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GEOthermal Technology for economic Cooling and Heating



GEOTeCH

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Collaborative Project

Drill rig and tooling (completely) operational and tested

Executive Summary

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1. PUBLISHABLE EXECUTIVE SUMMARY

In WP2 of the GEOTeCH consortium a dry drilling methodology based on hollow stem augers for soft to medium consolidated formations is developed and built. An essential element to this is the drill rig built by CONRAD.

To come to a practical auger design and that of the specialized drill rig, information is necessary on the augers as well on the mechanical requirements of the drill rig. Due to a lack of published information on augers used in drilling CONRAD and GROENHOLLAND have conducted a series of field test on prototype augers and on prototype hydraulic components of the drill rig.

Results from the testing that was carried out in the summer period of 2016 has been used in the design of the final augers as well as determining the mechanical and hydraulic requirements of the drill rig and auxiliary equipment.

Boundary conditions and considerations for the drill rig development:

Drill rig requirements: The drill rig to be produced as part of WP2 will be designed and build specifically to operate the HAS (Hollow Stem Auger). The initial specifications for the drill rig are developed based on the available information on auger drilling as well as the thermal and hydraulic requirements for the spiral heat exchanger, which is a parallel development of WP3.

Chassis, frame and tracks: The initial approach to the drill rig is to construct it on a crawler base, however it is not ruled out that a truck-based version will be developed at a later stage. The development of a truck- based rig has to deal with additional questions such as whether to use a separate engine or a PTO and on what truck dimensions to base the design.

The base frame for the crawler type rig is designed for a total full up weight of the drill rig of 8 to 10 tonnes. Length and width of the chassis frame need to allow for all on board components and are currently set at 4000 mm (l) x 2000 mm (w).

Engine Requirements: The diesel engine selected for the rig will have to be of the most recent low emission type Stage IV / Tier 4B (Euro 6).

Start stop functions and hybrid drive: To further reduce fuel consumption a start/stop control will be installed which reduces the engine rpm to stationary when no functions are operated on the rig for an adjustable time period.

Rig hydraulics: The hydraulic system consists of pumps (driven by rig engine) and the hydraulic motors that operate a certain component on the rig, such as the crawler tracks or the drill motor.

Mast, trolley and hydraulic drive motor: With HSA, the mast is exposed to high strains and torques due to rotation and pullback, requiring a robust design. The length of the mast determines the length of the stroke and thereby the working length of the auger sections.

Sensing and controls: The objective of WP2 is to provide a fully automated rig. The basis of this automation lies in the application of a Canbus control system.