

A Model for Analyzing the Startup Dynamics of a Belt Transmission Driven by a DC Motor

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Abstract : In this paper the dynamic behavior of a synchronous belt drive during start-up is analyzed and discussed. Besides considering the belt elasticity, the mathematical model here proposed also takes into consideration the electrical behaviour of the DC motor. The solution of the motion equations is obtained by means of the modal analysis in state space, which allows to obtain the decoupling of all equations of the mathematical model without introducing the hypothesis of proportional damping. The mathematical model of the transmission and the solution algorithms have been implemented within a computing software that allows the user to simulate the dynamics of the system and to evaluate the effects due to the elasticity of the belt branches and to the electromagnetic behavior of the DC motor. In order to show the details of the calculation procedure, the paper presents a case study developed with the aid of the abovementioned software.

Keywords : belt drive, vibrations, startup, DC motor

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