ET 480
Absorption refrigeration system

Description
- model of an absorption refrigeration system
- boiler operated alternatively by gas or electrically
- adjustable heating at the evaporator serves as cooling load

Refrigerating plants make use of the fact that a refrigerant evaporates at low pressure. In absorption refrigeration systems, the absorption of ammonia in the water produces this low pressure. The absorption process is driven by thermal energy, which can come for example from industrial waste heat or solar collectors to operate these systems.

This basic principle of an absorption refrigeration system is demonstrated in the ET 480 experimental unit taking the example of an ammonia-water solution with the ammonia acting as refrigerant. In the evaporator the liquid ammonia evaporates and withdraws heat from the environment. To keep the evaporation pressure low, the ammonia vapour in the absorber is absorbed by the water. In the next step, ammonia is permanently removed from the high concentration ammonia solution to prevent the absorption process from being halted. For this purpose, the high concentration ammonia solution is heated in a generator until the ammonia evaporates again. In the final step, the ammonia vapour is cooled in the condenser to the base level, condenses and is returned to the evaporator. The low concentration ammonia solution flows back to the absorber. To maintain the pressure differences in the system, hydrogen is used as an auxiliary gas.

In process technology systems the resulting waste heat can be used for cooling. In small mobile systems, such as a camping refrigerator or minibar in a hotel, the required heat is generated electrically or by gas burner. Another benefit of absorption refrigeration systems is their silent operation.

ET 480 demonstrates the functional principle of an absorption refrigeration system with its main components: evaporator, absorber, boiler as generator with bubble pump, condenser. The boiler can alternatively be operated with gas or electrically. Another electric heater at the evaporator generates the cooling load.

Temperatures in the refrigeration circuit and the heating power at the boiler and at the evaporator are recorded and displayed digitally.

Learning objectives/experiments
- demonstrate the basic principle of an absorption refrigeration system
- absorption refrigeration system and its main components
- operating behaviour under load
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Specifikation

1. operation of an absorption refrigeration system
2. main system components: evaporator, absorber, boiler with bubble pump, condenser
3. ammonia-water solution as working medium, hydrogen as auxiliary gas
4. boiler to separate ammonia
5. bubble pump for transportation in the circuit
6. adjustable electrical heater at the evaporator serves as cooling load
7. boiler is alternatively heated by electrical heater or gas burner
8. piezoelectric igniter for gas operation
9. digital displays for temperature and power

Technische Daten

1. Working medium: ammonia-water solution
2. Auxiliary gas: hydrogen
3. Electric heater: 125W
4. Gas burner, adjustable: propane gas
5. Evaporator heater, adjustable: 50W

Messbereiche
- temperature: 4x -80...180°C
- power: 0...150W

230V, 50Hz, 1 phase
230V, 60Hz, 1 phase
120V, 60Hz, 1 phase
UL/CSA optional
LxWxH: 750x450x750mm
Weight: approx. 47kg

Anforderungen

propane gas: 30...50mbar

Lieferumfang

1. experimental unit
2. hose
3. pressure reducer
4. set of instructional material
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Optional accessories

020.30009  WP 300.09  Laboratory trolley