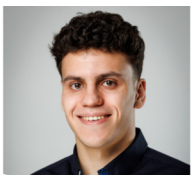
Continued development of hand-held diamond core drilling

Affordable productivity in construction

Graduate



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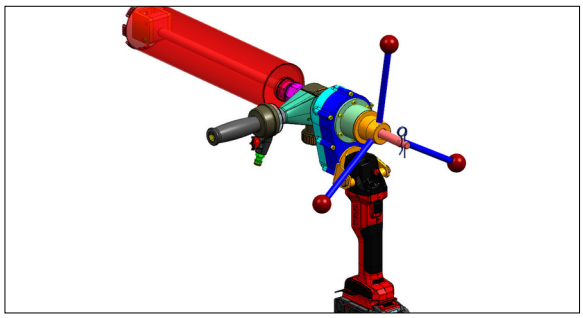
Initial Situation: This bachelor's thesis, carried out in collaboration with Hilti, focuses on the development of a cost-efficient core drilling system that combines the advantages of both rig-mounted and hand-held devices while utilizing existing core bit interfaces. The goal is to enhance hand-held drilling by improving stability and precision, thereby enabling higher feed forces and increased productivity. The work aims to produce a functional prototype based on a battery-powered angle grinder as the drive unit, ensuring economic feasibility. The study examines whether this drive concept provides sufficient performance and durability, and whether the system can be designed to be ergonomic, mobile, and user-friendly.

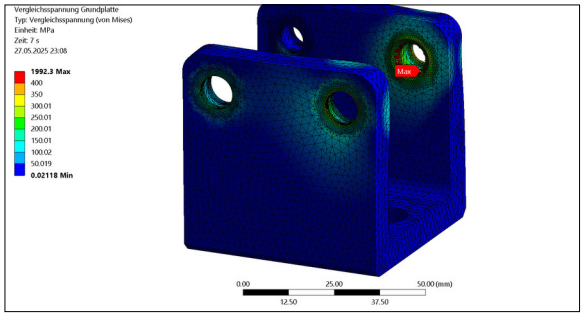
Approach / Technology: Achieving the targeted performance specifications requires the integration of a gearbox, designed using the KISSsoft gear calculation software. Shaft dimensioning is performed through manual calculations under realistic load conditions. A complete 3D model is subsequently created in Siemens NX. To assess system stiffness, finite element simulations are conducted in Ansys Workbench, with the results serving as a basis for design optimization. Finally, drilling trials are carried out to experimentally validate the simulation results and evaluate system performance under real-world conditions.

Result: The experimental results highlight opportunities for improvement in both performance and speed range, particularly with respect to motor current limitations and control during initial drilling. Furthermore, the study revealed that incorporating an additional centering mechanism substantially improves drilling quality by enabling more controlled starting and increasing stiffness at the onset of the process. The developed prototype provides valuable insights into the mechanical requirements of such a system and establishes a solid foundation for the further development of a robust, mobile core drilling solution.

CAD: 3D model of the core drilling system
Own presentment



FEM analysis: Deformation of the mounting plate due to the clamping screw
Own presentment



Drilling test on masonry
Own presentment

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Subject Area
Mechanical Engineering