Accepted Manuscript

Damping effect of one-way clutch on belt-drive systems

Hu Ding, Zhen Zhang, Li-Qun Chen

PII: S0997-7538(17)30614-9

DOI: 10.1016/j.euromechsol.2018.04.004

Reference: EJMSOL 3585

To appear in: *European Journal of Mechanics / A Solids*

Received Date: 12 August 2017

Revised Date: 3 February 2018

Accepted Date: 6 April 2018

Please cite this article as: Ding, H., Zhang, Z., Chen, L.-Q., Damping effect of one-way clutch on belt-drive systems, *European Journal of Mechanics / A Solids* (2018), doi: 10.1016/j.euromechsol.2018.04.004.

Damping effect of one-way clutch on belt-drive systems

Hu Ding[1*], Zhen Zhang[1], Li-Qun Chen [1,2]

1. Shanghai Institute of Applied Mathematics and Mechanics, Shanghai University, Shanghai 200072, China

2. Department of Mechanics, Shanghai University, Shanghai 2004444, China

Abstract: In order to study the damping effect of the one-way clutch on belt-drive systems, especially on the transporting belt, an experimental platform is built. The strongest resonant areas of the midpoint of the transporting belt with and without the one-way clutch are compared. The experimental results clearly show the damping effect of the one-way clutch on the resonance of the belt-drive system. In order to determine the optimum damping parameters, a two-pulley belt-drive dynamic model coupled with a one-way clutch is established. The coupled governing equations of the belt-drive system are established to describe the coupling of the transverse vibration of the transporting belt and rotation of the pulleys. Based on the differential quadrature method, the coupled equations are derived into a set of nonlinear ordinary differential equations. Then, time histories of the transporting belt are numerically solved. The natural frequency of the belt is determined by using the amplitude spectrum of the free vibration of the system. Moreover, resonance areas of the transporting belt are obtained by using the frequency sweep. Furthermore, the influences of the parameters on the damping effect of the one-way clutch are studied to help understanding the design of the clutch.

Keywords: Transporting belt; one-way clutch; nonlinearity; steady-state response; differential quadrature method

[*] Corresponding author. Shanghai Institute of Applied Mathematics and Mechanics, 149 Yan Chang Road, Shanghai 200072, China, Tel.: +86 21 56337273; fax: +86 21 36033287.

E-mail address: dinghu3@shu.edu.cn (H. Ding)