

Simulation of Compaction in Asphaltic Mixtures, Part I: Gyrotory Compactor

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Abstract

A very important phase in construction of a pavement structure is the compaction process of the asphaltic mixture. It reflects a complex mechanism where many parameters are influential. These parameters are associated with the initial air voids content in the asphaltic mixture, aggregate gradation and angularity, asphalt binder content and its viscosity, asphaltic mixture layer thickness, compaction pattern, equipment and temperature cooling rate. In general, the pavement constructors perform the most of their decision making and planning process according to their engineering judgment and monitoring of field data. Although these methods are well accepted by the road industry, still the availability of a reliable software tool to simulate the mechanical behavior of the asphaltic mixtures during compaction and foreseeing the optimum compaction pattern is highly demanded. In this work, a compaction model for asphaltic materials is developed using the finite element software package COMSOL Multiphysics® where it receives the input parameters such as initial air void and temperature dependent properties of granular structure bounded by asphalt binder and utilizes the Structural Mechanics Module and Heat Transfer Module within a time dependent analysis to simulate the compaction process of asphaltic mixtures by gyrotory compaction.