Co-funded by the European Community Horizon 2020 Program

Project Title:

GEOthermal Technology for economic Cooling and Heating

GEOTeCH

Grant Agreement No: 656889

Collaborative Project

Heat Exchanger Review and Specification
Executive Summary

Deliverable No.	2.1
Workpackage	2
Task	2.1.1 and 2.1.2.
Lead beneficiary	GH (task leader)
Authors	Guus van Gelder , Carlos Saborido
Delivery date	31-12-2015
Status	Final version
File Name:	(23-12-2015) integrated version 2.1 – Executive Sumamry.

Dissemination level		
PU	Public, fully open, e.g. web	
CO	Confidential, restricted under conditions set out in Model Grant Agreement	**X**
CI	Classified, information as referred to in Commission Decision 2001/844/EC.	

1. PUBLISHABLE EXECUTIVE SUMMARY

In the framework of the drilling technologies for borehole implementation, GEOTeCH European Research Project has the following objectives:

- Develop (design, test and produce) Hollow Stem Augers (HSA) for the installation of the concentric spiral heat exchanger developed.
- Develop (design, test and produce) the associated auxiliary equipment for the HSA, that will allows efficient and cost effective operation and installation of the concentric heat exchanger developed in the GEOTeCH project.
- Develop (design, test and produce) a drill rig platform that integrates the HSA and its auxiliary equipment in a user-friendly operator and production efficient tool.
- Investigate and test the potential application of the drill rig and auger equipment for the installation of the concentric spiral heat exchanger in foundation applications.

This document first of all provides a general overview of the current state of the Ground Source Heat Pump (GSHP) technology based on shallow closed loop heat exchanger application. In addition, the technical and legislative requirements for GSHP installation in a number of countries are reviewed, indicating that a certain level of market introduction and awareness of the technology is present. In addition, the potential future role of Ground Source Heat Pumps (GSHP) as a renewable technology is positioned in the light of the RES directive and the National Renewable Energy Action plans (NREAP).

Secondly, this study evaluates the currently available drilling and installation methods that are in use for installing vertical closed loop heat exchangers. This is done to assert the suitability of the proposed Hollow Stem Auger (HSA) for the installation of shallow heat exchangers, specifically the concentric spiral heat exchanger developed in the GEOTeCH project. A similar task is undertaken to evaluate the role of the HSA and the concentric spiral heat exchanger in installing thermally activated foundations.

Thirdly, using the information from the previous evaluation and from practical experience, the requirements and prototype design of the HSA, the drill rig and the auxiliary equipment required to successfully install the concentric spiral heat exchanger are stated. The objective of this section of the deliverable is to develop outline guidance and performance specification for actual prototyping of components that will be used for evaluation in the following phases of production and testing.

<u>The current and future position of GSHP</u>

- As an energy savings technology using renewables, GSHP clearly has a future role in combination with either renewable energy production (wind, solar, biomass) or with conventional energy production. Furthermore GSHP can store thermal energy.
- Evaluation of the current drilling and installation technology for vertical closed loop heat exchangers indicates that a dry drilling technique such as HSA has a number of distinct advantages when compared to conventional drilling systems using air or water as a flushing medium.
- In the foundation application, the main gain of the HSA and drill rig development will be in the ease of installation of the concentric spiral heat exchanger, allowing thermal activation of foundations with only very limited extra cost when compared to conventional foundations.

The outline specifications for the HSA, drilling and auxiliary equipment

- Automated, friendly operator drilling process
- Installation capability for different diameter (63 – 200 mm) spiral heat exchangers in all non-consolidated formations to a maximum of 50 to 60 meters of depth.
- Based on previous experience and a very limited data set, it is concluded that the torque and RPM requirement for successful HSA application should be in the region of 8.000 – 12.000 Nm (torque) and 25-150 RPM.
- Experience based requirements from the foundation application section of this report underwrite these requirements for the successful use of augers for micropiling.
- Limited amounts of water used in drilling process, direct processing of drilling spoils.