

Effects of different lubricants on bicycle chains: tribological and ecological study

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Abstract

Among the forces a cyclist has to overcome, chain drive frictions represent up to 3.9% of the losses in efficiency (Kyle 1986, Atkinson 2003). Lubrication seems to have an impact on these losses (Michelsen 2015), as better lubes can reduce frictions by 2.1%. Though, no study was made in real locomotion conditions. This study investigates the impact of different lubricants on chain's friction forces measuring the power output in real locomotion conditions. The effect of three different lubricants on the coefficient of friction (F_c , dimensionless) and mechanical cost (M_c , $J.m^{-1}.kg^{-1}$) were tested using mechanical test and exercise performed with bicycle respectively. Differences between lubes were found in tribological study as some of them have a lower F_c than others. However, no differences were observed for the on-field measurements between the lubricants. This means that the tribological tests do not reflect accurately what occurs in the bike transmission. In order to put a link between the very accurate measures of tribology and the less accurate measures performed on-field, a friction bench device should be envisaged.