

Rejuvenation of Hot Mix Asphalt Incorporating High RAP Content: Issues to Consider

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Abstract: The asphalt used to construct or rehabilitation roads often contains reclaimed asphalt pavement (RAP) in order to diminish not only the use of raw materials but also waste. However, when high level of RAP in hot mix asphalt (HMA) is used, the rejuvenating agents must be employed. A number of aspects must be taken into account to increase pavement service life as much as possible. Thus, the main issues related to the rejuvenation of asphalt mixtures with high levels of RAP are addressed in this paper. In particular, the focal points of this paper will focus on the use of reclaimed asphalt mixtures with maximum efficiency, special attention is paid to how the binder is structured and chemically composes, nature and dose selection of rejuvenator, as well as the diffusion, blending efficiency, homogeneity, time and temperature mixing. A review of the extant and related literature shows that RAP utilization holds promise for the sustainable pavements, provided that some issues were taken into consideration during the designing and application process.

1. Introduction

The first documented case of RAP utilization in constructing new asphalt roads dates back to 1915 [1]. However, it was not until the 1970s and the Arab oil embargo, during which the energy crisis triggered a substantial increase in asphalt binder prices, that RAP applications became widespread [2-3]. Noteworthy, RAP utilization has increasingly been playing a prominent role over the past 20 years. Asphalt binder plays an indispensable role in asphaltic paving mixtures, as well as the degree to which these mixtures perform as required when applied in the form of pavements. The importance of asphalt binder is reflected in the fact that over 110 million tonnes of the material are used annually, while enormous sums of money are allocated to asphalt pavement construction, rejuvenation, and maintenance [4]. When a pavement's service life has elapsed, reclaiming aggregate and binder through recycling initiatives is worthwhile for several reasons [5], most notably due to economic and environmental advantages. In fact, there is no consensus in specifications available regarding the percentages of RAP that can be used in asphaltic mixtures. RAP are complex materials, and the literatures indicate that the manner in which RAP is utilized is informed by the degree to which the material is homogenous [6]. Although 100% HMA recycling was not uncommon throughout the 1970s [7], RAP percentages used in the materials was lower than 25% in the past decades [8-9] due to the considerations related to the durability. Additionally, since the emergence of Superior Performing Asphalt Pavements, RAP levels



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