

ANNUAL EPIGENETICS CONFERENCE

&

International Conference on

November 28-29, 2018 | Tokyo, Japan

MECHATRONICS, AUTOMATION AND SYSTEMS ENGINEERING

Flexibility of hybrid load transfer assemblies: Influence of tightening pre-stress

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The flexibility of bolted assemblies of thin parts is a significant parameter, especially in calculating the load distribution between the various fasteners in an assembly. This characteristic is poorly understood in the case of assemblies that are working both in plastic deformation-shearing and friction. The present study firstly focuses on flexibility of an assembly working only by friction. It highlights the influence of pre-stressing and the coefficient of friction on flexibility as also on hysteresis and assesses the influence of the assembled parts' geometrical characteristics. The study then goes on to consider a hybrid load transfer assembly. Simulations performed using ABAQUS software provided insight as to how the joint behaves in relation

to the pre-stress applied. The results are compared to the case of an assembly working without pre-stress. Using these simulations, a model for determination is proposed. This allows the apparent flexibility of the fastener to be calculated, dissociating the case of apparent flexibility on the first loading cycle needed to calculate the load transfer from the apparent flexibility of the following loading cycles. The formulations proposed thus allow the behaviour of a hybrid load transfer fastener to be characterised in relation to the transferred load FT and a dimensionless parameter characterising the latter's global behaviour (adhesion or slipping).

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