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PHYSICAL, CUASY-STATICAL MODEL AND MEASUREMENTS OF THE FLOWS IN THE SOLID OF THE SCHOCK ABSORBER AND THEIR SIMULATIONS

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ABSTRACT

This paper includes the development and identification of the extinguisher model that envisages the force of the extinguisher as a displacement function of the extinguisher speed for given adjustment parameters. In order to compare the model coefficient, directly with the adjustment components of the extinguisher, the approach of black box models are the neoral nets, or maps of force – state is issued in favor of so called white box models that offer acces in extinguisher physicality.

Keywords: Extinguishing force, pressure, diameter, displacement, exponent of politrope, cuazy- static

1. INTRODUCTION

Hereby it is presented the activity for three models of the schock absorber activity. There are also given some experimental calculations of three models wherein are obtained the appropriate diagrams for these calculations, so here are included firstly theorical and experimental parts, these models are as follows:

1. Simulation of physical model.
2. Simulation of cuasy static model in pressure
3. Simulation of measurement of the flow in solid.

In the first modal for various values of diameters it is seen how diagrames are obtained , where all cases are linear.

For the second model is obtained a broken straight line,diferently from the first case where was unbroken straight line.

Whereas by simulation of flow measurement in solid it is abtained a parabolic curve.

2. PHYSICAL MODEL

The model of the extinguisher can be clasified in the model of pressure and model of bearing. The model of pressure consists of the of differential equations of inner pressure in chamber, whereas the model of bearing does calculation of oil bearing Q between chambers in different function of pressure Δp by means of non-linear equations. The extinguishing force is calculated for the pressure chamber in pressure and pull , friction and possible attack force,i.e.,

$$F = \left(A_{pt} - A_{rod}\right)p_{reb} - A_{pt}\,p_{com} + F_{friction} + F_{bumper} \quad \text{....................} \; (1)$$

F_{bumper} - striking force
A_{rod} - stick surface of absorber
A_{pt} - surface of duct pressure

p_{reb} - pressure feedback
p_{com} - pressure compression

3. SIMULATION OF PHYSICAL MODEL OF THE VEHICLES-EXPERIMENTAL PART

Actually by using the equation (1) for the case of physical model it will be done the simulation of this model, by getting the values of piston diameter of various shock absorbers. So it will be done the simulation of three types of values of these diameters and will be obtained three diagrams fig.1, and fig.2.

d= 25 mm

$$A_{rod} = \pi \frac{d^2}{4}$$

$$A_{pt} = \pi \frac{d_{pt}^{\ 2}}{4}$$

p_{com}= 0,,0.2,,,,,25 bar

F_{bumper}=0 N

$F_{friction}$ = 23 N

p_{reb}=15

d_{pt} = 36

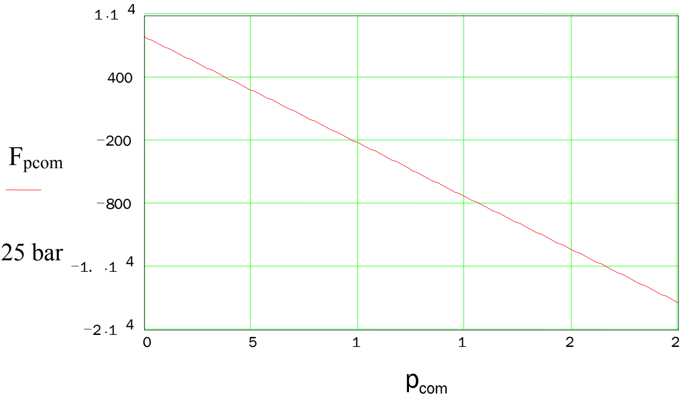

Figure 1. Force termination function of pressure d=25mm

The second case for different value of diameter

$F(p_{com1})=(A_{pt1}-A_{rod}).p_{reb} - A_{pt1} \cdot p_{com} + F_{friction} + F_{bumper}$

$d = 23 \ mm$

$$A_{rod} = \pi \frac{d^2}{4}$$

$d_{pt} = 32 \ mm$

$$A_{pt1} = \pi \frac{d_{pt1}^{\ 2}}{4}$$

$P_{com\ 1}$ = 0,,,0.2,,,,,,,,,25 bar

$F(p_{com1})=(A_{pt1}-A_{rod}).p_{reb} - A_{pt1} \cdot p_{com} + F_{friction} + F_{bumper}$

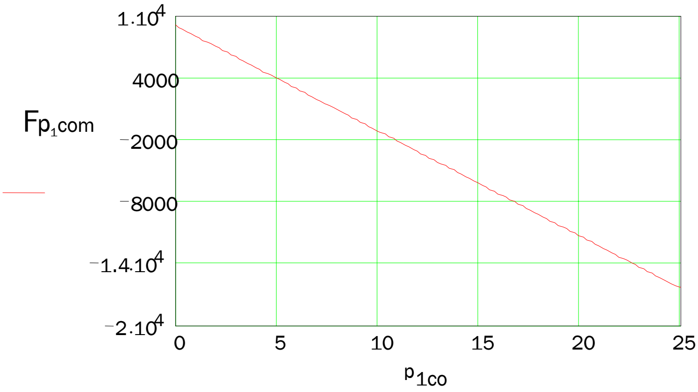

Figure 2. Force termination function of pressure, d = 23 mm

4. MODEL IN PRESSURE CUASY-STATIC

By means of cuasy-static test, are determined three models of parameters: static pressure of gas $p_{rt,0}$ and static volume of gas $V_{rt,gaz,0}$ in spare pipe and value of friction $F_{friction}$. Surely the solidity of attack spring or returning attackerof pressure can be determined in the same test. Cuasy-static test with slowely pressure and then with length of the shock absorber with typical speed 2(mm/s) in order to minimize extinguishing forces due to its loss of viscosity so that extinguishing force mainly is caused by friction and only with gas pressure. For the estimation of parameters is taken that indoor pressures in three chambers are equal between each other. Thus extinguishing force is modelized as follows:

$$F = -A_{rod}\, p_{rt,0}\left(\frac{V_{rt,gas,0}}{V_{rt,gas,0} + A_{rod}\, x}\right)^{\gamma} + F_{friction} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

By using testimeter of smaller quadrates that minimizes the difference between measured force and modelized force with middle quadrat are identified three parameters.

5. SIMULATION IN CUASY-STATIC PRESSURE

Simulate the pressure **CUASY-STATIC** of a fading force in the function of displacement and obtain the relevant diagrams

$x = -0.1, -0.08 \ldots 0$	
$F_{friction} = 23\text{N}$	Friction force
$d = 25$ mm	Diameter of extinguisher stick
$A_{rod} = \pi \frac{d^2}{4}$	Surface of extinguisher stick
$\gamma = 1.4$	Exponent of politrope
$V_{ngas0} = 9.3 \cdot 10^{-5}\ \text{m}^3$	Static gas volume
$P_{rt0} = 2.64 \cdot 10^{5}$ Pa	Static gas pressure

$$F(x) = -A_{rot} \cdot P_{rot} \cdot \left(\frac{V_{ngaso}}{V_{ngaso} + A_{rod} \cdot x}\right)^{\gamma} + F_{friction} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

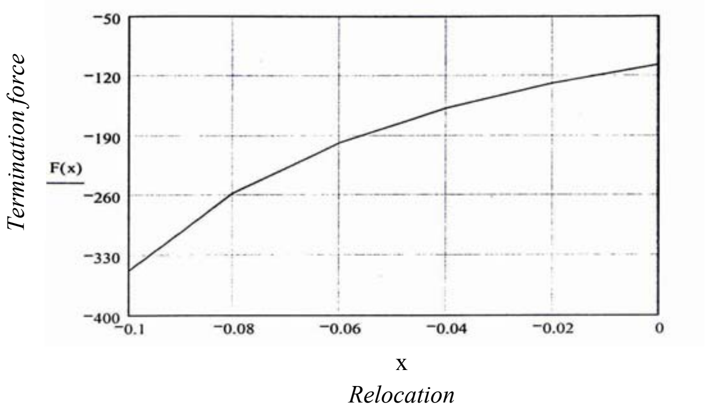

Figure 3. A fading force in the function of displacement, γ = 1.4, x_1= 0, 0.02.....0.1

$$F(x_1) = -A_{rod} \cdot P_{rto} \cdot \left(\frac{V_{ngaso}}{V_{ngaso} + A_{rod} \cdot x}\right)^{\gamma} + F_{friction} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

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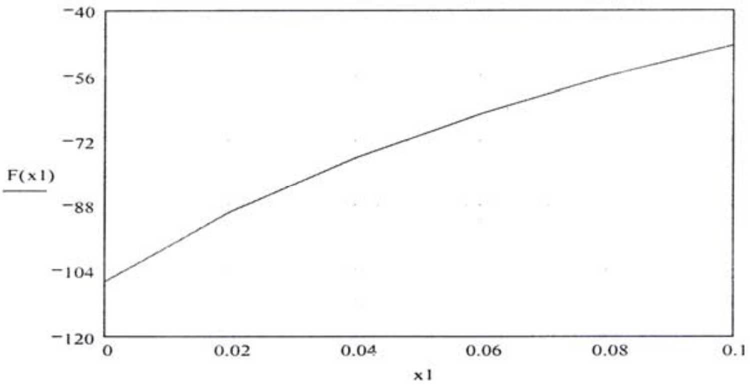

Figure 4. A fading force in the function of displacement in the expansion, γ = 1.4 γ=1.75

6. MEASUREMENTS OF FLOW IN SOLID

During the measurementof flow in solid a part of the flow is obliged to cross through the equipments under test by means of the pump as long as together are measured the fall of pressure and level of flow. Rank of determined flow is cleaned by using deviation slowely in a typical period of 200s. Measurement of flow in a solid by the valve crack generally is presented with the function:

$$\Delta p = BQ^r \quad \text{...}(5)$$

That is associated with specific exponent r. The measurement includes cracks with middle level of the piston valve of Monroe typ 1”. In table 1.is given the regiter of parameters that identify the measured flow wherein within brackets parameters are expressed in units of SI. Flow exponent is calculated by four measurements of four cracks of the same typ in order to determine the variability of production by means of standard digression of four estimations. Written quality from the value of RMS of remain demonstrate clearly the efectivity of required exponent.

Table.1.Suitable parameters from flow measurements in solid

Flow exponent r		1.75	2
Estimated flow	bar/(1/min)^r(Pa/(m^3/s)^r)	2.13 (4.9e13)	1.58 (5.7e14)
Of coefficient B			
Standard digression of B			
Of remain RMS	bar(Pa)	0.2 (2e4)	0.7 (7e4)

7. CONCLUSION

Such modelation of shock absorbers is initiated basing on the requirement of Consercium INVEC that is consisted from seven vehicle producers (Fiat, BMW,VW,Porsche, Daimler – Benz, Peugote dhe Renault),in order to make a standard model of the extinguishert. The purpose of this model is to include all non- linearity and dynamic within frequencies with gridle up to 30 Hz. Above 30 Hz,so in the gridle of frequently noise, seems to be very difficult to simulate the behavior of extinguisher in general way due to the specific changes that can be very different.

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