



NEW TOOLS TO SUPPORT THE DESIGNING OF EFFICIENT AND RELIABLE GROUND SOURCE HEAT EXCHANGERS: THE CHEAP-GSHPs DATABASES AND MAPS

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The overall goal of the EU funded project CHEAP-GSHPs is the development of more efficient and safe shallow geothermal systems for building conditioning, and the reduction of their installation costs.

New types of heat exchangers and installation techniques have been studied. In addition, in order to reduce the engineering costs of geothermal heat exchangers sizing, a Decision Support System (DSS) has been developed for the design of new geothermal systems. The DSS tools consider all aspects from the geological and drilling issues to the technical and economical ones, by starting from several possible design and operational solutions. They support the user in the selection of the most suitable heat exchanger, in the borehole field sizing and in the choice of the best installation technique. These tools are public and available on the web (<http://cheap-gshp.eu/>); they have been targeted at users with different levels of knowledge, so that they can be used by both expert and non-expert users.

Several databases have been built up to feed the DSS:

(I) a detailed Thermo-Geological Database indicating the thermo-physical parameters of a wide spectrum of European lithologies and unconsolidated sediments classes; in order to allow the correct evaluation of the heat exchange capacity of the subsoil where a new borehole field has to be installed.

(II) an European Superficial Geological Map, that represents the variability of the subsoil conditions in Europe; this is used associated to the Thermo-Geological database as well as to suggest the best drilling technique for the local geological setting;

(III) a pan-European Climatic Database;

(IV) a standard temporal profiles database of the heating and cooling requirements for several standardized typologies of buildings, by taking into account also several thermal insulation levels.

The detailed Thermo-Geological database has been built in order to identify the most appropriate values of physical and thermal parameters to be assigned to the local geological context. The database consolidates a wide amount of data present in the international guidelines and scientific literature (it is based on more than 60 references) integrated with more than 400 experimental measurements performed on samples of rocks and sediments sampled in several European countries. The Database includes 29 categories of rocks and 10 classes of unconsolidated sediments. The Thermo-Geological Database merges the thermal conductivity ranges exposed in literature with the values acquired by the direct measurements; in addition, the reference values of density and thermal diffusivity for each category are indicated.

Finally, a method to map the techno-economic potential of closed-loop shallow geothermal systems (expressed as €kW) has been developed. It merges all geological, climatic and energetic data collected in the Databases in order to quantify the geothermal potential for different locations and the feasibility of shallow geothermal systems. The method has been successfully applied in some test sites representative of main European contexts.

The new web tools and the developed mapping method support the design and the installation of new shallow geothermal systems, by taking into account all the involved aspects from the geological to the economical ones.