Available online at www.sciencedirect.com

ScienceDirect

Procedia Engineering 192 (2017) 259 – 264

Procedia Engineering

www.elsevier.com/locate/procedia

TRANSCOM 2017: International scientific conference on sustainable, modern and safe transport

Dynamic analysis of mechanical conveyor drive system

Stanislav Gramblička[a,*], Róbert Kohár[a], Marián Stopka[a]

[a]*Department of design and mechanical elements, Zilina 010 26, Slovakia*

Abstract

The article deals with the dynamic analysis of the mechanical system of the drive to the conveyor belt. Subject of the investigation is the behavior of the mechanical system at different operating conditions of the activity to the conveyor belt. Analysis of mechanical systems were set data necessary for the compilation of the various simulations of dynamic processes in Matlab. The result of the dynamic analysis are graphical wave forms behaviour of individual working statuses of the conveyor belt.

Peer-review under responsibility of the scientific committee of TRANSCOM 2017: International scientific conference on sustainable, modern and safe transport

Keywords: analysis ; mechanical system ; conveyorbelt ; simulations ; dynamic proces

1. Introduction

Engineering and design of the machines over traditional methods significantly improve and modernized thanks to the availability and implementation of powerful computing technology along the engineering activity. Machines and mechanisms for their design considered as mechanical systems of varying complexity made of material specimens and a variety of physical links between them. The compiling of a mathematical model of such a system is not always simple, and therefore requires a careful analysis in order to then proceed to the mathematical treatment.

A mathematical model of the mechanical system of material objects consists of mathematical relations between their movement and acting forces according to the laws of mechanics. The basic laws of mechanics are formulated for absolute space. Such space, however, does not exist, butt here is an index space, which we use in our considerations. Inertial space name is derived from the fact that it applies the law of inertia. [1,2,4]

* Corresponding author.
E-mail address: stanislav.gramblicka@fstroj.uniza.sk

Peer-review under responsibility of the scientific committee of TRANSCOM 2017: International scientific conference on sustainable, modern and safe transport
doi:10.1016/j.proeng.2017.06.045

1.1. The concept and characteristics of the machine as a mechanical system

Each machine is made up of a mechanical standpoint more or less complex system of material bodies with different kinematic linkages. The moving mechanical systems are divided into plane and spatial, they may further have one or more degrees of freedom. Individual members or bodies planar mechanical systems can perform sliding, rotation and general plane motion.

By transmission of motion values between bodies distinguish mechanical systems (flat and spatial) with a constant transfer (e.g. Machine with gears, hoists, lever action, etc.), and mechanical system of non-constant transfer (machines containing ballast tubes, crank mechanisms, gate mechanisms, cam mechanisms and the like.). In the drive for mechanical systems often it used the name of the device, which is especially true for non-constant transfer system.

Each system includes a movable mechanical member, which is the driving power source system, call it drive member. Own working system activity carried on an element. Transmission of power from the drive member to the working member so provide the so-called transmission elements. [1,3,6]

2. Mechanical system to drive the conveyor belt

Mechanical system to drive the conveyor belt is driven by the drive member of the - electric motor. The power from the driving member of the mechanical system is further transmitted to the input shaft of the transmission member (two-step gearbox). From the output shaft gear member is transferred to another power transmission member that is belt drive, the gear ratio is constant. Another gear member was inserted into the mechanical system of the drive belt conveyor structural reasons for better space utilization. From gear member no. 2 (belt drive) is no longer the power is transmitted to the working member (roller conveyor belt). The required speed of the belt conveyor is in the (ms^{-1}) and the total weight of the material transported on the belt is m (kg). The power required to drive the conveyor is loaded P (kW).[2,4,5,7]

When solving a mathematical model of this system we will assume:

- Elastic deformation of the members of the system are negligible
- Slip the belt on the drive drum is considered

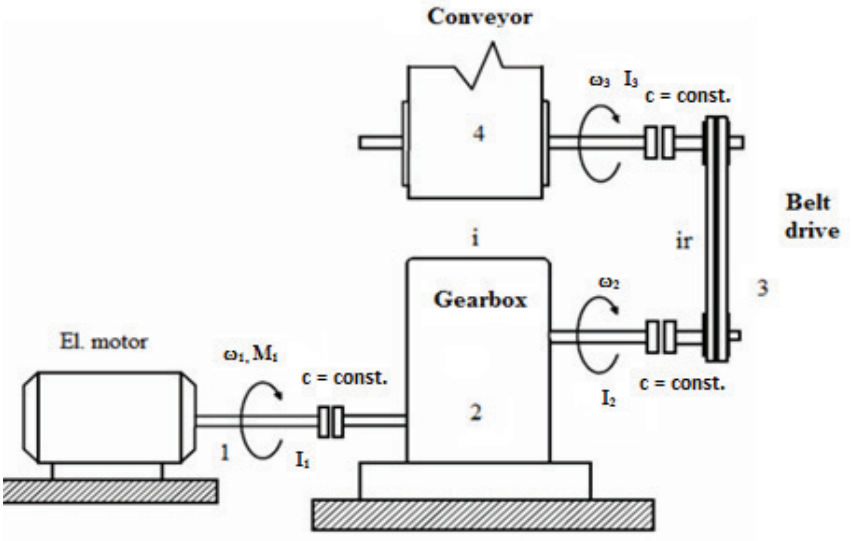

Fig. 1. Schematic diagram of mechanical conveyor belt drive system