

Thesis Title A Study of the Toughness of Rigid PVC Filled
with Recycled Vulcanised Elastomer Dust

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ABSTRACT

This study utilized vulcanised elastomer dust as an impact modifier in polyvinyl chloride (PVC) compound. Three types of waste dust are generated during sports shoe soles manufacture:- midsole waste (scrap dust of vulcanised EVA foam), outsole waste (scrap dust of a vulcanised blend of NR, SBR and BR), and laminate waste from the assembled sole (a laminate of the midsole and outsole).

The use of these dusts eliminates the need for the size reduction processes which is usually employed in rubber recycling. Blending with waste dust provides advantages both from the point of disposal of waste and the reduction in the product cost.

The toughness of PVC compounds was evaluated using Charpy notched impact testing. Differential scanning calorimetry (DSC) was used to assess the fusion level of PVC. The morphology of PVC modified with vulcanised elastomer dust was studied utilizing optical microscopy. The particle size distribution of dusts before and after

processing were measured from photomicrographs. To promote adhesion between the phases of PVC and dusts, the dusts which were used as soft fillers were treated with silane and zirconate coupling agents. The effect of dust type, level of loading, sieving, and dust particle size on the impact strength of the PVC compounds were investigated.

The results obtained indicated that the PVC compound filled with 10% midsole dust (M10) showed an optimum fusion level of approximately 40% where the impact strength was 5.5 kJ/m^2 compared to a base line value of 3 kJ/m^2 for unmodified PVC. The impact behaviour was dependent on dust type and level of dust loading. Sieving the laminate scrap dust prior to mixing did not improve the dispersion level or impact strength. The 20% and 25% loadings of midsole scrap dust in PVC gave superior impact strengths at a lower cost than a 5% addition of a commercial ABS impact modifier.