

Investigation of particle trajectories inside a plasma spray gun

Master's Thesis

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Motivation

Plasma spray guns are a technology for the production of a wide range of high quality coatings. However, when attempting to spray very fine powder distributions, nozzle clogging is persistently exhibited, i.e. material build-up at the nozzle exit as depicted in fig. 1. This prohibits applications in critical aero applications, where smooth surfaces are required and necessitate the use of such fine powders.



Figure 1: Clogging.

Objectives

The purpose of this work is to analyze particle trajectories inside a plasma spray gun, see fig. 2. The analysis shall include the clogging-exhibiting standard nozzle and an optimized design, for which rudimentary calcu-

lations indicate a suppression of the clogging. Also, the manufacturer of the nozzles will provide inlet conditions, such that the creation of the plasma does not have to be computed.

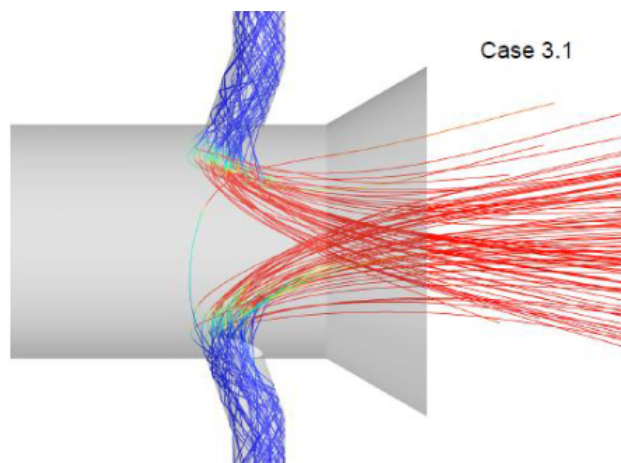


Figure 2: Typical particle trajectories inside a plasma spraying gun.

Requirements

- Ability to work independently
- Experience with ANSYS Fluent or similar flow solvers
- Beneficial: Ability to create a CFD mesh from geometry data
- Beneficial but not necessary: Knowledge of turbulence modeling

Take aways

- CFD Modeling of particle laden flows
- Experience with HPC clusters
- Scientific working and writing