# ENHANCED TURBOMACHINERY CAPABILITIES FOR OpenFOAM: DEVELOPMENT AND VALIDATION

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The role of turbomachinery studies is nowadays fundamental in a large number of industrial Computational Fluid Dynamics (CFD) applications. However rotating machinery brings particular challenges, such as to a complex geometry, presence of adverse pressure gradient and relative motion of multiple rotors and stators, which require the enhancement of standard CFD tools with turbomachinery- specific capabilities.
The Open Source CFD platform OpenFOAM is a C++ library for Computational Continuum Mechanics, with extended CFD capabilities. OpenFOAM object-oriented architecture allows to enhance specific libraries and to take advantage of the existing capabilities of the toolbox. This work presents the development with OpenFOAM of an application that solves the rothalpy conservation equation and the consequent improvements of the boundary conditions libraries to properly handle this physical quantity. In particular the rotor-stator interface boundary conditions General Grid Interface (GGI) and Mixing Plane Interface have been enhanced. It is essential take into account the fact that rothalpy is conserved over a blade row, stator or rotor, but not over a stage, stator and rotor. The value of rothalpy is not constant across the rotor-stator interface due to change of rotational speed between zones.
The development of these new capabilities and their validation will be shown as well as industrial applications of incompressible and compressible turbomachinery flows.