

## PROJECT WORK

### **Experimental investigation of Multiphase flow in the Crucible During Aluminothermic welding process using Water-Oil Models**

*Experimentelle Untersuchung der Mehrphasenströmung im Tiegel während des aluminothermischen Schweißprozesses mit Wasser-Öl-Modellen*

The aluminothermic (AT) welding, commonly known as Thermit<sup>®</sup> welding (TW), is an important process for joining and repairing rails due to its simplicity, robustness, portability and economic usage. It has been successfully used all around the world for over a century. It is, in principle, a casting process in which the molten metal from the crucible is poured into a preheated mould and left to solidify. For an efficient and high-quality weld, the knowledge of each stage involved during welding, such as pre-heating, Thermit<sup>®</sup> reaction, mould filling (pouring), and cooling (solidification) process, is significant.

This project aims to experimentally investigate the discharge process from the crucible utilised during AT welding of rails, employing water and oil as the primary fluids. Measurements within the flow field shall be conducted during the experiments, and an evaluation strategy shall be devised to effectively utilise these results for validating the existing CFD models developed at TTD.

The main objectives of this work are as follows:

1. Conducting an extensive review of relevant literature
2. Executing experiments on the established experimental rig
3. Investigating the influence of various parameters on the discharge process
4. Developing scripts using Python and ImageJ to effectively process and analyse images obtained from the experiments
5. Designing a systematic evaluation strategy to assess the obtained results
6. Documenting the results

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