SIMULATION OF MAS-20-750N-AA-MC-O-ER-BG PNEUMATIC MUSCLE USING FEA METHOD

Ioana Mădălina Petre

"Transilvania" University of Brasov-Romania, Department of Industrial Engineering and Management, babes_ioana@yahoo.com

Abstract: *The aim of this article is to present a simulation of a pneumatic muscle behavior by means of finite element analysis. The pneumatic muscle analyzed is a FESTO type muscle, of 20 mm diameter and length of 750 mm, with MAS-20-750N-AA-MC-O-ER-BG code. This kind of actuator replaces successfully the electric drives used until now. So, recently it can be observed an increasing utilization of the pneumatic muscle as actuator in different domains, because of their favorable caracteristics. The results of finite element analysis shows the behavior of the muscle - the volume expansion, the stroke that is capable to realise and the inflation pressure released into membrane.*

Keywords: *pneumatic muscle, actuator, finite element analysis, electric drives*

1. General Introduction

Pneumatic muscle is a recent actuator developed for the substitution of the electric drives. Its construction is simple; it consists of a rubber membrane covered with a nylon structure for offering strength. Under the action of pneumatic air the membrane increases its diameter and decreases its length, realising a certain stroke.

At the international level, it can be observed that it increased the interest of using this kind of actuator, especially in robotic movements.

In this paper it is presented the behavior of a pneumatic muscle, using finite element method (FEA).

The type of the muscle is MAS-20-750N-AA-MC-O-ER-BG from FESTO Company.

The research method is finite element analysis (FEA) using *COSMOSWorks* program.

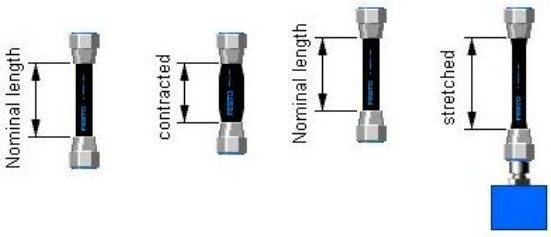
The results of finite element analysis shows the behaviour of the muscle - the volume expansion, the stroke that is capable to realise and the inflation pressure released into membrane – under different loads.

A future direction in this research is an indepth analyse of the pneumatic muscles and their application in medical equipments.

2. Pneumatic Muscle

Pneumatic muscle construction is based on an interior tube, made from neoprene rubber wrapped in braided sleeves made of nylon with strengthening and protecting role. The braided sleeves act to constrain the expansion for maintaining the cylindrical shape.

When pressure is applied, the muscle, which is blocked at one end, contracts and becomes shorter. The muscle expands when an external force is applied (e.g. a free hanging weight). This expansion is also called extending.



a b

Figure 1 *a- contraction of a pneumatic muscle, b – extending of a pneumatic muscle [1]*