

RECYCLING OF RUBBER CHIPS INTO COMPOSITE
ELASTOMERS

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ABSTRACT

This research work focused on standardizing and optimizing the current local methods of recycling tread tyre chips that are generated as waste in re-treading industries. Existing factory processing methods, such as used in wheelbarrow tyre and car mat production were analysed and their shortcomings highlighted. These shortcomings were used as improvement areas in the research. Physical properties such as size and weight of various samples of scrap chips from different re-treading companies were compared and a grading code generated using meshes. The graded chips were surface treated with potassium permanganate to generate hydroxyl groups on the rubber surface, in order to facilitate a reaction with virgin natural rubber (NR). Various chips/NR volume ratios were prepared, processed and cured using conventional industrial procedures. The mechanical properties of the samples, such as tensile strength, hardness, elongation at break (%), resilience (%) and abrasion resistance were tested and compared with those of specimens prepared using existing manufacturing methods. Blend cost analysis and mechanical properties optimization are among the areas that were given extra emphasis due to their importance in this research. New formulations were generated to produce superior products that will create a new market for this plastic pollutant thereby reversing the effect it has on the environment.

The results showed that tread particle size form the fundamental basis for the control of most mechanical properties(toughness, elongation and abrasion) of recycled rubber vulcanizates. For a natural rubber based formulation such as used in wheelbarrow tyre manufacture, the tread buffings were found to be

good extenders of natural rubber while still imparting moderate improvements on the mechanical properties. Also, the buffings were found to improve the tensile properties of virgin NR vulcanizates through blend aging