

Study of the Effect of Rotation on the Deformation of a Flexible Blade Rotor

Authors : Aref Maalej, Marwa Fakhfakh, Wael Ben Amira

Abstract : We present in this work a numerical investigation of fluid-structure interaction to study the elastic behavior of flexible rotors. The principal aim is to provide the effect of the aero/hydrodynamic parameters on the bending deformation of flexible rotors. This study is accomplished using the strong two-way fluid-structure interaction (FSI) developed by the ANSYS Workbench software. This method is used for coupling the fluid solver to the transient structural solver to study the elastic behavior of flexible rotors in water. In this study, we use a moderately flexible rotor modeled by a single blade with simplified rectangular geometry. In this work, we focus on the effect of the rotational frequency on the flapwise bending deformation. It is demonstrated that the blade deforms in the downstream direction, and the amplitude of these deformations increases with the rotational frequencies. Also, from a critical frequency, the blade begins to deform in the upstream direction.

Keywords : numerical simulation, flexible blade, fluid-structure interaction, ANSYS workbench, flapwise deformation

Conference Title : ICMSE 2024 : International Conference on Mechanical and Systems Engineering

Conference Location : Bogota, Colombia

Conference Dates : February 12-13, 2024