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EXPERIMENTAL ANALYSIS OF INNOVATIVE HEAT EXCHANGER WITH UNIFORM HEAT FLUX USED IN HEAT PUMPS SYSTEMS

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Abstract

The study presents the experimental testing of a heat exchanger with uniform thermal flux (HEUTF), used as a cold source in HVAC systems with heat pumps. A water-water heat exchanger is tested, having a special geometry, with uniform thermal flux along the system. The heat exchanger proposed consists of a distributor and a collector, connected to each other by means of 20 staggered copper pipes, being suitable for serving low or medium geothermal sources. The innovation consists in the uniformity of the heat flux along the entire length of the heat exchanger, due to the alternating circulation of the heat transfer fluid between collector and distributor. The work is focussed on offering a replacement to current technical solutions that are characterized by horizontal or vertical polyethylene pipes connected in parallel. Unlike the typical geothermal heat exchangers, when the surface and the depth of digging determines a non-uniform loading of the soil, the present solution induces an improved level of uniformity regarding the thermal load of the storage medium, while the global heat transfer coefficient resulting from the experimental tests has values between 76.9 ... 110.7 W/m²·K. The proposed solution is highly efficient in terms of maximizing the storage capacity and of decreasing the necessary surface for mounting the source.

Key words: beam of pipes, compact heat exchanger, geothermal sources, heat pump, heat flux

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