

Khaled Anwar Kandil

Thesis

Analytical and Experimental Study of Field Compaction of Asphalt Mixes

Abstract

Compaction of asphalt concrete mixtures is a very complex process. A wide range of factors affect this process. Considerable research work has been carried out to investigate the effects of these factors on the compaction quality. Although the results of these studies have led to improving the quality of the compacted asphalt layers, the information gained can be regarded as general guidelines. Most of the obtained information is based on studies that were carried out to investigate the effect of specific factor(s) on the degree of compaction under a given set of conditions that may not be encountered in many practical projects. Thus, an accurate modeling of the compaction process would greatly enhance the compaction process and lead to improved final product. The research work presented in this thesis started with identifying the limitations associated with field compaction of asphalt mixes and establishing the need to develop a scientific framework for asphalt compaction in the field. The next step aimed at understanding the mix behaviour during compaction through a review of different behaviour of the engineering materials and the ingredient characterizes of the asphalt mix. The following step focused on the design of a simple test procedure to determine the studied behaviour. Subsequently, a commercial paving project was selected to investigate the important compaction variables under actual field conditions. Thus, the mix behaviour was evaluated and compared under both field and laboratory conditions. The results of both laboratory and field-testing were used to develop two compaction models. The developed models considered the significant variables affecting the compaction. The models can be used to evaluate the compaction quality as a function of one or a combination of the input variables. The first model was developed based on correlating the results obtained from the laboratory testing to those monitored in the field. The second model involved using an existing computer software that allows using the output results of the suggested test procedure to represent the characteristics of the asphalt mixes under compaction conditions. This model has the extra advantage of modeling the asphalt multi-layer structure, including the effect of the underlying supporting layers.

Degree

Ph.D.

Completion

2002

Supervisors

Abd El Halim, Easa