

## **Life Cycle Cost Analysis of Asphalt Pavement in Thailand**

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### **ABSTRACT**

Asphalt pavement is dominating pavement type of the road network in Thailand. These pavements require routine and periodic maintenance regularly depending on traffic loads and construction quality. The Life Cycle Cost (LCC) is an important method to estimate required future maintenance needs and to help making decision effectively. This article presents the result of life cycle cost analysis including construction and maintenance works of one hundred highways representing five pavement standard classes of the Department of Highways. It is found that the highways in lower pavement standard classes have higher variation of life cycle costs comparing to the highways in higher pavement standard classes. In addition, the highways in higher pavement standard class tend to have less life cycle cost though they have supported much higher traffic loads. This result can help identify the need for maintenance work of the whole pavement's life cycle and also plan for budget allocation properly.

### **INTRODUCTION**

Around 82% of transportation and logistics in Thailand rely on highway and road network (Office of Transport and Traffic Policy and Planning, 2012). More than 90% of the highway network is asphalt pavement (Department of Highways, 2012). Based on the Department of Highways (DOH)'s design standard, there are five classes of pavement standard depending on forecasted traffic volume. Since there are differences in traffic volume and design parameters, especially in pavement structure, the deterioration and required maintenance works are also different. Therefore, there is necessary to estimate the budget needed for proper highway maintenance in order to maintain highway in satisfied service level.

Life cycle cost analysis (LCCA) is a key part of a rational method for budget planning, and has been widely implemented on highway construction planning (NCHRP, 2011). The LCCA is an engineering economic analysis, which systematically compiles all operation costs of each alternative during a specific period of time (Cole, 1997). The LCCA should be applied since the planning stage, before starting the construction process. However, previous research shows that the actual and the estimated costs can be significantly different (Chan, 2008). Key influential factors that affect pavement deterioration are the traffic volume, especially because of heavy trucks, and pavement type. As a result, the maintenance work would relate to the traffic volume and pavement type. The objectives of this research are, therefore, to analyze the highway maintenance costs associated with asphalt pavement type, and quantify the relationship between life cycle cost and traffic load, using the historical data from the DOH. The ultimate goal is to help analyze the necessary level of maintenance cost of the whole pavement life cycle. As a result, the budget can be planned and allocated effectively.

### **DATA COLLECTION**

This research uses historical data from the DOH. Since the analysis focuses on life cycle costs, the selected routes should have been in service for at least 15 years. Only routes which have complete historical data of construction, maintenance, and rehabilitation activities, as well as traffic volume during 1996 to 2011 are selected. In addition, the selected study routes must not be reconstructed, widened or damaged by natural disaster during the analysis period. The total number of selected routes for this analysis that met the criteria is 100 routes, which can be classified by pavement standard class as shown in Table 1.

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