

Compact ammonia-water absorption chiller with increased coefficient of performance

Field of application

Absorption chillers reduce the power consumption required for refrigeration and air-conditioning. As the refrigerant is not compressed by an electric compressor but by a "thermal compressor", its power consumption can be substituted by various heat sources, e.g. by solar heat or waste heat generated through technical processes.

State of the art

The refrigeration cycle of an absorption chiller is based on the principle that a refrigerant is first absorbed in a solvent and then, at a higher temperature and pressure, desorbed from the solution. Ammonia is often used as the refrigerant and water as the solvent. The combination of these working fluids has the advantage of evaporator temperatures lower than 0 °C. Conventional absorption chillers are a complex system, i.e. they consist of multiple components. Therefore a lot of installation space is required. Efficiency losses occur at low evaporator temperatures and high heat rejection temperatures due to insufficient absorption of the refrigerant.

Innovation

Scientists at the University of Stuttgart have now developed an absorption chiller that is extremely compact, lightweight and stable in terms of operation, even at low evaporator temperatures and high heat rejection temperatures.

Its compactness and lightweight are achieved through multiple heat exchangers. Their plates are arranged so that the condenser and the dephlegmator or the evaporator and the refrigerant heat exchanger are combined in a single component consisting of two cover plates with six connections.

Additionally, an absorber pre-cooler ensures that the absorption is improved and the absorption chiller attains a higher coefficient of performance at lower evaporator and/or higher heat rejection temperatures.

A reservoir, a plate generator and a separator form a non-forced flow system. This open system particularly stabilizes fluctuations, so that any ammonia vapor is separated in the reservoir before entering the generator (see figure). In addition to the stabilization of the fluctuations in the reservoir, another advantage of this circuit is that the ammonia-rich condensate collected in the dephlegmator can be fed directly into the reservoir. It is not fed into the weak solution - as known in plate generators with forced circulation.

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Your benefits at a glance

- ✓ Increased efficiency at low evaporator and high heat rejection temperatures
- ✓ Greater compactness
- ✓ Lower weight
- ✓ Lower production costs
- ✓ Less refrigerant required
- ✓ Stable operation even during fluctuating operating conditions
- ✓ Low heat losses due to less pipes and combined components

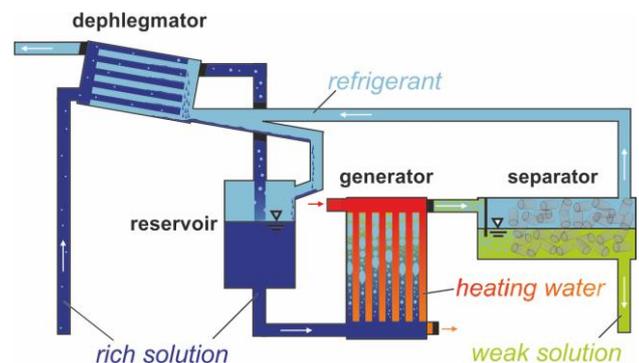


Figure: Patented circuit of generator, reservoir and separator of absorption chiller

Technology transfer

Technologie-Lizenz-Büro GmbH is responsible for the exploitation of this technology and assists companies in obtaining licences.

Patent portfolio

A European patent application (EP 13 785 816) is pending.

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