Abstract

The batch mixing problem determines the proportion in which different aggregate batches are to be blended so as to achieve a mix with a given gradation. Each aggregate batch has its own gradation. Since these batches are either obtained from stone quarries or from older pavements, the gradation of an aggregate batch is not homogeneous. So, when the gradation of a batch is determined through sampling process, the gradations values of these samples are not same. Hence, it is better to assume the gradations of batches as stochastic quantities. Also when large quantities of batches are blended, masses of the batches in the mix deviate from their specified values. That is, there are variations in the masses/proportions of individual batches in the mix. Hence, the masses/proportions of individual batches in the mix should be considered stochastic. Assuming the gradations of batches and/or the mixing masses/proportions as stochastic causes many relevant computed parameters to also become stochastic. For instance, the mix obtained from mixing different batches achieves the given gradation with a probability known as the reliability of the mix. In this thesis, an attempt has been made to develop the expression which represents the reliability of a mix.

In addition to achieving the given gradation, the mix is also required to satisfy various other restrictions. Budgetary restrictions require that the cost of the mix lies within certain limits. Also, field engineers often specify that certain batches, such as fine aggregates, should have a minimum proportions in the mix. It is also important to consider the fact that certain aggregate batches that are to be blended can have limited availability. The batch mixing problem should incorporate all these factors while determining the mixing masses/proportions of the batches to be blended. In this thesis, optimization formulations have been developed that incorporate the mentioned requirements of the batch mixing problem.

Keywords: Batch mixing, Optimum batch mix, Reliable batch mixing, Quantity limits