

# Sensitivity Analysis of a Non-Ideal Expanding Flow to Perturbations of the Design Conditions

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## Abstract

This paper presents a sensitivity study aimed at quantifying the role of uncertainties affecting the nominal geometrical layout of an experimental test-rig. The considered test case consists in a converging-diverging nozzle used to produce a supersonic expansion of a siloxane MDM flow in a non-ideal regime. Further details regarding the experiment can be found in the provided reference. Due to the manufacturing process, small flaws necessarily affect the actual geometry of the test section. The sensitivity analysis takes into account these uncertain, which are characterized and propagated through the CFD model. Moreover, perturbations that necessarily affect the nominal operating conditions, such as the total temperature and the total pressure at the inlet of the nozzle are considered. An evaluation of the Sobol indexes allows to assess the relevance of each source of uncertainty and provides an indication of the major causes making the actual test-rig depart from the designed behavior. Numerical predictions, complemented by the related error bars, are eventually compared against experimental measurements.

## References

1. G. GORI AND M. ZOCCA AND G. CAMMI AND A. SPINELLI AND A. GUARDONE. Experimental Assessment of the Open-Source SU2 CFD suite for ORC applications. Energy Procedia 129 (2017) 256-263.