

EXPERIMENTAL DETERMINATIONS UNDER DYNAMIC CONDITIONS OF THE SAFETY CLUTCHES WITH SHEARING PINS

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1. Consideratii theoretical

The behavior of the coupling in real functioning compulsorily includes its analysis under dynamic conditions. Due to the high cost of the dynamic trials, these trials limited to: tracking the characteristic under dynamic conditions, the study of the behavior of the coupling under transitory conditions as well as de-coupling of loads. In order to accomplish these trials one conceived, projected and realized the cinematic chain of a trial stand. Its adaptation to the calculus technique, in order to numerically process the results, was accomplished with the help of a programmable interface with which the stand is endowed.

The calculus of the components of the machines and of the transmissions of the mechanics are accepted, only that, a series of hypotheses simplificatoare, and sometimes I am used-up approximate adding methods, what drives to a certain uncertainty in what looks the real produced in exploitation. Also, the features the mechanics ale the used-up materials dont the by-pathes knowed to a nicety, and as often as not these dont I maintained constantly temporally, the materials homogeneous, and their features the mechanics are determinate, at large, on epruvete, these behavior be different from one innards with configurapii and different sizes.

The attempt of resistance has as the aim the determination capacity of the couplings resisted to imposts. With this end in view are achieved the shipment of the coupling with tasks having the values of as far as the limit of this resistance. This kind is can caused the measure in which new building realizatã is able to resist to imposts and therewith, the degree of covering of nominal solicitations, of resistance for material used-up.

Among the significant parameters for which I enforced the boundary values and prescribed the admissible errors remembered:

1. The maximum torque, represented valuable eldest the which torque burn can appear in system, in normal regime of operation;

2. The angle of relative turnings among semicuplaje, cãrui value depends on: The torque transmited of coupling, the material nature from which by-path realize the elements mediate, the admissible boundary values ale deformations of the elements mediate, form constructive and the way of disposition of the elements mediate, etc.

Abbots of sprockets, ale cãror boundary values are determinate of: The material nature from which by-path realize the elements mediate ale of the coupling, the elastic features ale of the materials from which by-path realize the elements mediate ale of the coupling, form constructive, And the way of dispose the

elements mediate as part as the coupling, the technological games and of mounting ale the coupling as part as the transmission of the mechanic.

Abaft the analysis and interpretation of experimental date, I obtained a series of result ale attempts, which results offers informabii about:

- the performances of the coupling tried;
- the behavior statics and dynamics of which coupling constituie the object attempt;
- the influence constructive parameters have the coupling about this features;
- the behavior of the coupling to different regimes of operation ale the transmission of the mechanic;
- the influence of technological factors and of exploitation about the couplings.

Result attempts enables to verified if the adding used-up hypotheses in projection îi lost] the validity in modelarea mathematics and dynamics of experimental model of the coupling.

The attempt of resistance of constitutive elements ale of the couplings has the role caused resisted to as far as imposts these destruction. The coupling realizat and tried to resistance can give informabii about the degree of cover the nominal solicitation of the capacity of material used-up resistance in his building. As part as attempts of resistance, is in progress initially, the settlement significant what parameters were varied up to the values maximum the effective attempts driving, this case, to the destruction of the coupling tried.

The of a elaboration adding model for the determination state tensional and the of a deformations structuri must rigorous relate with adding metodica and the experimental determinations.

The case experimental determinations, principalii the which parameters must measured and register the by-pathes he who define the state of resistance, that is the deformations and the tensions the mechanics. For the determination of the deformations and the tensions is can applied to the experimental mensurations, is for the verification of theoretical results, be is found out the size of the tensions produced in right the needles points ale the element researched, where dont is can lost]ed by-computation a sufficient value of precise.

If the imposts act dynamically, therefore the moment of impost M_t s breeds quick, this decrease, on the portion of kinematic chain contents between the trained machine and the engine of actuation, are owed the moment of inertia of table on the move. The figure 1 is presented schematically, the kinematic chain of of a transmisii (fig. 1,a), and the shipment diverselor segments ale this, the case of of a act dynamic imposts (the representation shipment corresponds of a very short time and is qualitative).

The protection of the transmission can be realizatã through the limitation of the torque to the value maxim of motive moment $M_m \max$ fig. 1 1 b; the limitation of the moment to the value maxim of the torque of cupajului fig. 1, c; Interrupt the motive feeding of actuation fig. 1, d; the kinematic chain breaking of to the safeseat coupling fig. 1 e.

From fig. 1, c and e, result that in the case of dynamic imposts the safeseat couplings limit the torque to the value enforced of these except on the portion of kinematic chain among coupling and the engine of actuation. The safeseat coupling act and in the direction of trained machine, through the decrease of the moment M_t s

but the theoretical researches and experimental showed that on the portion of kinematic chain contained between coupling and the place of appearance of the impost the torque is elder than the torque enforced of coupling. For instance, from the theoretical researches, results that to the of a starting unit with inertial big people, the value of which torque solicit this part of kinematic chain touch 30%...40% from the value of maximum which torque appears in a transmission without safety coupling and he is of 1, 25... 2 either elder than the torque transmited of the safety which coupling the team the transmission.

For this reason, is recommended the location of safeseat coupling the next to maul the place of the appearance of dynamic imposts.

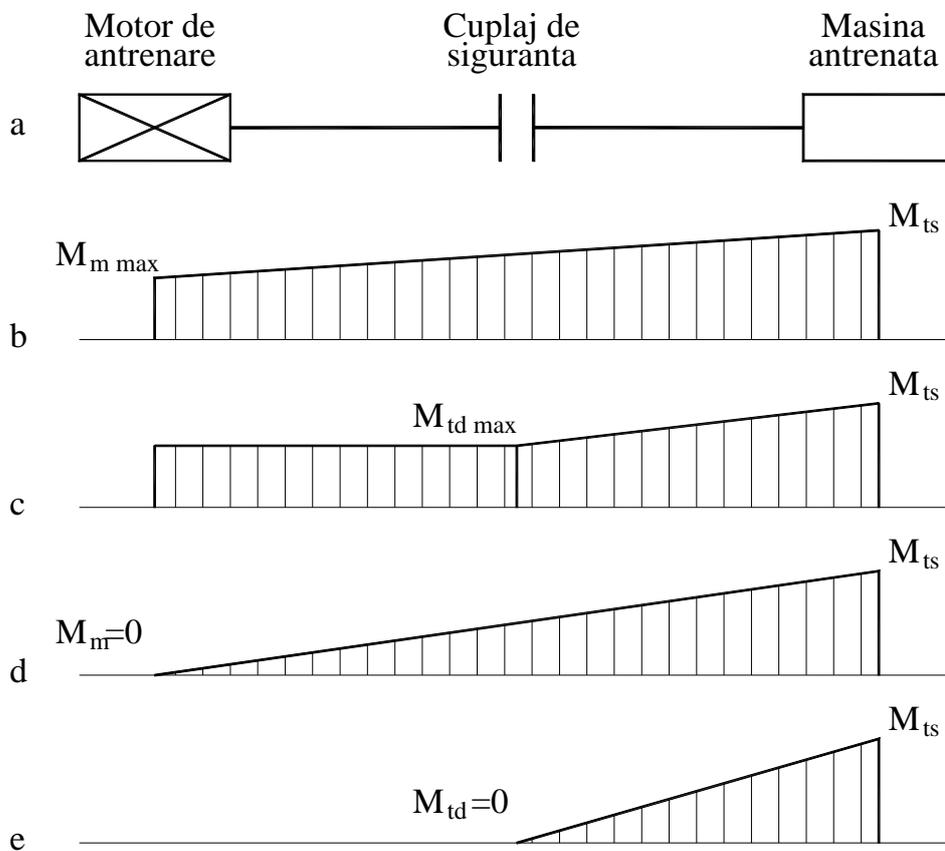


Fig. 1. The kinematic chain of of a transmisions the si the shipment diverselor segments ale this

2. Experimental determinations about the feature safety coupling in dynamic regim

The behavior in the real operation of the coupling presupposes the in way obligatorily analyses this behavior in dynamic regim. Due to the erect cost of dynamic these attempts attempts they confined to: Trasarea the feature of the in dynamic regime, the study behavior of the coupling of the in transitory regim, as well as auto trips of the task. In the sight these effectuation attempts he conceived, projected and achieved the kinematic chain of of a stall of attempts. This accommodation to adding technique, in the sight digital remaking of the results, he achieved with of a help programmable which interfaces found out the in the endowment standing.

Experimental determinations in dynamic regime of safety coupling

The remaking of the informations furnizate of stall and the determination of the features of the coupling tried are achieved the in doua stages, the registration and the remaking of the date.

Abaft remakings of the date achizitionate, the program achieve the diagram of the torque depending on time.

Afterwards he is established the regime represented of attempt, the guy of the spline, the number of used-up splines(z), the diameter of the splines(d), material the splines and these diagrams.

The figure 2 is presented the curve of variation of the torque for OL 42, $z= 2$, $d= 2\text{mm}$ for which the moment transmited is of 1350 1350 Nmm, the value of the torque of deculpare on a par with the value the maxim of the moment of the coequal impost 2350 Nmm, the remanent torque of 1000 Nmm, for auto trip of 0,0014s.

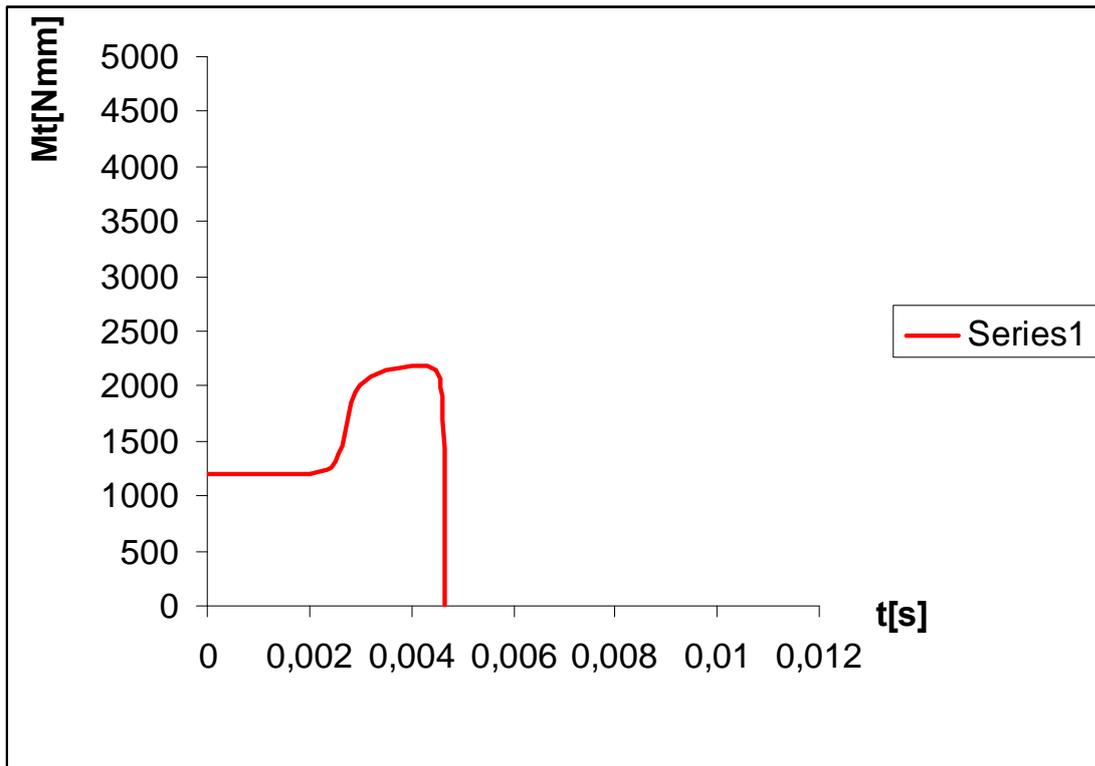


Fig. 2. Curve of variation of the torque for OL 42, $z=2$, $d=2\text{mm}$

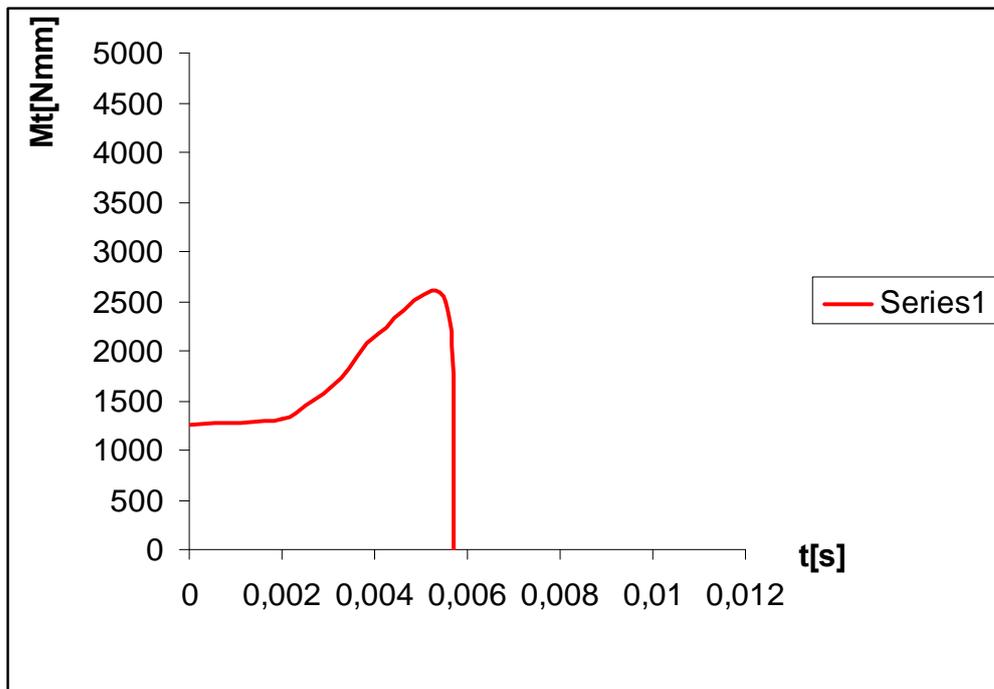


Fig. 3. Curve of variation of the torque for OL 42, $z=4$, $d=2\text{mm}$

The figure 3 is presented the curve of variation of the torque for OL 42, $z=4$, $d=2\text{mm}$ for which the moment transmitted is of 1350 Nmm, the value of the torque of deculpare on a par with the value the maxim of the moment of the coequal impost 2700 Nmm, the remanent torque of 1350 Nmm, for auto trip of 0,004s.

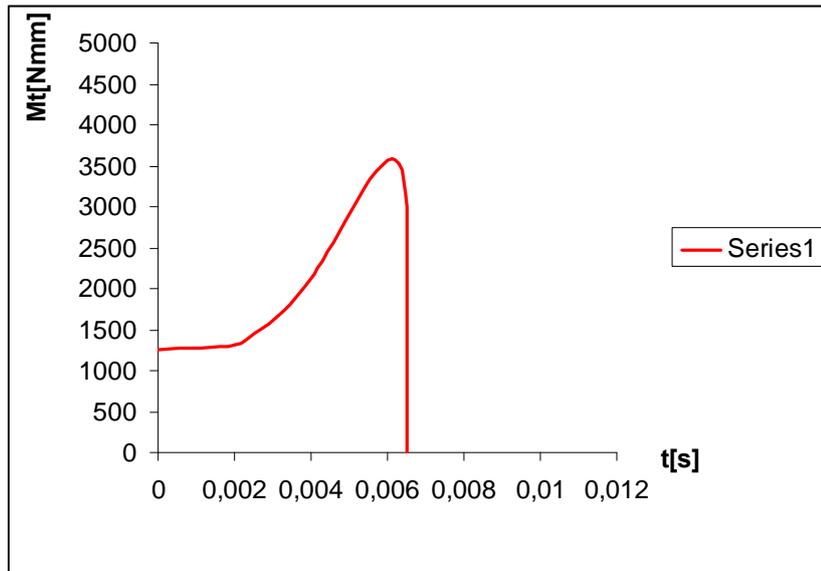


Fig. 4. Curve of variation of the torque for OL 42, $z=2$, $d=3\text{mm}$

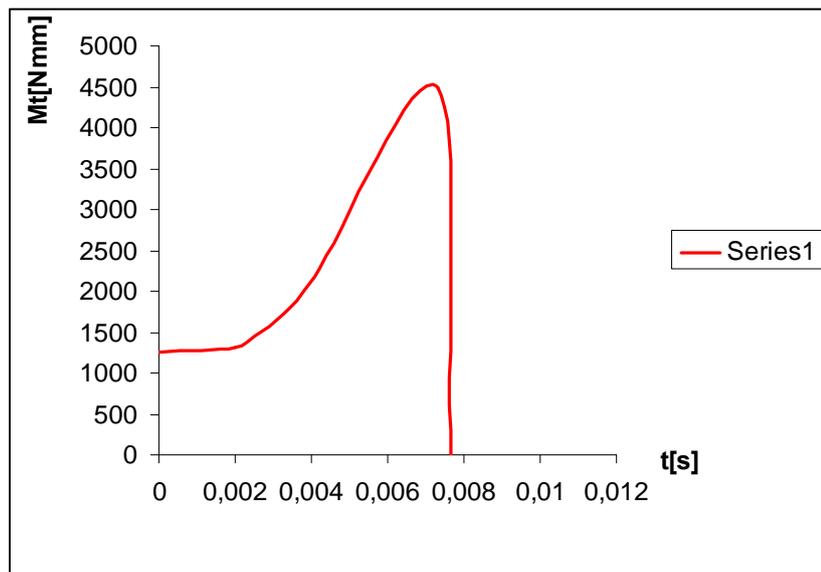


Fig. 5. Curve of variation of the torque for OL 42, $z=4$, $d=3\text{mm}$

The figure 4 is presented the curve of variation of the torque for OL 42, $z=2$, $d=2\text{mm}$ for which the moment transmitted is of 1350 Nmm, the value of the torque of deculpare on a par with the value the maxim of the moment of the coequal impost 3700 Nmm, the remanent torque of 2350 Nmm, for action time automatic release of 0,0045s.

The figure 5 is presented the curve of variation of the torque for OL 42, $z=4$, $d=2\text{mm}$ for which the moment transmitted is of 1350 Nmm, the value of the torque of deculpare on a par with the value the maxim of the moment of the coequal impost 4650 Nmm, the remanent torque of 3300 Nmm, for auto trip of 0,0053s.

Bibliography

- [1]. **Ioan Stroe, Elena Eftimie**, Cuplaje elastice si de siguranta, Editura Ecran Magazin, Brasov, 2001, ISBN: 973-8281-00-8.
- [2]. **Marius-Beniamin Fazecas**, Contributii teoretice si experimentale privind rezistenta si durata de viata a cuplajelor, Editura Politehnica, Timisoara, 2007, ISBN: 978-973-625-498-7.
- [3]. **Richard W. Hertzberg**, Deformation and Fracture Mechanics of Engineering Materials, Fourth Edition.