

In the last few decades pavement engineering, especially in the field of asphalt mixtures has performed major steps ahead in terms of implementing new materials and technologies or targeting a more sustainable and material effective pavement design progressing. Modern asphalt multilayer systems are much more long lasting structures reflecting the ongoing increase in either traffic intensity or traffic load.

Since asphalt mixtures are based on the use of bituminous binders which are a complex organic viscoelastic and time-temperature dependent material, they naturally tend to change their performance. Their properties and some of the testing methods are well known and studied for decades. Nevertheless, there is so far very limited knowledge about fatigue relations especially if both, bitumen and asphalt mix composite, are assessed on fatigue in aged conditions.

In terms of determining the fatigue phenomenon both in bitumen and asphalt mixture level, the most critical aspect is time severity of the tests and the necessity to perform such advanced testing on large number of test specimens. If further focusing on understanding the fatigue performance of virgin asphalt mix composite (as required so far in pavement engineering) and of aged asphalt mixtures, the required effort to reach adequate results is huge. This problem could be partially reduced by determining bitumen fatigue parameters and evaluating only basic asphalt mix characteristics and using advanced predictive models based on artificial neural network method for asphalt mix fatigue behaviour assessment.

In order to reduce the need of continuous repetition of laboratory tests and even in situ monitoring of the pavement, in the project modelling tools and consequently predictive tools of the asphalt mix performance will be a subject of development. Since the asphalt mix is a complex material and it's performance is related to many factors more advanced modelling techniques are needed for introduction of reliable simulations or model-based robust predictive tools.

Artificial Neural Networks (ANN) will be involved in pavement engineering and road materials science to predict asphalt mix performance and avoid costly equipment, laboratory tests and consequently save time.

The aims of this study are definition and validation of neural network based predictive model for fatigue-life of asphalt mix based on bitumen fatigue and empirical characteristics of asphalt mix. Moreover it is assumed to provide easy to use and quick prediction tools of parameters that could indicate the performance of the mix before using tests in laboratory.