Universität Stuttgart
Institut für Kernenergetik
und Energiesysteme

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Forschungs- und Lehrgebiet
Thermofluiddynamik

Semester Project or Master Thesis

Integration of Particle-Paths in Analytic Flow Fields

Aim: Demonstration of the behaviour of heavy particles within a complex velocity field of the continuous phase, represented by potential-flow theory.

Description: In a computer program the 2D velocity field of the continuous phase of a particle-laden flow can be represented analytically by a superposition of fundamental solutions of potential-flow theory (parallel flow, vortices, dipoles, sources and sinks). These elements can be combined to represent known model flows such as the flow arould a circular cylinder, a cyclon, a vortex street and a general turbulent flow. Under such conditions particles are not evenly distributed. It has been observed that solid particles or droplets move away from vortex centers into regions with free stagnation points. This behaviour shall be investigated by particle-path simulation using the Euler-Lagrange representation of two-phase flows and demonstrated by example calculations, as shown in Fig. 1. The influence of the Stokes number St shall be investigated in the region $0.01 < St < 10$.

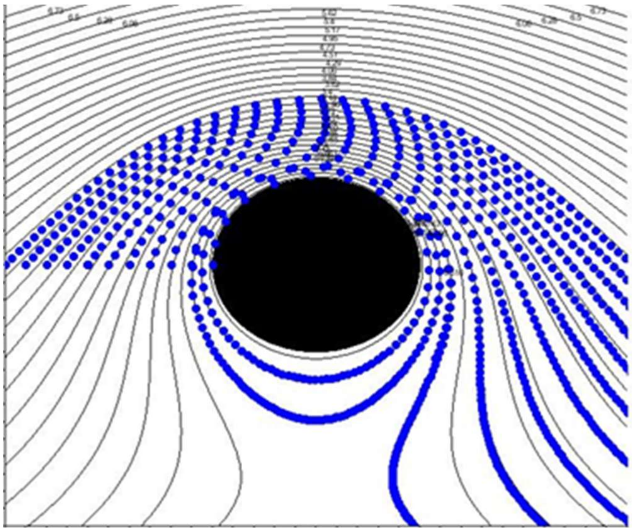

*Fig 1:
Example of the distribution of marker particles (blue symbols) injected into the flow around a cylinder with strong clockwise circulation, represented by its streamlines (solid lines).*

Requirements: Knowledge about potential flow theory and the modeling of isothermal two-phase flows in the framework of the Euler-Lagrange model

Advisor: E. Laurien

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