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Fossil to renewable – how to speed up the installation of borehole heat exchangers?

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Geothermal heat pumps coupled with borehole heat exchangers are appropriate tools to extract renewable and climate- friendly energy from the shallow subsurface. To properly construct these systems, knowing the initial temperature conditions is essential. However, drilling activity modifies the temperature field in the underground around the borehole as well as in the pipe placed into the borehole. During the installation it has to wait for a constant temperature in the pipe after the probe is placed, before measuring the final temperature. According to the rule of thumb, this period is usually one week. The objective of this study is to determine whether this time is really necessary or if a shorter period would be also enough for reaching the undisturbed temperature. The measurements took place in the 11. district of Budapest, Hungary. The analysed borehole was drilled with rotary method deepened into the Budai Marl Formation with a depth of 70 metres. We executed four measurements on the first day, two on the next day, and one after that for four days. The most significant differences can be noticed between the first day measurements. After the third day, the received curves fit better, but they only approached each other from the fourth day with only 0.1-0.2°C difference. It can be concluded that a stable temperature profile required 72 hours of resting for this specific case which is shorter than the supposed one week. With this knowledge, assuming similar behaviour in other cases, installation period of borehole heat exchangers can be significantly shortened. Next step of this research is investigating other geological and seasonal conditions to reveal potential deviations from the current results.

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