ROMANIAN RESEARCH ON REFRIGERATION AND AIR-CONDITIONING

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Topics

› Research developed on refrigeration and air-conditioning systems by a group of professors from the Technical University of Civil Engineering from Bucharest focussed on the following topics:

› **Air Conditioning Systems Driven By Renewable Energy Sources - Solar Cooling**
› **Air Conditioning Systems Using Ice Slurry As A Cooling Medium**
› **Mechanical Refrigeration Systems Micro Electronic Components**
› **Mechanical Vapor Compression Refrigeration Systems**
1. AIR Conditioning Systems Driven By Renewable Energy Sources - SOLAR COOLING

Ammonia-water absorption refrigeration system driven by solar energy, for cold water and ice (20 t/d) preparation, Jurilovca-Tulcea, 1983
Resorption heat transformer driven by district heating outlet water of 28-23°C, producing 55-60°C warm water.

Resorption compression heat pump, using ammonia-water solution, for hot water preparation, 1989 Bucharest.
Absorption refrigeration system using ammonia-water solution and mini channel heat exchangers, driven by solar energy

General view of the absorption system.
Compacted version of the system described above was built in CRIOMEC SA

G, C, E and the economizers are mini channel type. The A is an original construction, of mini channel type, with an upper distribution for the poor solution, a lower collector for the rich solution and a median distribution for ammonia vapor injection. The C and the A are air cooled. The hydraulic diameter of the channels is 1.5 mm. The cooling capacity of the system is 7-10 kW. Hot water prepared by solar energy, with temperatures between 85-90°C was used at the G for boiling the ammonia-water solution.
Experimental investigation concluded that hot water of 83.4 °C/74.6 °C at the inlet / outlet of the G holds enough thermal energy in order to drive this ammonia-water absorption system; the COP of the system was found to be 0.5.
Coupling Yazaky systems with solar energy system

YAZAKY system - absorption refrigerating systems using lithium bromide-water solution
2. Air conditioning systems using “Ice Slurry” as a Cooling Medium (PCM)

Experimental stand for ice-slurry generation and further using in comfort air conditioning
The cooling capacity of the system ranges from 3 to 7.5 kW. Ice-slurry is generated in a scraper-type generator that is part of a single stage compression system.
The refrigeration system specially designed to cool micro electronic components by mechanical vapor compression was assembled in June 2006 in the Laboratory of Thermodynamics and Thermal Equipment from the Technical University for Civil Engineering in Bucharest. Here are some of its technical features: hermetic compressor type TEE AZ 47 YT, displacement of 2.80 cm³, refrigerating capacity ranging from 50 – 60W. Refrigerant used: R134a. The refrigeration system for micro electronic components is characterized by low weight of 6.6 kg, compact size, high reliability and a low noise level and vibration.
4.1. Mechanical Vapor Compression Refrigeration Systems - *Systems using ammonia as a refrigerant*

The experimental single stage mechanical vapor compression refrigeration system comprises the following main pieces of equipment: screw K of 60 kW refrigerating capacity (at -10°C t0 and +25°C tC); oil separator; plate type condenser; liquid ammonia subcooler; refrigerant receiver of 300 mm diameter and 1500mm length; ammonia pump; plate type evaporator of 6.2 m² heat transfer area; liquid separator of 300 mm diameter and 2000 mm length; variable speed centrifugal pumps. The evaporator may be either forced, or gravitationally fed.
4.2 Mechanical Vapor Compression Refrigeration Systems - *Systems with R404A as a refrigerant*

Technical features: refrigeration capacity: 18.0 kW, for -10.0°C to, +35.0°C cooling medium temperature and +20.0°C suction line vapor temperature. The system COP is 1.79. Heat rejection rate at condenser is 29.20 kW, for +47.4°C tC. This mechanical vapor compression refrigeration system uses R404A as a refrigerant is fully automated and includes one digital K of Copeland type with refrigeration capacity control depending on consumer heat demand.
THANK YOU FOR YOUR ATTENTION!