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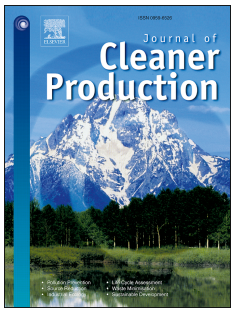

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A review on moisture damages of hot and warm mix asphalt and related investigations

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Abstract

Moisture damage has been reported as one of the main forms of distress in asphalt mixtures since the 1900s. The bond between asphalt aggregate constituents fails in the presence of water interacting at the interface, resulting in the stripping of binder from the aggregate surface and cohesive failure within the asphalt binder. This paper reviews various techniques and investigations for assessing the moisture damage and aims to optimize the standard testing protocols. The introduction of new in-situ testing techniques and material selection criteria is required to address the moisture susceptibility of asphalt mixtures. These efforts can improve the field assessment of moisture damage that appears during the design life of an asphalt pavement and bridge the gap between field and laboratory investigations.

Keywords: Surface free energy, Adhesion failure, Moisture damage, In-situ test, Warm mix asphalt

1. Introduction

Moisture damage in asphalt mixtures has remained a topic of debate among investigators for many years. Moisture shortens the service life of asphalt mixtures, resulting in failures such as alligator cracking, ravelling, potholing and rutting (Liddle and Choi, 2007). There are three major areas of research in asphalt moisture damage: field investigations, laboratory experiments and analytical studies. Initially, most research was limited to field observations. Later, laboratory-based testing methods combined with field investigations were developed (Mehrara and Khodaii, 2013). The laboratory approach was based mostly on the development of techniques for simulating the field conditions accurately rather than conducting a fundamental assessment of asphalt moisture damage. In contrast, analytical methods based on surface free energy (SFE) evaluation are used to characterize the fundamental properties of aggregate and binder as related to moisture damage resistance (Howson et al., 2009). This fundamental evaluation can yield input criteria for material selection and design for preventing moisture damage in the field. New in-situ testing techniques can assess the expected failures in