



Maintenance strategy assessment on structures – integrating policy, risks and functionality

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Summary

Asset owners of civil structures are wrestling with several issues, such as upcoming high replacement costs, trajectory programming, degree of compliancy to laws and regulations and organizational objectives. In order to support the asset owners with these issues, a multi-criteria analysis on a strategic level is developed. The multi-criteria assessment is based on a qualitative questionnaire. Considering scenarios on net present value of technical and social costs also helps in the decision making.

A new system is introduced with its goals, history and developments and deployment options.

Keywords: Strategic objectives, asset management, assessment, multi-criteria analysis, bearing capacity, RAMS- aspects, risk management,

1. Introduction

Many structures in the Netherlands were designed and constructed in the period 1930 – 1970 as part of the construction of the Dutch highway and regional road networks. Therefore, many structures have risks regarding load bearing capacity and have to be strengthened or reconstructed.

The main road network plays a vital role in the economic development of the Netherlands. Failing of these structures in the network has an immediate consequence for the service level that the Asset owner can provide to road users. Choosing the correct maintenance treatments and timing of repair / reconstruction is important. The budgets available are limited therefore choices have to be made in assigning funds. Depending on size of the project, procedures are more detailed (quantitative analysis) or more abstract (qualitative assessment). An important step in the process is reflecting on applicable policy and strategy of the asset owner and manager. The Asset Decision Support System (ADSS or “BVK” in Dutch) supports the selection process by illustrating in a simple ‘dashboard-function’ priorities and definition of projects. The ADSS is also usable in evaluation of developments over the infrastructure network.

2. Situation

High replacement costs

In the long-term, it is unclear if replacements with related high replacement costs are needed on a large scale. In order to assess the financial risks it is important to have an early and transparent overview of the financial consequences of replacements, the rate of predictability of the replacement and the belonging costs.

Trajectory programming

For trajectory programming, can one predict early replacements or maintenance on a large scale? Besides the technical status, the functional status should be taken into account.

Compliance

Objects which are insufficiently compliant to maintenance policy and laws and regulations
Asset management organizations are lacking tools to act on a strategic and tactical way.

1. To give substantiated considerations about future replacements of objects;
2. To give an instrument to benchmark the progress of the implementation of (new) policy and objectives.

Quality management

From the bases of quality management, PAS 55 or NEN-ISO 55000 asset owners have the need for status overview in the organizational development of their maintenance organization. The Netherlands has a lot of infrastructure for navigation and therefore a great amount of intersections with road traffic. There are many bridges which need to be managed. Depending on the maturity of the asset management organization, the assets are managed in an operational, tactical and strategic way in order to grow in the organizational professionalism.

3. Methodology

The core of the model is to assess an object with an in advance formulated set of assessment questions. This questionnaire has predetermined choices. Each answer will contribute and substantiate a change for replacement or maintenance. The weighed sum of the scores for replacement divided by the weighed sum for maintenance gives the figure for replacement ($R_{\text{replacement}}$). The set of questions are based on a large amount of sets of program requirements for the building of bridges. The analysis on these programs led to aspects, such as durability, availability, safety, functionality and maintainability and technical status.

4. Solutions

ADSS offer solutions for several issues

1. Risk assessment process and options for quantitative and qualitative analysis
2. Using NEN-2767 condition survey in respect to the technical inspections for the definition and prioritization of projects.
3. Functional inspection as part of the 'third' (mostly forgotten) parameter in definition and prioritization of projects.
4. The application of the ADSS or "BVK" as part of the prioritization and project selection process.
5. Registering bearing capacity
6. Assessment of effect of maintenance works on direct physical objects in the vicinity of the asset as well as stakeholders such as road users.
7. Support on decision for replacements.