GEOTHERMAL INSTALLATIONS OPTIMIZATION BY ELECTRONIC MICROPROBE

INVENTION DESCRIPTION

Nowadays, in air conditioning and sanitary hot water, the heat pumps with buried or geothermal exchanger have showed their advantages regarding efficiency, achieving consumption reductions about 50% in relation to the aerothermal pumps (for example, air conditioner). , They are of interest because do not require refrigeration towers,without impact in the buildings and avoiding the legionella risk. However, they have the inconvenient of the extra cost that the geothermal exchangers construction supposes. So an optimum implantation of these systems is necessary.

The thermal conductivity (λ) of ground coupled heat exchangers is a key parameter in the sizing of air conditioning geothermal installations. Errors in its determination may have important consequences in the cost and energy efficiency of installations.

Currently, there are several methods for obtaining this parameter, as the Thermal Response Test (TRT). Conventional TRT methods only allow to measure the fluid temperature in the input and output of the system, without knowing the variations of λ along the length of the heat exchanger.

As a consequence, geothermal installations are usually oversized, since traditional TRT method does not allow to use geological layers with better λ. Moreover, most of the conventional methods cannot determine λ with enough accuracy, and its determination can be complex, it can cause a high cost and long execution time of the TRT.

Researchers from Universitat de València and Universidad Politécnica de Valencia, have designed a new method and device to determine the dynamic measurement of the fluid temperature in a ground coupled heat exchanger, facilitating the use of geological layers with better λ, reducing costs of the installations and execution time of the TRT method in comparison to the conventional TRT methods .

The new invention is based on the use of autonomous wireless sensors. They allow detecting the geological layers more efficient in the geological heat exchangers. The new method and device allow to improve the sizing of the ground coupled heat exchangers, avoiding extra costs in the installation.

BUSINESS APPLICATION SECTORS

The main applications of the technology are the following:

- In Geothermal Energy: To design geothermal air conditioning installations, and to diagnose the degradation of heat transfer in borehole heat exchangers of installations in use.
- In other sectors: To determine accurately the fluid temperature along the pipes, as in the oil industry.

TECHNICAL ADVANTAGES AND BUSINESS PROFITS

The main advantages provided by the invention are:

- Utilization of the geological layers with better λ, since the new invention allows to determine λ along the geological profile of the ground.
- Reduction of the execution time and the cost of the TRT.
- Increased accuracy in the measurement of temperature and the determination of λ.
- Easy adaptability to new or in use heat exchangers, in both vertical and horizontal exchangers, piles and retaining walls. Easy transportation and installation.
- Improvement of the energy efficiency of new geothermal installations, facilitating the use of geological layers with better thermal conductivity.

DEVELOPMENT STATUS OF TECHNOLOGY

The inventors have carried out successfully positions tests of the probe in 10 length meters in horizontal and vertical. These developments have used the financing of the proof of concept program "*Valoritza i Transfereix*" of the *Universitat de València*.

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INTELLECTUAL PROPERTY RIGHTS

The technology is protected through the following Intellectual Property Rights:

- Patent ES2339735 “Procedimientos y aparatos para la medición de la temperatura de un fluido en un intercambiador de calor acoplado al terreno”

SOUGHT COLABORATION

- License agreement, use, distribution or commercialization.
- R & D project to apply to other sectors.

RELATED IMAGES

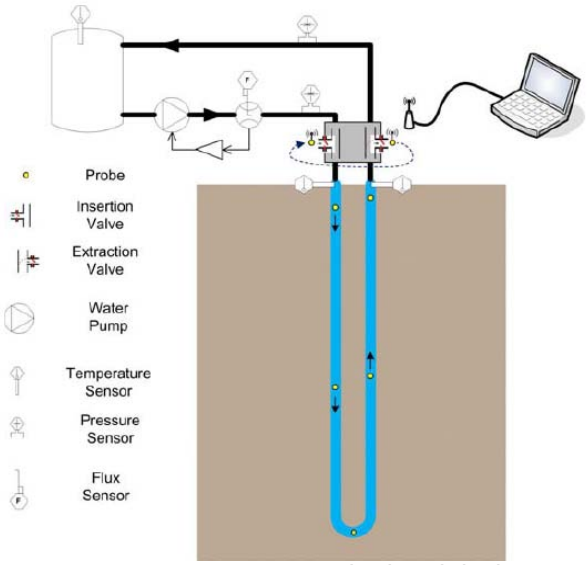

Image 1: New method and device to measure TRT

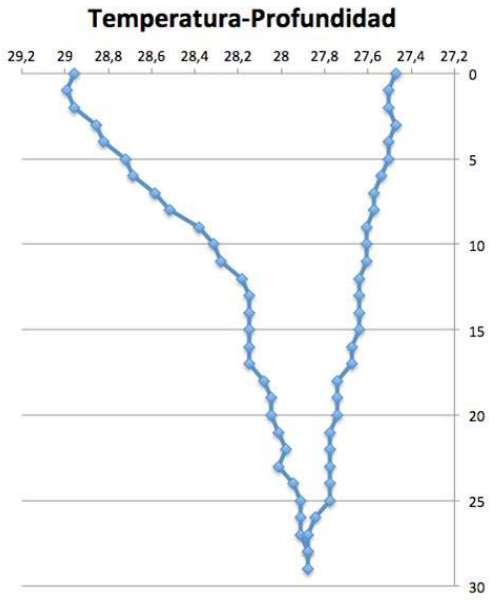

Image 2: Temperature profile obtained during a heat injection test

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