

REDUCTION OF ROLLING RESISTANCE BY TYRE-SIZING

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Rolling resistance of tyres and the consequent increase in fuel consumption are of concern in automotive and tyre industries. As rolling resistance directly contributes to high fuel consumption, tyre industry has focused on the development of tyres with low rolling resistance. The objective of the present study is to develop a method to reduce the rolling resistance by tyre-sizing. The basic expression for rolling loss ($R = h \cdot I \cdot d \cdot W/A$) has been modified to express R in terms of tyre diameter and wheel size. These revised expressions indicate that increasing tyre diameter or wheel size can reduce R . These equations form the basis of two tyre-sizing methods: one method is to substitute with next bigger size tyre, having same aspect ratio and wheel diameter. The second method involves selection of bigger wheel size tyre with low aspect ratio but of same tyre diameter. The results showed that by adopting tyre-sizing method, the rolling resistance decreased by about 5 – 8 per cent for passenger tyres and 6 – 12 per cent for truck tyres. This rolling resistance reduction has been explained by applying simple scientific principles. It is concluded that tyre-sizing method reduces rolling loss and thereby improves fuel economy.

Keywords: Fuel saving, Rolling resistance, Tyre sizing.

INTRODUCTION

Improving the fuel efficiency of automobiles is a subject of great importance for the automobile industry because of the increasing oil price and adverse environmental aspects (air pollution and global warming). Tyre industry is focused in developing fuel-efficient, low rolling resistance tyres. It is well known that the tyre rolling resistance has a direct relationship with the fuel consumed by the automobile. Hall and Moreland (2001) showed that about 8 – 18 per cent of total fuel is used for overcoming the tyre rolling resistance of a medium passenger car. Transportation Research Board (2006) published a detailed report on rolling resistance and fuel

consumption. It is established that low rolling resistance improves the automobile mileage with reduction in fuel consumption.

Rolling resistance is one of the important performance properties of tyres. Tyre scientists and engineers have conducted studies on rolling resistance from different perspectives for over three decades. These researchers approached the subject mainly from compounding aspects (Water and Conant, 1974; Lou, 1978), effect of tyre construction (Williams, 1981; Keefe and Koralek, 1983) and finite element analysis approach (Luchini *et al.*, 1983; Warholik *et al.*, 1987). Schuring (1980) and Schuring and Futumura (1990) conducted extensive studies covering all aspects of rolling resistance.

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