# STUDY CONSIDERATIONS ON THE FRETTING PHENOMENON FOR LAMELLAR SPRINGS

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***Abstract:*** *Fretting regimes were first mapped by Vingsbo. In a similar way, three fretting regimes will be considered: stick regime, slip regime and mixed regime. The mixed regime was made up of initial gross slip followed by partial slip condition after a few hundred cycles. For the study of the fretting phenomenon in case of elastics assemblages spring slides with multiple sheets, I used the experimental stall. On the rigid support the elastic lamella is assembling through the agency of the superior plate and of the screws.*
*The elastic lamella oscillates because of the rod crank mechanism with eccentric. This mechanism is auctioned with the electrical engine assuring the necessary conditions for producing the fretting phenomenon*

**Keywords**: fretting, transition, variable friction coefficient.

## 1.Introduction

Fretting is now fully identified as a small amplitude oscillatory motion which induces a harmonic tangential force between two surfaces in contact. It is related to three main loadings, i.e. fretting-wear, fretting-fatigue and fretting corrosion.

The main parameters were reported to be amplitude displacement, normal load, frequency, surface roughness and morphology, and residual stresses. More recently fretting has been discussed using the third-body concept and using the means of the velocity accommodation mechanisms introduced by Godet et al.

Fretting regimes were first mapped by Vingsbo[1]. In a similar way, three fretting regimes will be considered: stick regime, slip regime and mixed regime. The mixed regime was made up of initial gross slip followed by partial slip condition after a few hundred cycles. Obviously the partial slip transition develops the highest stress levels which can induce fatigue crack nucleation depending on the fatigue properties of the two contacting first bodies. Therefore prediction of the frontier between partial slip and gross slip is required[2,3,4].

The type of surface damage that occurs in fretting contact depends on the magnitude of the surface normal and tangential tractions. In existing fretting models the relative displacement is assumed to be accommodated mainly microslip in the contact surface.

## 2. Experimental means

For the study of the fretting phenomenon in case of elastics assemblages spring slides with multiple sheets, I used the experimental stall from fig.1.[5]

The stall permits testing for one slide and for spring slides with multiple sheets, too.

### 2.1. Description of the stall

On the rigid support the elastic lamella is assembling through the agency of the superior plate and of the screws. The elastic lamella oscillates because of the rod crank mechanism with eccentric. This mechanism is actioner with the electrical engine assuring the necessary conditions for producing the fretting phenomenon.

The contact is charged with the assistance of 4 screws through the agency of some helicoidally springs and through the agency of some radial-axial bearings with conic rolls.

The helicoidally springs beforehand standard permit a charge with a normal and known force, the presence of the radial-axial bearings assuring the eliminate of friction between the screw and the superior plate.

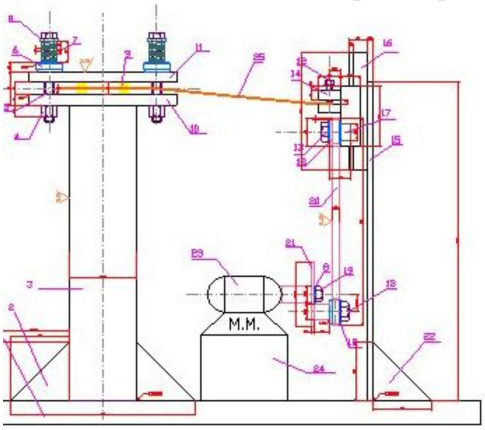


***Fig.1.*** *Experimental stall*

***Fig.2.****The system excentricity*

The stall can be used for the testing at fretting of some couples by different materials. This stall can be adapted for study of the lamellar springs with many sheets.

The lamellas used in experiments have the dimensions 560x56x2 mm and are realised by spring steel having hardness 55 HRC.

The rod-crank mechanism permits a displace at the end (extremity) of the 20 mm lamella and can modify this displace by changing of the system excentricity(Fig.2). The system is actioned through the agency of electrical enging having revolution of 750 rot/min.

The experimental stand was used to study of the state of wear produced in slide contact, specific contact leaf springs with multiple sheets by small amplitude oscillatory motion.

In this case we have studied the phenomenon of fretting dependence of normal forces, giving specific traces for each case. If the pressure variation in normal force of 200N we used force and 250N duration ranging between 40000 and 60000 application of load cycles.

The wear traces resulting from attempts to push the normal force of 250N shows, just as expected, an increase in sample size used to increase the duration of application.

Also, all traces of fretting wear tests wear identified by the presence of “red powder” at the contact between the two blades.

The traces obtained for 250N and 40000 cycles are given in fig.3, for the same normal force and 50000 and 60000 cycles for traces obtained are given in fig.4 and fig.5

Traces obtained for 200 N and 40000 cycles are given in Fig.6, for the same normal force and 50000 and 60000 cycles for traces obtained are given in Fig.7 and 8

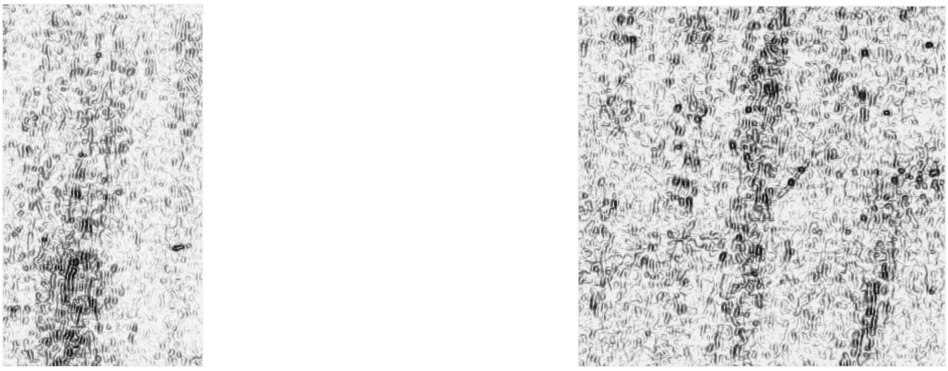

***Fig.3.****The traces wear for a normal charcing of 250 N, Nc=40000 number of cycles*

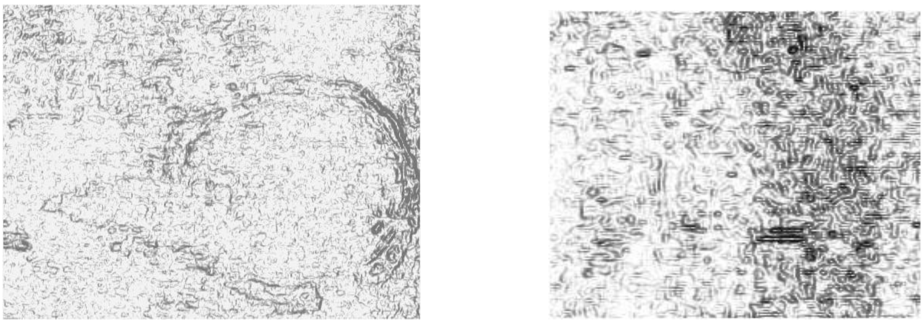

***Fig.4.****The traces wear for a normal charcing of 250 N, Nc=50000 number of cycles–lamella lower*

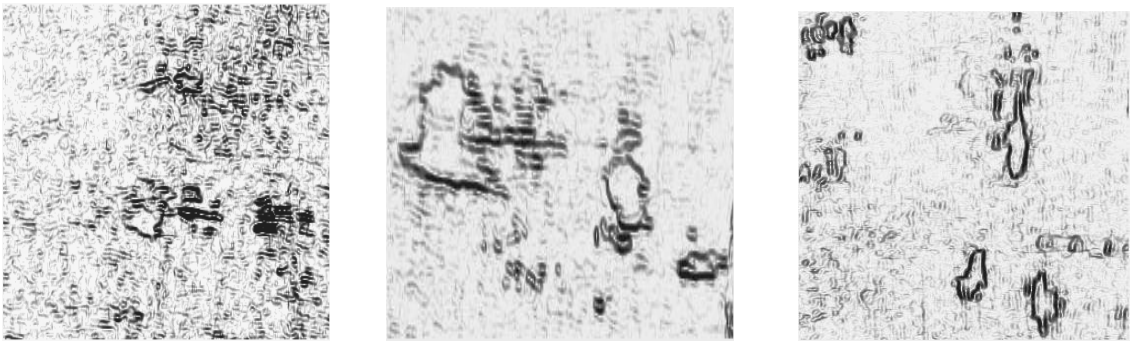

***Fig.5.*** *The traces wear for a normal charcing of 250 N, Nc=60000 number of cycles–lamella upper*

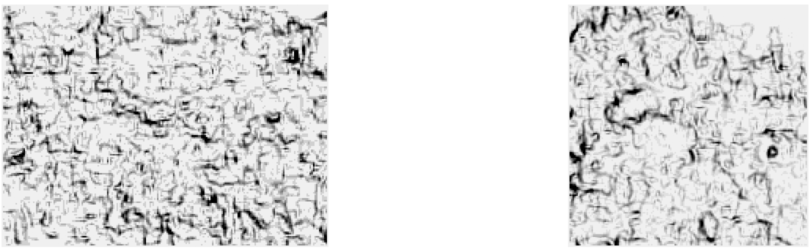

***Fig.6.*** *The traces wear for a normal charcing of 200 N, Nc=40000 number of cycles–lamella upper*

***Fig.7.*** *The traces wear for a normal charcing of 200 N, Nc=50000 number of cycles–lamella upper*

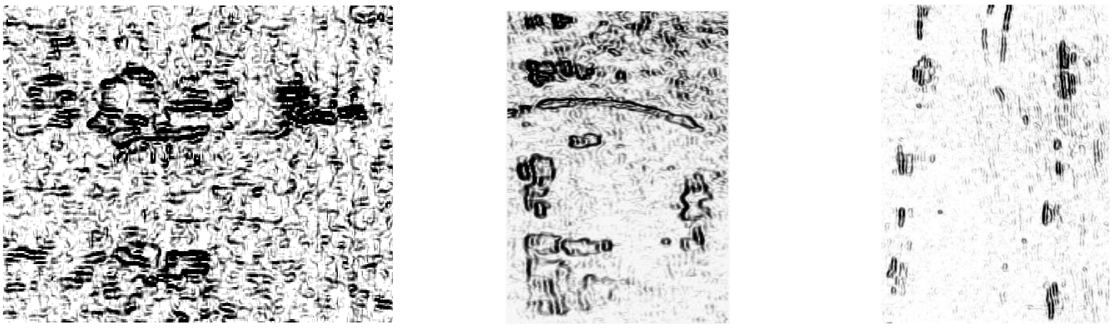

***Fig.8.*** *The traces wear for a normal charcing of 200 N, Nc=60000 number of cycles–lamella lower*

For 40000 cycles the traces obtained are distinguished by small areas of adhesion between the two lamella, these areas increased significantly to 50000 and 60000 cycles. To 60000 cycles per slide were found in much larger areas that was present "red powder 'which means an increase in wear with time request. For the same lifetime can be observed an increase in area used to increase the normal force push.

The traces obtained were taken with a camera, is then processed by computer. Examples of fretting wear are shown in Figure 9, 10.11

***Fig.9*** *The traces wear for a normal charcing of 250 N, Nc=50000 number of cycles*

## 3. Conclusion

The experimental stall permits realization of the experimental tries for the study of fretting. We can determine the different size of the fretting areas and we can compare these with the theoretical results.

Identified the presence of "red powder 'on slides and subjected to fretting wear has been an increase in the duration of the request. For the same lifetime can be observed an increase in area used to increase the normal force push.

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