

ENERGY-EFFICIENT RUBBER SPRING FOR ARM-LIFTING DEVICES FOR DUCHENNE PATIENTS

Healthcare is driven by increasing the comfort and the independency of patients. This implies that they need tools helping them to master their daily life. These can be grippers or spring-arrangements to reduce or replace the force necessary to lift things with their hands and arms. For the arm-lifting devices, the key parts are springs, which need to be made from elastomers as they have a very high energy density and elasticity.



Objective

Within this assignment, a very special elastomer-based material has to be developed, which will fulfill the requirements for being used as a spring in an arm-lifting device. The most important characteristic of this material is a low hysteresis, as this reduces the energy loss during movement of the rubber springs, and thus improves performance and durability of the springs, as well as it lessens the energy needed by a patient to lift their arm.

Assignment

The basis for this work is an elastomer composition, that was developed by a recent MSc graduate at ETE. However, the properties of this material have to be further optimized. The challenge of this assignment is to design an optimized rubber composition, in which many key ingredients play a crucial role in altering the final properties. This includes variation of the polymers and fillers as well as the network formation and other functional additives. Moreover, another challenge is to balance mechanical and dynamic properties. The properties in focus are a low hysteresis and a special stress-strain behavior.

The work will be performed in the laboratories of ETE at the UT.

Report

The graduation report should contain the results of the material development study: the material composition related to the trends in properties in question.

Partners

This project will be technically supported by Yumen Bionics. They develop arm-lifting devices for Duchenne patients. Yumen Bionics will give technical advice and can do measurements on the newly developed materials specifically for this application.



Fig. 1 : A Duchenne boy using an arm-lifting device with elastomer springs i.e. the blue strip.



Fig. 2 : Balanced forces principle of an Anglepoise lamp, which is used for the arm-lifting device.

Start:

Earliest: September 1, 2020

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