

**A DUAL FILLER SYSTEM FOR LOW-SPEED
SOLID TYRE BASE COMPOUND**

A dissertation submitted to the
Faculty of Animal Science and Export Agriculture
Uva Wellassa University
in partial fulfilment of the requirements for the award of
Bachelor of Science in Palm & Latex Technology and Value Addition

by

**THAMBAWITAGE DONA ISURIKA KALHARI
GUNASEKARA**

**Palm & Latex Technology and Value Addition Degree
Programme**

Faculty of Animal Science and Export Agriculture

Uva Wellassa University of Sri Lanka

2018

ABSTRACT

The effects of the dual filler system of Carbon Black (CB) and Chopped Tyre Cord (CTC) were investigated on the mechanical properties and cure characteristics of the low-speed solid tyre base compounds made out of Natural Rubber (NR) and Reclaim Rubber (RR). Chopped tyre cord is a cost-effective filling material which is derived from the rejected pneumatic tyres. Thermo Gravimetric Analysis (TGA) was carried out for two CTC grades and the CTC grade having high amount of CB (25%) was selected and used during the study. Compounds were prepared to keep CB to CTC ratios at 65:35, 55:45, 45:55 and 35:65 in parts per hundred parts of rubber (pphr) filler loading levels. Then curing and physico-mechanical properties were investigated according to ISO standards. Mooney viscosity of the compounds was within the accepted levels of 60-85 Mooney Units. Scorch time (T_{s2}) and optimum cure time (T_{c90}) have increased due to the reduction of carbon black content when increasing the CTC content in the compounds. However, it has improved the processing safety of the newly developed base compound. Hardness was within the accepted levels of 87-92 (Shore A) and the tensile strength was greater than 6 MPa. Tear strength and rebound resilience have improved along with the increase of CTC content. Through the Dynamic Mechanical Analysis (DMA) test, the viscoelastic properties were compared between the developed Base compound and the Base compound used in the current production. In conclusion, it is possible to use CTC in Base compounds of low-speed solid tyres as a cost-effective filler at 65 pphr levels with improved properties and low cost compared to the use of CB.

Keywords: Carbon black, Chopped tyre cord, TGA (Thermo Gravimetric Analysis), Physico-mechanical properties, DMA (Dynamic Mechanical Analysis)