Integrated Asset Management Tool for Highway Infrastructure

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Summary

To enable proper and long-term maintenance planning for a huge and heterogeneous set of engineering structures (bridges, culverts, noise barriers, gantries) the authors developed an integrated life cycle management tool that offers tailored solutions with regard to the given location, involved materials, fabricates and the underlying design code at the time of construction. The core of this tool is formed by a probabilistic ageing model and a comprehensive cost model. Each structural member is represented by a generic ageing function, which is derived from the major sources of information reflecting impact on structural ageing (visual inspection/ numerical simulation/structural monitoring and freight traffic progression). Furthermore the model incorporates VCE's 50 years of experience in the field of bridge inspections and structural health monitoring. Due to defined treatment-trigger-criteria a huge set of maintenance strategies is generated leading to an extensive optimization exercise. The final project output is composed by tailored maintenance plans for every structure.

Keywords: Remaining Lifetime, Decision Tools, Maintenance Strategies, Optimization.

1. Introduction

A considerable shift in state-of-the-art policy for structural maintenance has been observed in the recent past. Major aspects like

- Network level analysis (instead of single structure maintenance)
- Cross-asset maintenance
- and long-term scheduling instead of short term planning

represent a substantially broadened demand from infrastructure owners & operators.

The authors describe a development that incorporates these new key aspects into an integrated software solution - composed in a modular manner and enabling periodic modification, changes or improvements.

The paper presents a system for estimating the remaining lifetime of engineering structures in the course of roadways, analysing the structural design, processing the data of visual inspections and structural monitoring campaigns. The system also predicts the performance of structures depending on the strategies adopted for maintenance and repair. The methodology implemented in the system is based on the statistical analysis of a large database of structures, and consequently its response is realistic and empirically well-founded.

Parts of an existing highway network, that has already been analysed in the course of a comprehensive reference project (see [1]) served as a valuable basis throughout the entire development work (determination of proper algorithms, software programing, testing) of the presented asset management tool.

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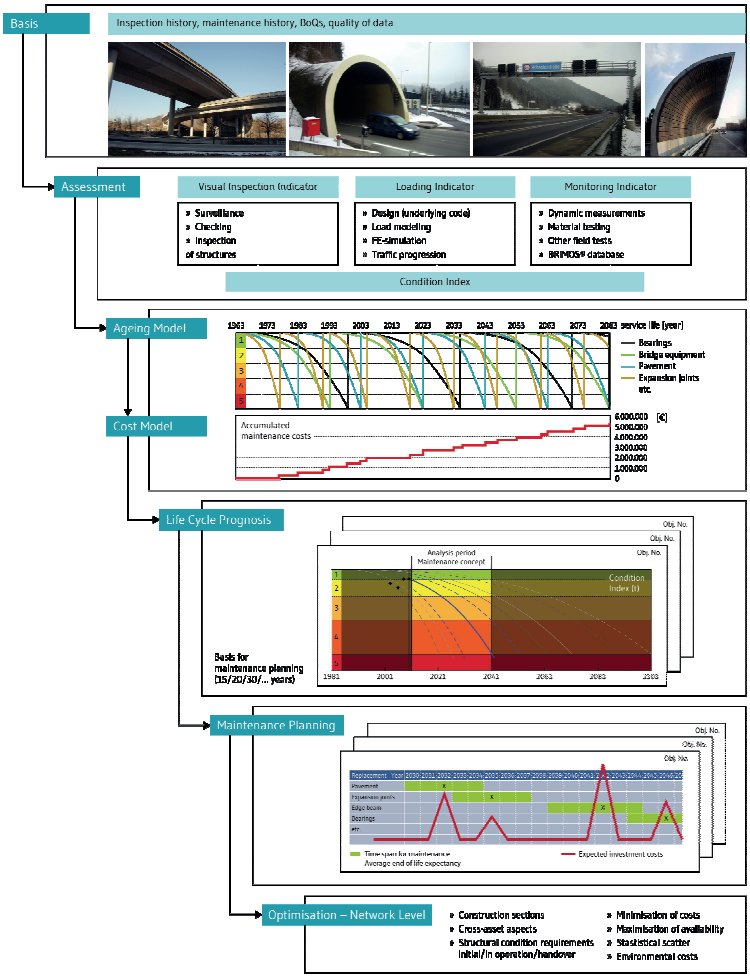

Fig. 1: Process scheme – from stock information to maintenance planning

1.1 References

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[3] prCWA 63:2012 (E): *Ageing behaviour of Structural Components with regard to Integrated Lifetime Assessment and subsequent Asset Management of Constructed Facilities*, CEN Enquiry (TC), ON Secretariat, June 2012