

**UNIVERSITI TEKNOLOGI MARA**

**A STUDY ON THE RELATIONSHIP  
BETWEEN HEAT BUILD-UP (HBU)  
AND DYNAMIC MECHANICAL  
ANALYSIS (DMA) IN TRUCK TYRE  
TREAD FORMULATION**

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## ABSTRACT

The purpose of this work is to investigate the association between high temperature build-up and dynamic mechanical analysis in conjunction with dynamic attributes such as tangent delta (damping properties), loss modulus and storage modulus on the industrial rubber compounds containing Natural Rubber (NR) and Styrene Butadiene Rubber (SBR). Two different types of carbon black structures were used, which were N339 and N375 were characterised with respect to their rheological and physical properties. Heat Build-up (HBU) test is a testing procedure which is used to measure the rate of heat generated by the rubber vulcanisates when subjected to repetitive stresses or strain under controlled conditions. Dynamic Mechanical Analysis (DMA) measures the viscoelastic properties of mostly polymer materials during a controlled temperature or frequency program. From the tests that have been done, the results shows that the damping properties which is tangent delta showed the same trend, according to the results of viscoelastic properties of the material, even though different mode of test, different size of sample and different heat distribution. This result also supported by dynamic mechanical analysis and physical test results whereby the usage of low and high carbon black structures that incorporated with NR exhibits lower heat generation compared to NR/SBR blends. It shows that NR with low and high carbon black structures exhibits low heat build-up (surface and intrinsic) with a balance of good traction and low rolling resistance for application in tyre.

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