Dynamic Mechanical Thermal Analysis (DMTA) was used to assess filler-rubber interactions in terms of storage modulus ($E'$), loss tangent ($\tan\delta$), and the variation of glass transition temperature. Two fillers including carbon black and ground flexible polyester polyurethane (PU) foam particles of average size 200 µm were introduced into the natural rubber vulcanisates. It was found that a satisfactory reinforcing level [when comparing with carbon-black-filled natural rubber compounds which showed optimum properties at 60 parts per hundred (pph) rubber, in the dynamic mechanical properties of the rubber compounds] was achieved when adding the PU particle filler at 20 pph. In addition, the effect of the curing system, such as sulfur and peroxide, on the dynamic mechanical properties and cure times, including morphology of fractured surfaces, are discussed.