STABILITY IMPROVEMENTS OF PRESSURE-BASED COMPRESSIBLE SOLVER AND VALIDATION FOR INDUSTRIAL TURBO-MACHINERY APPLICATIONS

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FOAM's pressure-based compressible solver family has been suffering from stability issues hampering its usability for industrial applications. The stability issues can be overcome by using a physically motivated linearisation of the density change in the pressure equation. In the presentation, the new pressure-equation will be derived and discussed. In addition, alternative formulations of the energy equation (rothalpy) and a special boundary condition for turbo-machinery (radial equilibrium pressure boundary condition) have been implemented and tested. Finally, the new solver has been validated extensively against a leading commercial code on an industrial application – a rotor-stator stage of a fan compressor.