Karlsruher Institut für Technologie

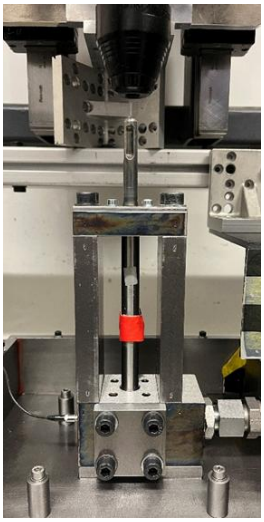
Institute of Vehicle System Technology
Institute Mobile Machines

Prof. Dr.-Ing. Marcus Geimer

MOBIMA
MOBILE ARBEITSMASCHINEN

Bachelor's / Master's Thesis

Design Enhancement of a Hydraulic Substitute Base for Rotary Hammers



Rotary hammers are used to break up mineral materials such as concrete or rock by means of highly dynamic impact pulses. Reproducible test conditions are essential for developing and testing these machines. Conventional tests on mineral substrates, however, exhibit high variability and progressively destroy the test substrate.

To address this issue, a hydraulic substitute base was developed at the Institute of Mobile Machines and successfully tested. It reproduces the energy dissipation of mineral substrates using hydraulic components. The energy dissipation is adjusted by interchangeable orifice check valves.

Particularly at small volume settings, pressure peaks above 500 bar occur and may damage the orifice check valves currently used. The aim of this thesis is therefore to enhance the test-rig design. A pressure-resistant and compact orifice system will be developed and integrated into the design. Further improvement potential in the existing test rig will also be identified and, where possible, implemented.

The following work steps are planned:

- Analysis of the existing test rig and the loads occurring at small oil volumes
- Definition of requirements for the new orifice and valve concept
- Review, selection, and evaluation of suitable high-pressure valves
- Development and evaluation of alternative design concepts
- Detailed design of the selected solution, including the required components
- Identification of further improvements regarding dead volume, venting, reconfiguration, and component protection
- For a master's thesis: implementation and testing of selected test-rig improvements
- For a master's thesis: evaluation of the revised design in test-rig experiments
- Documentation and presentation of results

The exact scope will be adapted to the type of thesis. A bachelor's thesis may focus on a clearly defined design subtask. A master's thesis will include a broader evaluation of alternatives, implementation of the design, and experimental validation.

Type of thesis:

- Focus: Hydraulics, impact mechanics
- Fields: Simulation, sizing, design

Start and duration:

- From September 2026 or later
- Duration: 3/6 months

Requirements:

- Ability to work independently, systematically, and scientifically

If you are interested in this thesis, please feel free to contact me.

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