STUDY OF RUBBER/ROAD DRY FRICTION IN ROLLING SLIDING AND LINEAR SLIDING CONDITIONS

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ABSTRACT

For safety and energy consumption reasons, friction in tyre/road contact is an important property when designing tyres. But the origin of friction in tyre/road contact and its relationship with the kinematic conditions are still not well understood. In this study, we carried out experiments to characterise rubber/road friction in two different kinematic conditions. With a first experimental device, a flat rubber sample is put into contact with a circular road sample. After a certain time spent in such a static contact, the road is put in rotation at a constant speed. Both the normal and friction forces are monitored as a function of time. We vary the shear speed and the age of contact before sliding. Indeed as it has been shown in Baumberger and Caroli [1], shear speed and age of contact have a strong influence on the friction behaviour of the system. In the second type of kinematic conditions, a cylinder of rubber is put into contact with the same road sample than previously. Both solids are now put in rotation. The slip ratio i.e. the ratio between the relative speed between the two solids and the road speed, is controlled and varied. We use an analytical model develop by Carter [2] to calculate the effort in the rolling friction contact. We will present the evolution of the friction coefficient as a function of the sliding velocity and contact age. We will also present the friction coefficient as a function of the slip ratio for several normal loads and average speeds. Both types of results will be compared and discussed.

REFERENCES

[1]T. Baumberger and C. Caroli, “Solid friction from stick-slip down to pinning and aging”, Adv Phy 55 (2006) 279-348

[2] F. W. Carter, “On the Action of a Locomotive Driving Wheel”, Proc. R. Soc. 112 (1926) 151–157.