# SIMULATION OF THE ACOUSTIC WAVE PROPAGATION IN STEEL COMPONENTS - VALIDATION AND VERIFICATION

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This presentation is devoted to the simulation of propagation of acoustic waves in the body of a large scale steel component. Such waves are initiated by impact of loose or detached parts and components and detected by on-line monitoring equipment. It is envisaged to use numerical analysis to enhance on-line diagnostics. Steel components can be modeled as a homogeneous, isotropic, linear elastic material. On simplified geometries, this problem is traditionally tackled using the Finite Difference Method (FDM). However, this methodology is too restrictive when components of industrial relevance have to be considered.

The power of OpenFOAM in physical modeling stems from mimicking of partial differential equations in software, thus allowing rapid and reliable implementation of complex physical models in a framework that allows rapid industrial deployment due to state-of-the art complex geometry handling through polyhedral meshes and support of massive parallelisation.

The basic methodology is an explicit time marching procedure applied to the second order discretization of equations in space [1]. The discretization process relies on the Finite Volume Method (FVM) to compute cell centered values of the working variables from the face fluxes given through solution of the Riemann problem. In this presentation, we shall present an introduction to the engineering problem accompanied by the specification of the mathematical problem. Representative results will be shown for several validation cases including comparison with previous results [2] as well as a grid convergence study.

**References**

[1] H. Rusche, M. Rehm, P.Kodet, Simulation of the Acoustic Wave Propagation in Steel Components, 8th OpenFOAM Workshop Jeju, 2013.

[2] Guided wave propagation simulation using finite-difference time-domain method, Kouty nad Desnou, Czech Republic, June 2010. 9th International Conference PROCESS CONTROL.