Construction and Analysis of Hysteresis Curves of Fibers and Cords

Student(s)
EYLÜL ENGİN
TUTKU DENİZ TOSYALI

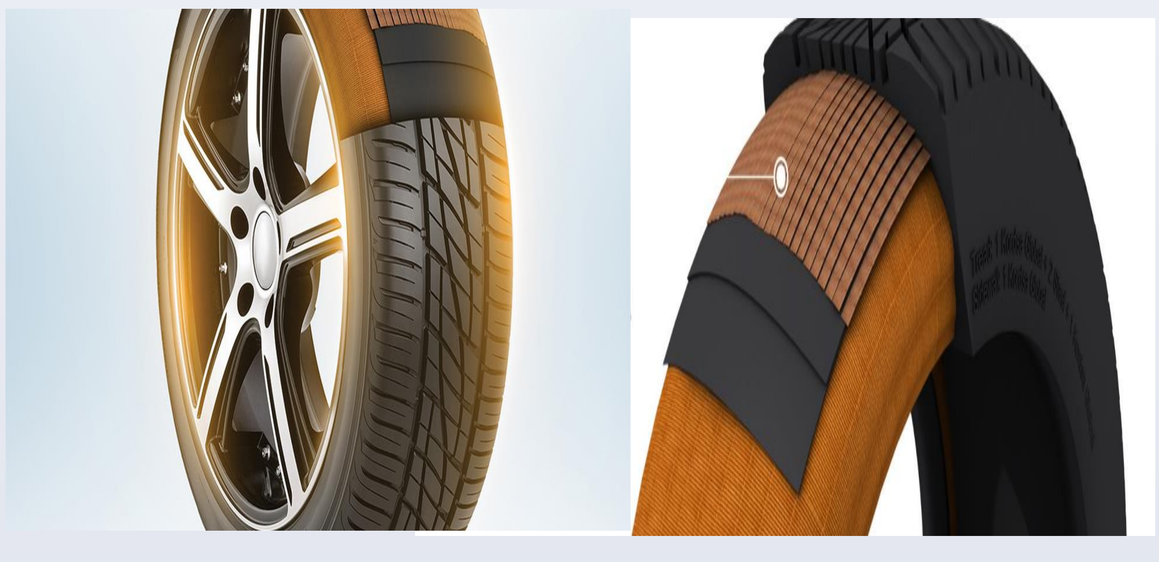
Faculty Member(s)
ERSİN GÖĞÜŞ
ÖZGE AKBULUT

Company Advisor(s)
ZEKİYE BAYKARA

Sabancı Üniversitesi
FACULTY OF ENGINEERING AND NATURAL SCIENCES

ABSTRACT

- The main objective of this project is to characterize the mechanical behavior of fibers exposed to dynamic loads.
- In the tires and of cords made up of these fibers, it is essential to estimate the damage that may occur during the lifetime of the fibers and cords.
- Cycling stress loan and strain test results are used in constructing hysteresis curves.

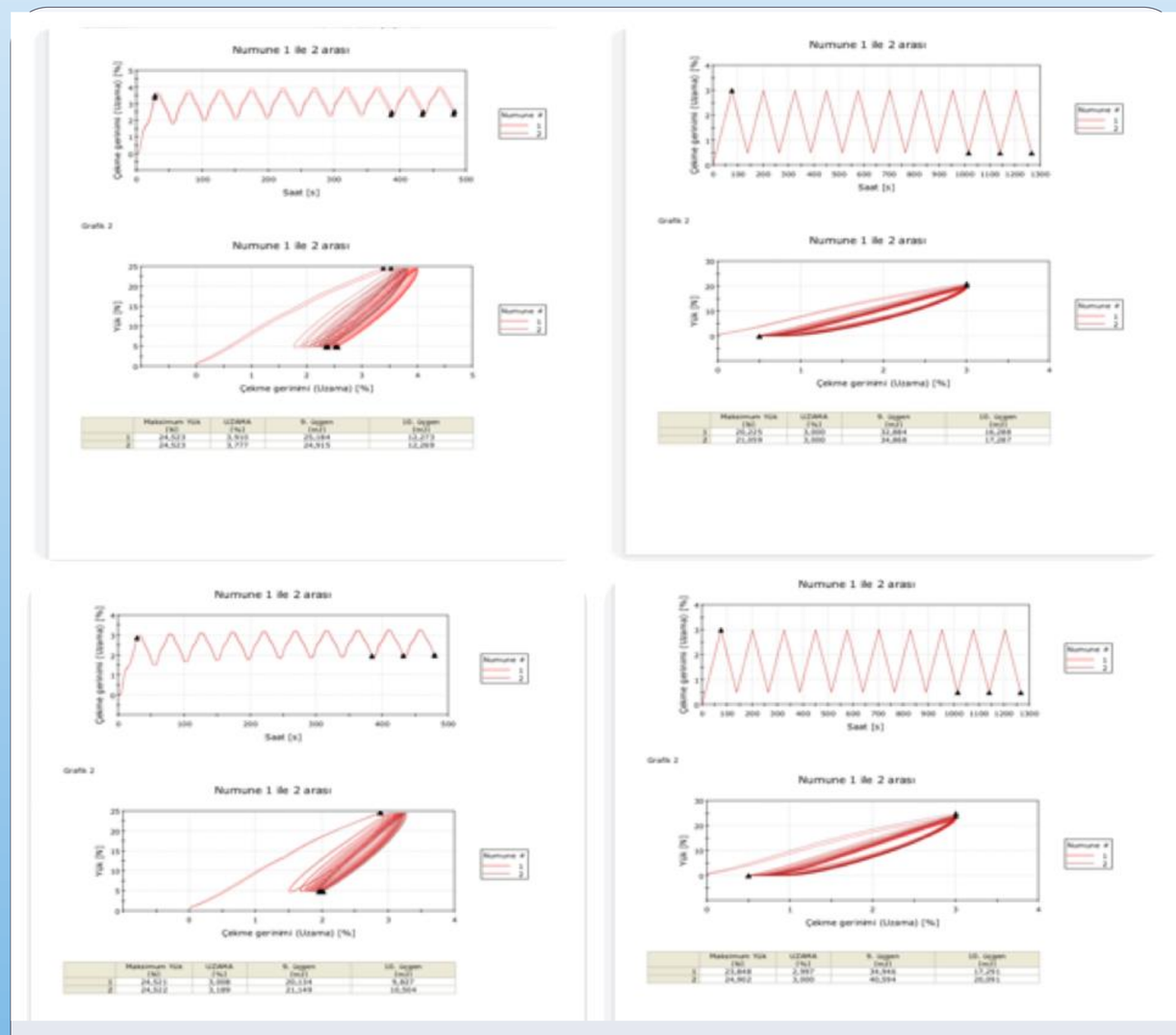


OBJECTIVES

- Materials of great importance should preserve their capabilities under physical circumstances, such as, extreme temperature and pressure. There should be an optimal balance between each other.
- The project goal is to minimize the rolling resistance of tires by means of minimizing the area under the hysteresis curves.

PROJECT DETAILS & RESULTS

- Instron is a testing machine to determine the tensile properties of materials, such as breaking strength, breaking elongation, and the modulus of textile cords.
- Hysteresis properties (heat generation rate) can also be determined under cyclic (dynamic) condition.
- Hysteresis can be determined between two forces or two elongations.
- The loop area of the 10th cycle is used for steady state (stabilized) conditions.



- All cycling loan tests were performed between 5 and 25 newtons for 500 second, with 10 cycle. In every cycle, results are varying due to material deformation. Areas under cycles shows elongation in the material.

DISCUSSION

There are 2 different hysteresis tests; one of them is the variable is stress, and the other is the strain.

Identity of the Specimens		Cyclic Stress		Cyclic Strain	
Material Type	Number of Twists	Cycle 9	Cycle 10	Cycle 9	Cycle 10
1100x2 PET	400	20,6	10,2	37,8	18,7
1100x2 PET	500	25,0	12,3	33,9	16,8

Mean of 9th and 10th triangle will give mathematical energy loss of the material. The goal is to optimize the energy loss. Therefore, the type of polyester with the smaller value of energy loss is preferable.

These tests were applied with default settings for all specimens.

FUTURE DEVELOPMENTS

- Standart tests were applied to all samples in the same way. For the future this project, it is aimed to develop actual performance tire and it will be achieved by gathering other test parameters.

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