RAP: Save Today, Pay Later?

ABSTRACT

In recent years, there has been a significant increase in the use of RAP for the construction and rehabilitation of flexible pavement structures. There are many advantages that are associated with the use of RAP, including economic benefits due to the reduction in virgin asphalt binder and new aggregates required, environmental benefits associated with the use of a recycled material, significant energy savings, and short-term performance benefits due to increased rutting resistance. However, field observations have raised some concerns in terms of the long-term performance of mixtures containing RAP compared to those of virgin mixes.

In order to address these concerns, the authors used data from FHWA’s LTPP SPS-5 experiment in Texas to quantify and compare the field performance of pavement sections containing RAP with those of those that do not contain RAP. Based on the SPS-5 data, simple performance models were developed for rutting and cracking of the pavement structure. The models are then used to statistically quantify the effect of RAP on each type of distress and to estimate the expected pavement life of a given overlay, with and without RAP. As expected, the results indicate that there is a significant gain in rutting resistance when using RAP. However, pavements containing RAP develop cracking earlier, and at a faster rate, so short-term savings may be offset by additional overlays later in the life of the pavement. This raised the following concern: are we saving today to pay later?

The main objectives of this paper are: i) to make pavement designers aware that RAP may not be always the most economical solution, and that ii) life-cycle cost analysis (LCCA) is imperative to assess the real benefits and costs of the various alternatives.

Based on the simple performance models developed, a basic LCCA analysis was performed in order to compare the economic advantages or shortcomings of using RAP in the HMA mix. The interim results indicate that, under particular scenarios, the use of RAP might not be the most economic choice. Where and how much RAP should be used should be determined through a case-by-case analysis. In order to do this, accurate field performance data are necessary. While LTPP may provide some initial data, RAP technology has evolved since the inception of LTPP and the use of fractionated RAP is more prevalent now. Therefore, LTPP needs to be updated and new data sources may be needed.

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