

# Numerical investigation of the influence of particle deposits on the aerodynamics of turbomachinery blades

## Studienarbeit/Masterarbeit

The study/master's thesis should aim to numerically investigate the influence of particle deposits on the aerodynamics of turbomachinery blades. The aerodynamic performance critically depends on the optimal aerodynamic design of the blades. In practice, particles such as dust, salt, oil mist, or combustion ash continuously enter the flow and may accumulate on blade surfaces. These deposits alter the blade geometry, affect boundary layer development, and lead to a deterioration of aerodynamic performance, including reduced pressure ratio, increased drag, and potential flow separation. The objective of this work is to analyze the impact of various deposition patterns considering quantity, distribution, and thickness on the flow dynamics within a typical turbomachinery blade passage using direct numerical simulations. A realistic blade geometry will be modeled and subjected to different deposition scenarios. The simulations will be carried out using an academic CFD tool, with the Navier-Stokes equations solved directly (DNS). The results will be evaluated with respect to flow distribution, pressure distribution, changes in efficiency, and flow stability.

### Requirements:

- High interest in fluid mechanics and CFD
- Proficient in Linux command line
- Proficient in programming (C++, Python)
- Proficient in English and motivated to work

### Contact:

Dr.-Ing. Christoph Bode

E-Mail: [chr.bode@tu-braunschweig.de](mailto:chr.bode@tu-braunschweig.de)