THEORETICAL AND EXPERIMENTAL FEATURE ELASTIC AND SAFETY CLUTCH ROLLER. PART-II

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Abstract: The modular design imposes finding the optimal solutions from constructive and functional point of view. The constructive design must be correlated with the technological one. Thus, it is possible to obtain mechanical components with reduce building limit and weight, with high durability and small price. In this context, the present paper presents the conceiving and the design of a new clutch with multiple functions, the elastic and safety clutch. This type of clutch combines the functions of elastic and safety clutches, and it will be denoted as elastic and safety clutch with elastic rubber roller. The experimentally determined characteristics clutch.

1. INTRODUCTION

The elastic and safety clutches are characterized by a variable rigidity (nonlinear characteristic) – relation (1); the security condition of the mechanic transmission is presented by relation (2), [1, 3]:

$$k(\varphi)=\frac{dM_t(\varphi)}{d(\varphi)} \tag{1}$$

$$M_{t\,lim}=(1+\Delta)\le M_{t\,max\,a} \tag{2}$$

where:
$k(\varphi)$ - represents the tangent to the curve of the torsion moment, who is written depending on the relative rotation; φ - the relative rotation angle, between the semi-clutches; $M_t(\varphi)$- the torsion moment corresponding to the clutch deformation with the angle φ; $M_{t\lim}$ - the torsion moment when the uncoupling produces or ends; $M_{t\max a}$ - the maximum torsion moment admitted by the strength of the most weak clutch element; Δ - the relative error reset inputs in function of the clutch .

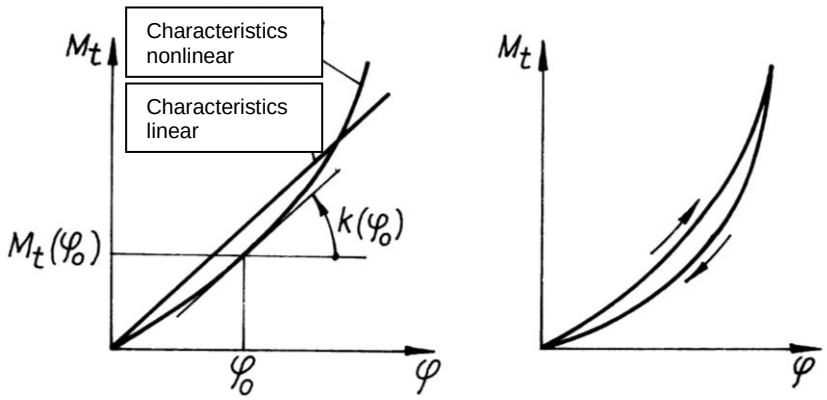

Figure 1. The characteristics clutch

2. DETERMINATION OF THE ELASTIC CHARACTERISTIC

Main objectives when trying elastic and safety clutches are the maximum torque transmitted the relative rotation angle of the clutch parts. These parameters determine the clutch characteristics.
If performance testing is necessary to establish the influence of various parameters on the operation of constructive and functional clutch of this feature.

2.1. ELASTIC AND SAFETY CLUTCH WITH RUBBER ROLLERS (RUBBER Φ25 – RUBBER Φ 25)

Equations (3) and (4) define the characteristic clutch Figure 2, the experimental data presented in Table1. Determinations were effectuating the static [7]

$$M_{tcap} = \frac{1}{2} D_0 z l (d_1 + d_2) E_1 \left(\frac{\varphi_{max}}{\frac{h_1 + h_2}{D_0} - \varphi_{max}} \right) \geq M_{tc} \tag{3}$$

$$\varphi = \frac{2 M_t h}{D_0 (M_t + D_0 z A_0 E_1)} \tag{4}$$

Table 1. Determination experimental

Applied force coupling parts [N]	Angle relative displacement φ [°]
10000	2.75
40000	7.8
70000	10.3
100000	15.04
130000	19.3
160000	22.2
190000	25.3
210000	29.2
250000	32,5
260000	35

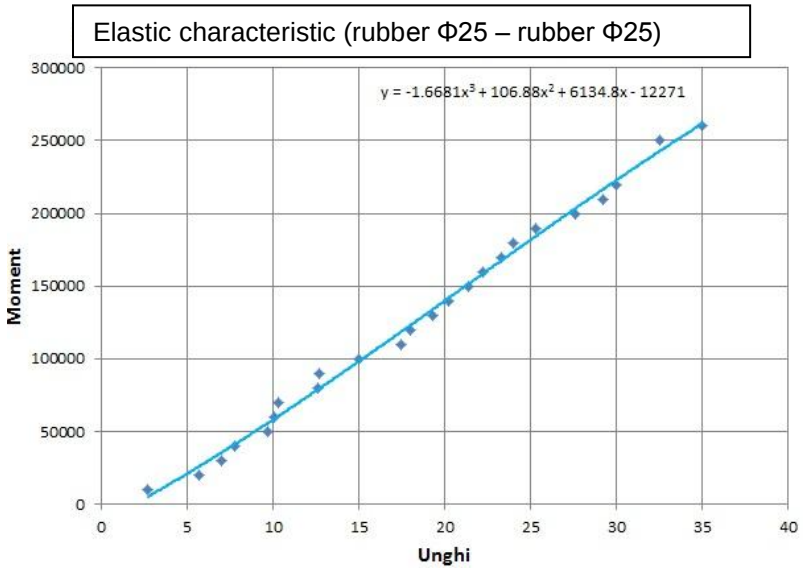

Figure 2. The elastic characteristic clutch (rubber Φ25 – rubber Φ25)

2.2. ELASTIC AND SAFETY CLUTCH WITH RUBBER ROLLERS (RUBBER Φ25 – RUBBER Φ20)

Equation (5) defines the characteristic clutch Figure 3, the experimental date presented in Table 2.

$$\varphi = \frac{2M_t(h_1 + h_2)}{D_0\left(M_t + \frac{1}{2}D_0 zl(d_1 + d_2)E_1\right)} \quad (5)$$

Table 2. Determination experimental

Applied force coupling parts [N]	Angle relative displacement φ [°]
10000	1.3
30000	3.7
50000	6.2
70000	9.5
90000	12.3
110000	14.6
130000	18.15
150000	22.5

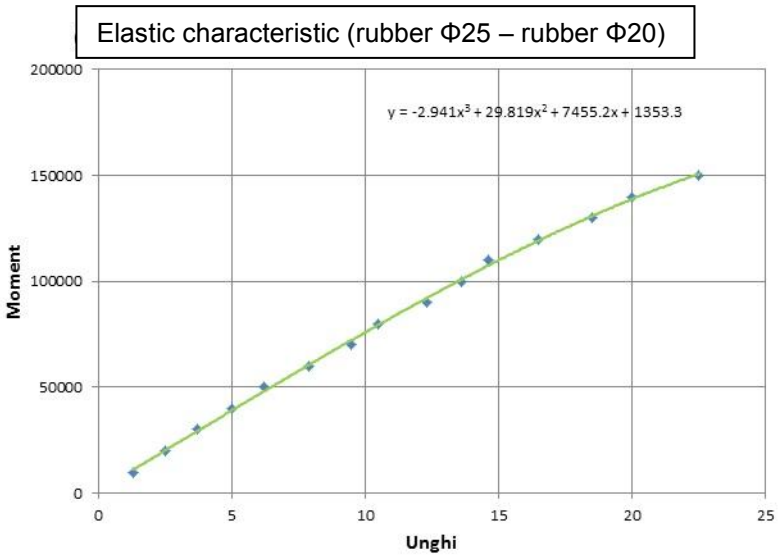

Figure 3. The elastic characteristic clutch (rubber Φ25 – rubber Φ20)

2.3. ELASTIC AND SAFETY CLUTCH WITH RUBBER ROLLERS (RUBBER F25 – POLYURETHAN F20)

Table 3 and Figure 4 shows the test values. Figure 4. prezinta the elastic characteristic clutch (rubber Φ25 – polyurethane Φ20)

3. CONCLUSIONS

Study based on a new design the elastic and safety clutches can identify a series of final conclusions such as:

Table 3. Determination experimental

Applied force coupling parts [N]	Angle relative displacement φ [°]
10000	1.8
30000	3.6
50000	6.1
70000	8.3
90000	10.5
110000	12.6
130000	15.4
150000	18.1
170000	21.2
190000	26.2

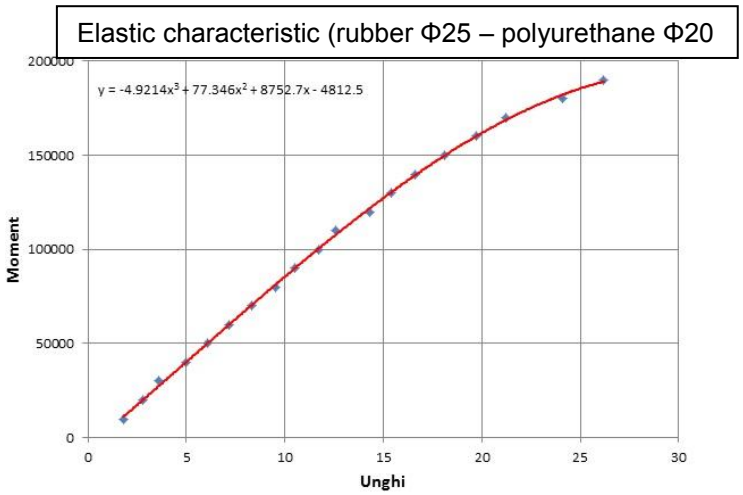

Figure 4. The elastic characteristic clutch (rubber Φ25 – polyurethane Φ20)

- can get different elastic characteristics, according to the form constructive nature of the elastic element and how the clutch arrangement;
- provide relative rotation between the two clutch parts according to the nature and arrangement of elements of the coupling half, above the permissible limits, elastic coupling is one of safety;
- and regulation limits the torque able to be transmitted.

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