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Influence Of Filler on Asphalt Dispersions with Recycled Tire Rubber for Hot Asphalt Mix

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Abstract

Mineral filler additions change the rheological behavior of the asphalt binder, which has a big impact on the properties of asphalt mixtures like rutting resistance, fatigue resistance, and thermal susceptibility. There is currently no specification in Argentina that specifies the ideal filler content to be added to hot asphalts modified with recycled tire rubber (RTR). In the current study, an analysis of the behavior of asphalt dispersions with varying amounts of RTR—from 15% to 25% of the binder weight—is done when mineral filler is incorporated in various concentrations. By measuring how the dispersion reacts to the softening point test and temperature sweep using a dynamic shear rehometer (DSR), it aims to establish a standard for the ideal amount of filler to incorporate and show how the RTR residue and filler work together to produce the desired results. The amount of rutting resistance offered by the asphalt has been found to increase by up to 200 percent when measured with DSR for the highest contents of RTR and filler.

Keywords*:* Filler, RTR, Rheology, Hot asphalt mix

INTRODUCTION

The most common problems in asphalt pavements are rutting, fatigue failure, and thermal susceptibility, which arise because of incorrect dosages and/or forms of placement, mixing, and compaction of asphalt mixtures. Hot mix asphalt is composed of a combination of different materials, such as asphalt, either conventional or modified, together with aggregates and filler [1].

Its properties depend on the relative concentrations, by volume, of its components. These proportions are calculated during the design of the mixes to obtain a quality asphalt pavement suitable for its life in service. The service requirements that must be considered when designing an asphalt mix are durability, slip resistance, flexibility, stability, and compatibility. The quality of an asphalt pavement is directly related to its properties of flexibility, stability, and durability [2]. Generally, when a mix has more flexibility, its stability decreases. Over the years, in the design of asphalt mixes, it has been decided to increase stability at the expense of flexibility using mineral filler. Therefore, it is necessary to establish criteria to add mineral fillers to conventional asphalt mixes without excessively affecting either of these two properties. This criterion, developed by Ruiz (1960) [3],[4], is based on considering that dense mixes are made up of a granular skeleton of compacted coarse and fine aggregates, whose voids are partially filled by the dispersion of the filler in the asphalt. The incorporation of mineral filler modifies the relationship between stresses and strains, considering the constant time of load application and temperature.

It was shown that there is a relationship between the volume of filler and the volume of the asphalt-filler system, for which the addition of filler increases the resistance to