

Development of a new Thermal Response Test (TRT) for deeper boreholes

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Abstract

In Europe mostly fossil fuels are used in buildings and with the burning of fossil fuels, the greenhouse effect, and air pollution are seen in some parts considerably. One of the solutions to this problem is using Ground Source Heat Pumps (GSHP) that is shown as the best alternative heating system. In the application of GSHPs generally drilled shallow boreholes (<200m) are used and to determine the performance of a borehole, a Thermal Response Test (TRT) is applied. Now TRT is a common method in GSHP applications and there are many service providers and they reported thousands of tests.

Since deeper boreholes have many advantages like high performance, high heat storage capacity, needing less space etc. depths of boreholes increase continuously. However, the current test methods are not sufficient for deeper boreholes. In this context, we are planning to develop a new tool for thermal characterization of deeper boreholes (>200m). We have already carried out some numerical investigation on it. Based on the numerical models it has been seen that a test probe, that can be lowered inside the borehole or pipe, can give the thermal conductivity of the borehole when constant temperature test is applied.

In the outgoing phase, at the INRS Canada, the existing test device that similar to proposed in this study will be investigated and tested and new test tool will be designed based on scientific investigations. Then, the researcher will come back to the GZB, Germany. The new test tool will be built and tested in an existing borehole whose thermal conductivity profile is already known. After the validation, the design of the test tool will be finished. This kind tool is even necessary today and will be needed more intensively in the near future. It will provide more detailed and economical performance prediction of deeper boreholes for the scientists, researchers engineers, and designers. In addition, it may open new entrepreneur opportunities for the contributors.