

**AN INVESTIGATION OF MAJOR CAUSES AND EFFECTS TO MITIGATE  
THE CHAFER OPENING ISSUE IN BIAS PLY PNEUMATIC TYRE  
MANUFACTURING PROCESS**

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## ABSTRACT

The chafer opening is an issue in semi-automated processes of pneumatic tyre manufacturing carried out by assembling of several semi-products manually according to a pre-defined sequence on tyre building machines. Chafers are rubberized fabric cord strips used to wrap around the bead at the final stage of tyre building. Main functions of the chafers are to protect the bead area from abrasive wearing due to forces applied on tyres while running. Detachment of chafers from the carcass bead area is a major issue; called chafer opening which causes defects in cured tyres. Root causes for this issue were identified by Ishikawa diagram developed using observations on the process and interviewing ten expertise. Therefore, mitigation of chafer opening issue by manipulating the compound viscosity towards tack of rubber in compounds used for chafers and use of alternative adhesive is advantageous. Viscosity and tack of rubber compounds were studied using Mooney viscosity and peeling test respectively. Mooney viscosity of the chafer compounds was laid in between 27-33 Mooney units; however, Mooney viscosity was decreased further with increasing the milling time up to 240 seconds on two-roll-mill which indicates higher tack force up to 0.600N. Application of an adhesive using high octane petroleum and phenolic tackifying resin mixture as an adhesive to hold chafer and carcass was studied as an alternative to improve the tack. Results of peeling test revealed that more than 400% increase in tack with the use of 1:0.05 ratio of high octane petroleum and phenolic tackifying resin mixture. Finally, chafer opening issue could be mitigated by reducing the viscosity of compounds and use of an effective adhesive to improve the bonding between chafer and carcass while increasing quality of the tyre carcass.

Keywords: chafer, pneumatic tyre, tackifying resin, tack of rubber, viscosity