

# Deliverable D2.4

## Penetrometer machine developments for heat basket type GSHE's

### WP2

<b>Grant Agreement number</b>	657982
<b>Project acronym</b>	Cheap-GSHPs
<b>Project full title</b>	<b>Cheap and Efficient Application of reliable Ground Source Heat Exchangers and Pumps</b>
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<b>Lead beneficiary</b>	Hydra srl
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#### Dissemination Level

<b>PU</b>	Public	
<b>CO</b>	Confidential, only for members of the consortium (including the Commission Services)	<b>X</b>
<b>CI</b>	Classified, as referred to in Commission Decision 2001/844/EC	

## **Publishable summary**

The deliverable 'Penetrometer machine developments for heat basket type GSHE's' is a confidential document delivered in the context of Work Package 2, Task 2.4, with regards to the piling methodology to install heat basket type ground source heat exchangers.

The deliverable presents the penetrometer technology as the starting point for the installation of stainless steel coaxial GSHE and the development of a new drilling methodology optimized from the installation of heat baskets of reduced diameters using the penetrometer technique.

The cost of drilling equipment has an important voice in the total cost of perforation, especially considering that in a penetrometer technique the equipment remains in the ground as part of the GSHE, therefore an optimal diameter between the tube and the heat basket should be found.

The new technology therefore has been studied by the technical office of Hydra together with the contribution of Rehau concerning the heat basket design, of UNIPD-IE for the simulation of the new heat basket design and RED regarding the GSHE design improvements.

Rehau has also manufactured the new prototype of the heat basket in its workshop and called the prototype 'slimhelix' due to its reduced diameter. In such a way, it was possible to show the feasibility of production of the new slimhelix and compare it to a convectional single-U GSHE.

Even though the prototype has been manufactured, the results from the simulation and the analysis of the cost regarding the drilling equipment showed that there are no economic advantages in using this solution. Also the slimhelix production analysis showed its weakness in comparison to a single U tube. Therefore, the slimhelix field installation has not been implemented because this route is finally not competitive on the market.

However, other drilling methodologies for installing slimhelix heat baskets have been proposed and examined in term of ease of perforation and maybe in a future project this could be the starting point of other geothermal applications.