

## **Effects of shelf age based on types of approval marking on passenger car tyres' safety performance**

### **ABSTRACT**

Issues surrounding the use of aged tyres are one of the major concerns with regard to vehicle safety. The changes in rubber components due to the ageing process may cause changes in a tyre's mechanical and chemical properties which may lead to road crashes attributed to tyre failure. The main objective of this study is to discover the effects of tyre shelf age and approval markings on the performance of aftermarket passenger car tyres. This study involved conducting accelerated ageing on the randomly purchased tyres. By utilizing the Design of Experiment method, 48 passenger car tyres from four tyre manufacturers were used as test samples representing 'Marked' and 'Non-marked' tyres. Half of the samples were subjected to accelerated ageing process using an accelerated ageing chamber to simulate the desired age, to the maximum of 5-year old shelf aged. All new and aged tyres comprising both 'Marked' and 'Non- marked' groups were then tested under the Tyre Performance Test protocols stipulated in the Malaysian Standard (MS) 149:2008. All of the samples were tested in accordance with MS 149:2008 and the results were compared thoroughly by markings, age and type of failure. The study implied that age did have effects on safety performance of the tyres and significant difference in terms of safety performance was observed between 'Marked' and 'Non-marked' tyres. In overall 'Marked' tyres showed superior performance as compared to 'Non-marked' tyres for all of the tests conducted. The results had also provided crucial reference in terms of suggested age of tyre life span for proactive tyre replacement. The suggested tire life span for proactive tire replacement is 7.2 years-old for 'Marked' tyres and 2.3 years old for 'Non-marked' tyres. Since the Malaysian government has already gazetted the mandatory standard on tyre markings for the local market, relevant authorities need to take responsibility for the effective and efficient enforcement of compliance with the standard.

**Keyword:** Passenger car tyres; Accelerated ageing; Design of experiment; Performance test; Shelf age