

■ 博士學位論文紹介 ■

논문 제목 : 수명주기비용분석기법을 적용한 교량유지관리 방안에 관한 연구
 (Developing Bridge Maintenance Policy Using Life-Cycle Cost Analysis)
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The Life-Cycle Cost(LCC) method has been popular among developed nations since 1980's as one of the analysis tools for decision-making. The underlying concept for LCC method is that structures such as buildings and bridges should be constructed and managed to minimize the total cost based on life-span of structures.

After the Korean government adopted "Enforcement Ordinance of Construction Technology Management Act" in 2000, construction industry should adopt the LCC method to relatively large construction projects. According to the Article 38-13 in the Act, it is mandated that construction projects valued 50 billion won or more are reviewed on the basis of LCC perspectives. However, there are a lot of challenges to be addressed for implementing LCC concept into practice successfully.

This study aims to conduct actual LCC estimations for the randomly sampled 60 bridges in Korea, to estimate economic benefits due to preventive maintenance of the bridges, and to suggest policy implications for successful implementation of LCC analysis.

In the advanced nations, the structural safety and maintenance scheme has been well established under the government's supervision, and the practice is systematically organized and implemented by

the agencies in charge. Also the structure maintenance system was developed using the LCC technique, thereby, preventive safety and maintenance system has been built over structure's entire life cycle.

Such system will eventually result in the enhanced safety so that the use of structure can be promoted as well as reducing the financial burden to the national economy by extending the life of a structure. Therefore, to achieve the goal of optimizing the investment at national level, while sustaining the improved structure safety and maintenance, the nationwide structure safety and maintenance scheme should be established. And the safety and maintenance system based on the LCC technique should be built.

In this study LCC analysis was conducted to each of the 60 bridges with the recommendation on appropriate maintenance level considering the potential economic benefit. The analysis results are summarized as follows:

- 1) The LCC of both current and preventive maintenance levels on each type of bridge were estimated and compared to each other. Results show that the economic benefit can be expected when a preventive maintenance system is adopted.
- 2) When the LCC concept is introduced to the

maintenance of the bridges on national expressway, national highway and special great city road, economic gains can be generated as much as 17 trillion won by 2050 and 21.4 trillion won by 2100 including user's cost. Considering the economic benefits, LCC analysis, when successfully introduced, can contribute to identifying tremendous social and economic impact in a positive way to a nation.

LCC analysis will become a new paradigm in Korea as a basic tool in decision making process over the entire stages in construction project, including planning, designing, construction, and maintenance. Korean market, however, has yet to recognize the need for adopting the LCC analysis technique, and to be matured enough to accommodate it.

For the bridge structure, unlike other civil or architectural structures, it is necessary to improve the cost function models of LCC, and to complete the standardization of the models to forecast the user's cost. Particularly, the user's expected loss and regional economic loss in the event of repair

or rehabilitation works should be considered as an indirect cost loss. Also, the basic statistical data needed to estimate the variables in cost function and/or the techniques required to predict uncertainties of the variables need further study.

Another challenge is to set up a model to forecast the expected loss caused by the damage due to the excessive loads and/or natural disasters such as typhoon, earthquake and flooding. Thus, to introduce LCC analysis in practice, development of relevant technology should be sustained as well.

Given the fact that a variety of structures are maintained by many different agencies in Korea, the priority shall be placed on the in-depth research and development of LCC technique. More specifically, standardized LCC analysis procedure, software, and data base system should be developed. The outcome of LCC analysis will contribute to establishing a safety and maintenance scheme and to estimating the standard life span of major structures. The level of nation's safety and maintenance system can be upgraded through developing and making use of a standard maintenance criteria.