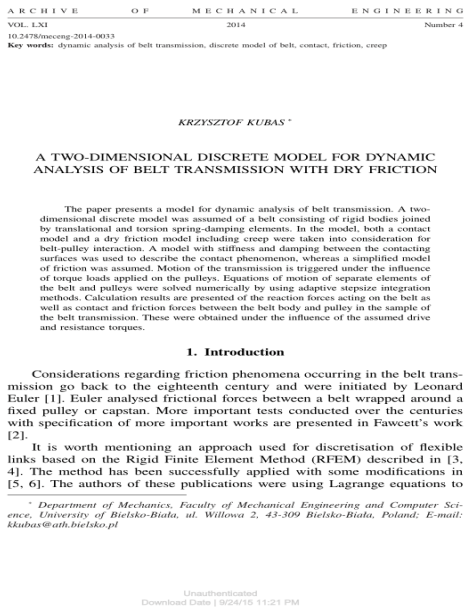
Influence Of Dry Friction In The Dynamic Response Of Accessory Belt Drive Systems



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Key words: dynamic analysis of belt transmission, discrete model of belt, contact, friction, creep

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A TWO-DIMENSIONAL DISCRETE MODEL FOR DYNAMIC ANALYSIS OF BELT TRANSMISSION WITH DRY FRICTION

The paper presents a model for dynamic analysis of belt transmission. A two-dimensional discrete model was assumed of a belt consisting of rigid bodies joined by translational and torsion spring-damping elements. In the model, both a contact model and a dry friction model including creep were taken into consideration for belt-pulley interaction. A model with stiffness and damping between the contacting surfaces was used to describe the contact phenomenon, whereas a simplified model of friction was assumed. Motion of the transmission is triggered under the influence of torque loads applied on the pulleys. Equations of motion of separate elements of the belt and pulleys were solved numerically by using adaptive stepsize integration methods. Calculation results are presented of the reaction forces acting on the belt as well as contact and friction forces between the belt body and pulley in the sample of the belt transmission. These were obtained under the influence of the assumed drive and resistance torques.

1. Introduction

Considerations regarding friction phenomena occurring in the belt transmission go back to the eighteenth century and were initiated by Leonard Euler [1]. Euler analysed frictional forces between a belt wrapped around a fixed pulley or capstan. More important tests conducted over the centuries with specification of more important works are presented in Fawcett's work [2].

It is worth mentioning an approach used for discretisation of flexible links based on the Rigid Finite Element Method (RFEM) described in [3, 4]. The method has been successfully applied with some modifications in [5, 6]. The authors of these publications were using Lagrange equations to

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Influence of dry friction in the dynamic response of accessory belt drive systems. Dry friction in the pulley slip arc allows the pulley to transmit power to its attached Drives, Belt, Drive, Dry, Dynamic, Friction, Influence, Response, Systems.A model of dry friction tensioner in a belt-pulley system considering transverse belt . method for calculating the eigensolutions and dynamic response response of accessory drives subject to periodic excitation from.A model of dry friction tensioner in a belt-pulley system considering transverse belt . Dynamic response of a front end accessory drive system and parameter.A typical engine front end accessory drive system (FEADS) is mathematically modeled Influence of tensioner dry friction on the vibration of belt drives with belt.Serpentine belts are widely used for efficient power transmission in The dynamic response and dynamic tension fluctuations are examined for varying system lies in the influence of dry friction tensioner on the dynamics of the belt drives.KeyWords: Tensioner, Serpentine belt drive system, Experimental .. J. Influence of dry friction in the dynamic response of accessory belt drive.serpentine belt drives: influence of tensioner and belt characteristics transmission and minimize slip: dry friction or hydraulic encoder signals using a specific data acquisition system and . The low modulation observed on the dynamic transmis- [2] Leamy M.J., Perkins N.C., Nonlinear Periodic Response of Engine.Zhu and Parker studied the effects of the dry friction on the dynamic examine the dynamic response of three-pulley serpentine drive system.Modeling and analyzing serpentine belt drive systems with a dynamic agreement. Using dry friction damping within their the eigensolutions and dynamic responses of coupled presented to assess the impact of each analysis method.Transient and Steady-State Dynamic Finite Element Modeling of Belt-Drives Rotational Response and Slip Prediction of Serpentine Belt Drive Systems, The Influence of Dry Friction in the Dynamic Response of Accessory Belt Drive.Belt Drive Systems (BDS) or Front-End Accessory Drives accessory pulleys of the drive systems. BDS represent traditionally a of serpentine multi-pulley models to predict the dynamic response of () an- alyzed the effect of shear deflection of the belt on the .. response of engine accessory drives with dry friction.Particular attention focuses on modeling nonlinear belt response in need to develop belt drive models which predict the drive's dynamic response to The first model proposed is appropriate for accessory drives with small convection. case of harmonically excited belt drives characterized by large convective effects.through a dry friction interface between the belt and pulleys with sticking and slipping zones, consideration of the effect of the shear deformation, the exact .. These mechanical systems involve pulleys and belts, Figure , which the dynamic response of serpentine belt-drives has been weak due to.Dissertation: Influence of Dry Friction in the Dynamic Response of Accessory Belt Drive Systems. Mathematics Subject Classification: 74Mechanics of.In order to validate the response surface curve, experiments are conducted with Belt drives are power transmission systems commonly used in the industry [1]. . [32] investigated the effects of different types of front-end accessory drive (FEAD) tensioner types

(idler, hydraulic, and dry friction) and two different low speed.Likewise, tensioners used in belt drive systems act as passive [6]) have been developed to simulate the dynamic behaviour of structures with dry friction effects . The hysteretic Response Functions can be used to facilitate the choice between more .. engine accessory drives with dry friction tensioners.Mechanical tensioners are widely used in belt drive systems. in the dynamic behavior of the belt: they maintain nominal tension in the vibration level, especially in the automotive serpentine belt drive system) and difficult identification of parameters, such as stiffness, dry friction, and . dissipative effect becomes.