

Research Topic:

„Increasing the heat output of thermo-active plane structures due to the control of groundwater flow by means of innovative injection bodies “

Researching institution:

Chair of Geotechnical Engineering, RWTH Aachen University  
Mies-van-der-Rohe-Str. 1, 52074 Aachen

in collaboration with

URETEK Deutschland GmbH  
Weseler Str. 110, 45478 Mülheim an der Ruhr

Financial Support:

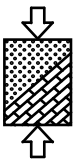
Deutsche Bundesstiftung Umwelt (DBU), Osnabrück

Project Manager:

Univ.-Prof. Dr.-Ing. M. Ziegler (RWTH Aachen University)

Research Staff:

Dipl.-Ing. S. Kürten (RWTH Aachen)  
André Bähren (Uretek)



## **Aim of the research**

The utilization of geothermal energy with earth-coupled structures (thermo-active structures) represents a promising and already tested possibility to cover the heating demand of buildings. The chair of Geotechnical Engineering (RWTH Aachen University) has developed thermo-active seal panels. In this system the heat exchanging pipes are integrated into the sealing. So the economic efficiency can be increased compared to the thermal activation of concrete structures. In this context regarding plane structures in flowing groundwater offers a great (energy) potential, because they are widely coupled with earth and the groundwater flow provides an additional energy potential.

Currently, in the planning and design of thermo-active structural elements the additional heat transport towards the structural element due to groundwater flow is usually disregarded or only factored in by a blanket approach. A specific use of the natural energy potential of a groundwater flow is currently not carried out. By means of a targeted control of the groundwater (e.g. with a Funnel-and-Gate construction) the groundwater velocity in the front of the structural element can be increased, which will lead to an increase of the efficiency of the system. The aim of the project is to increase the heat output of thermo-active plane structures with the control of the groundwater flow. The necessary Funnel-and-Gate system is supposed to be build with injection bodies from polyurethane. The efficiency of the system will be reviewed by field- and/or laboratory tests as well as by numerical investigations.

## **Working Scheme**

The research project is formed as a cooperation of the Chair of Geotechnical Engineering (RWTH Aachen University) and URETEK Deutschland GmbH, so that particular problems will be worked on together. In this regard three focal points will be worked on in the research project. In the first focal point the environmental aspects of the project will be investigated. This also includes, besides the investigation of the environmental compatibility of the uncured grouting material, an investigation of the expansion of the temperature plume in the ground and an investigation on how to prevent a harming damming effect in front of the structural part. In the second focal point a technical adjustment of the injection bodies to the special demands for the application of a groundwater control will take place. In the third focal point the optimization potential for the heat output through the Funnel-and-Gate construction made out of injections bodies will be determined.