The dynamic mechanical properties of rubber vulcanisates filled with cryogenically pulverized polyurethane foam particles, used as a reinforcing filler, were investigated with respect to storage modulus ($E'$), loss modulus, and the variation of glass transition temperature. Two rubbers were using styrene-butadiene rubber (SBR) and ethylene–propylene copolymer (EPDM). The effects of filler concentration and filler characteristics (such as particle size and moisture content) were also monitored. It was found that the optimum dynamic mechanical properties of the compounds were obtained when introducing the PU particles of 40–50 parts per hundred (pph) rubber in the SBR and 30 pph in the EPDM, the properties being affected by the size of PU particles and moisture content.