The Effect of AMBs Number of a Dynamics Behavior of a Spur Gear Reducer in Non-Stationary Regime

Authors : Najib Belhadj Messaoud, Slim Souissi

Abstract : The non-linear dynamic behavior of a single stage spur gear reducer is studied in this paper in transient regime. Driving and driver rotors are, respectively, powered by a motor torque C_m and loaded by a resistive torque C_r. They are supported by two identical Active Magnetic Bearings (AMBs). Gear excitation is induced by the motor torque and load variation in addition to the fluctuation of meshing stiff-ness due to the variation of input rotational speed. Three models of AMBs were used with four, six and eight magnets. They are operated by P.D controller and powered by control and bias currents. The dynamic parameters of the AMBs are modeled by stiffness and damping matrices computed by the derivation of the electromagnetic forces. The equations of motion are solved iteratively using Newmark time integration method. In the first part of the study, the model is powered by an electric motor and by a four strokes four cylinders diesel engine in the second part. The numerical results of the dynamic responses of the system come to confirm the significant effect of the transient regime on the dynamic behavior of a gear set, particularly in the case of engine acyclism condition. Results also confirm the influence of the magnet number by AMBs on the dynamic behavior of the system. Indeed, vibrations were more important in the case of gear reducer supported by AMBs with four magnets.

Keywords : motor, stiffness, gear, acyclism, fluctuation, torque

Conference Title : ICAMMM 2016 : International Conference on Applied Mechanics, Materials, and Manufacturing

Conference Location : Jeddah, Saudi Arabia

Conference Dates : January 26-27, 2016