

# Automotive Windshield Wiper Blade from Incorporating RSS/Skim Rubber Blend in the EPDM Formulation

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## Abstract

Ethylene-propylene-diene rubber (EPDM) is one of the highly demanded synthetic rubber to manufacture automotive windshield wiper blades. In order to Sulphur vulcanizing of EPDM, powerful synergistic systems are needed to cope with the low level of unsaturation in the EPDM rubber. Blending natural rubber in the form of ribbed smoked sheets (RSS) and skim rubber is an obvious method of taking advantage of the relatively low price of skim rubber whilst minimizing its disadvantages, not least that possible variability. In addition, the vulcanization characteristics of skim rubber better due to presence of higher amount of non-rubber ingredients in skim, which act as co-accelerator activators for the vulcanization reaction. Hence skim rubber is used for increasing the rate of vulcanization of SBR. Similarly, non-rubber ingredients present in skim rubber can act as co-accelerator activators for the vulcanization of EPDM also. Optimum amount of skim rubber that can be used as an additive to improve cure characteristics and physico-mechanical properties of EPDM lies are around 5 phr with TMTD/TBBS accelerator system.

This research was focused to investigate the potential of EPDM/RSS /skim rubber composite to manufacture automobile windshield wiper blades. The used blend ratios of EPDM/RSS /skim rubber composites were 30/70/0, 30/65/5, 30/60/10, 30/55/15, 30/50/20 and 30/45/25 and the composites were prepared according to the ISO 4097-1980 (E) formulation with TMTD/TBBS accelerator system.

Optimum cure time of the composites progressively has decreased from the first composite to the last composite. Torque difference of the composites has increased with the increment of skim rubber content up to 15 phr and after that it has decreased. However, scorch safety has gradually increased when increasing the skim rubber quantity of the composite. Cure characteristics after 30/55/15 ratio implies the decrement of crosslink density of the composites due to decreasing the number of cross linking sites in the composites. Highest hardness value (61 IRHD) and the lowest compression set % (27) was also obtained with the 30/55/15 composite. The overall results of this study shows that even though the amount of non-rubber ingredients increases with the increment of skim rubber, the number of cross linking sites available for the Sulphur vulcanization has been decreased. This research study concludes EPDM/RSS/skim rubber composite of 30/55/15 ratio can be used to manufacture automotive windshield wiper blades.

**Keywords:** EPDM/RSS /skim rubber composite, Cure characteristics, Physico-chemical properties