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A Cost-efficient Well Construction for Deep Geothermal Resources

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Approximately 70 % of the budget of a geothermal project is spent for the construction of the wells. Therefore, the aim of the Geothermal Energy and High Performance Drilling Research Program (gebo) is to reduce the costs for the production of power through geothermal energy. To minimize these drilling costs the drilling time and the time needed for the deployment of the casing have to be decreased as possible. The basic concept herein is to decrease the well diameter by creating a monobore well. Essential in accomplishing this is a special type of casing, structured from the folded tubulars for expandable casing applications featuring clover-like cross sections, expandable to a cylindrical form, when the casing is at its downhole position. This enables to increase the drilling speed and leads to less completion work.

The handling of these special tubulars with conventional manipulators is rather unfeasible. Handling machines must generally be in position to grip, lift and place objects. Therefore, a Casing-Running-Tool (CRT) was modeled in such way as to be insertable from the upper end and grab the complex shape of the folded tubulars from the inside. This tool form provides minimum space requirements while at the same time allowing the tool to descend into the well. Furthermore, it is essential that the tool can hold onto the whole casing construction whereas no plastic deformation occurs on the casing at the tool-tubular contact area. Therefore, it was selected that force applied on the gripping surface be weight dependent. FEM simulations were conducted to depict the stress distribution on a casing section measuring 500 m and illustrate the critical length the gripper has to feature as to avoid plastic deformation.

This handling device being the critical component for an automated handling process of these tubular, helps to improve the overall casing process efficiency by further decreasing the time needed for the well construction. Integration into commercial drilling rig machinery of this handling device is therefore essential.