

# Science and Engineering Research Program

## Project Description

**Institute:**

Institute of Electrotechnology - Faculty of Electrical Engineering and Computer Science

**Project title:**

Electromagnetic Stirring Applications for the Continuous Casting of Metals: Investigation and Optimization of the Process under Different Electrical Inputs.

**Project description:**

Electromagnetic stirring is widely applied in industry for the production of semi-finished metals. Its application takes place especially in the continuous casting lines, since electromagnetic forces are generated inside the melt and mix it intensively during its solidification. This results into a significant improvement of the mechanical quality of the casted product. Strong electromagnetic forces can be achieved only with specific electrical parameters supplied to the electromagnetic stirrer though.

This project will investigate the application of different electrical inputs for the electromagnetic stirring during the continuous casting of metals. In particular, the effect of pulsed magnetic fields with different intensities and frequencies will be analyzed and the mixing effect will be optimized. A significant increase of the stirring effect inside the molten metal is expected, with a consequently improved heat and mass transport. The mixing effect under pulsed field will be then compared to the one under stationary field. The project will focus on a joint simulative and experimental investigation: first, numerical simulations will be carried out, starting with the realization of the time-dependent model; secondly, simulations will be validated through experimental activities on the same setup. The motion of the liquid metal and its velocity will be measured with the use of the Ultrasound Doppler Velocimetry, and the efficiency of the stirring setup will be quantified.

**Required skills:**

- Good communication capability.
- Basic knowledge of Excel.
- Basic understanding of Electrotechnics.
- Basic knowledge of Fluid dynamics and FEM numerical simulation.

**Contact/supervisor:**

Institute of Electrotechnology  
Leibniz University Hannover  
Wilhelm-Busch-Straße 4  
DE-30167 Hannover

Mattia Guglielmi, M.Sc.  
[guglielmi@etp.uni-hannover.de](mailto:guglielmi@etp.uni-hannover.de)  
+49 511 762 18910