

Impact of road surface on rolling resistance in road cycling

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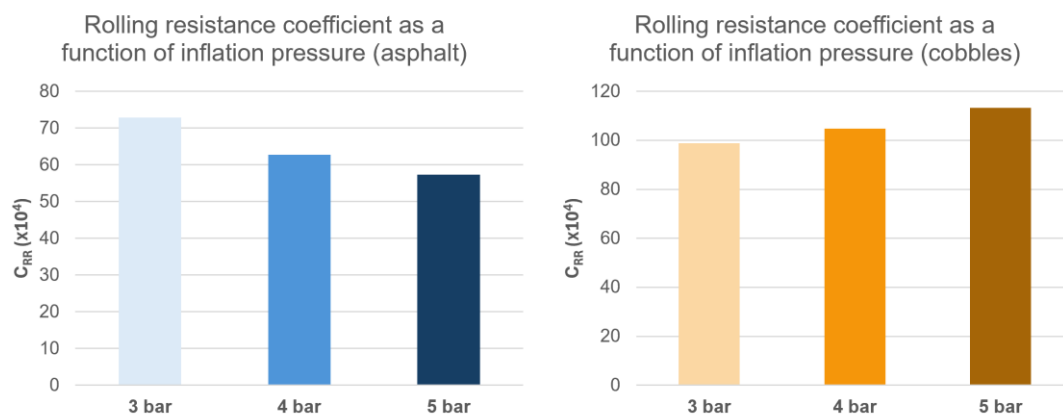
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This study investigates one of the key performance factors affecting professional road cycling: rolling resistance. Rolling resistance is one of the three major obstacles that cyclists must overcome when pedalling, along with elevation gain and aerodynamic losses [1,2]. Most of the energy losses from rolling resistance are caused by the hysteretic behaviour of the tyre material, which, when subjected to repeated load-unload cycles during rolling, dissipates energy in the form of heat [3]. Rolling resistance losses are often evaluated with the rolling resistance coefficient (C_{RR} , dimensionless) defined by the ratio of the rolling resistance to the load to which the tyre is subjected. We analysed various parameters that have an influence on this rolling resistance, in particular inflation pressure and the road surface.

The aim is to guide coaches, mechanics and team managers in their choice of tyres and inflation pressure for a given race. To do this, we carried out measurements on a test bench on which we could modify the rolling surface and therefore test different sizes of road defects.

A strong influence of the rolling surface on the measurement of rolling resistance has been highlighted. The larger the surface elements on the ground, the greater the energy losses associated with tyre rolling. The impact of tyre inflation pressure has also been studied. This effect also depends on the surface of the ground. For a smooth surface, a high inflation pressure is recommended to increase performance and reduce the vibrations felt by the rider during practice. On rough surfaces like cobblestones, lower pressure is recommended. A link between rolling losses and vibrations transmitted to the bike has also been observed.

Keywords: Cycling, tyres, rolling resistance.



Effect of pressure on rolling resistance coefficient for two different road surfaces: asphalt and cobblestones

References

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