect cycle, especially for lower temperature of supplied waste heat and/or lower refrigeration temperature.

Keywords:

waste heat; absorption refrigeration; simulation

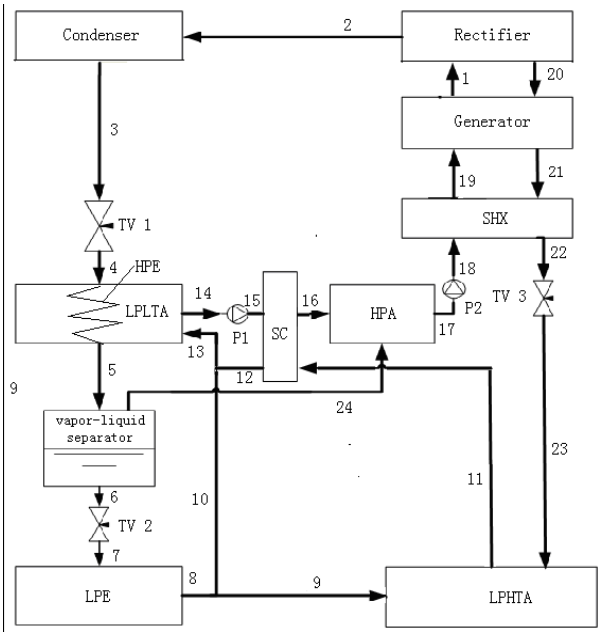

Figure 1 The diagram of the proposed cycle