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Autor: Molnar, Istvan / Lubloy, Laszlo / Bako, Andras
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The Hungarian Bridge Management System

Istvan MOLNAR
M.Sc. Civil Engineer
State Company for Public
Szekesfehervar, Hungary

Laszlo LUBLOY
Professor
Szechenyi Istvan College
Gyor, Hungary

Andras BAKO
Professor
Technical College of
Budapest, Hungary

Abstract

In the years past new period opened in Hungary not only in the politic, society and economy, but also in the bridge management. To support the development of the market economy and to improve the internal and international traffic the road directorate should make an effort to ensure the costs (with domestic and foreign resources), politicians should be convinced of the efficiency of bridge projects. In Hungary several elements of the bridge management have appeared in the past decades (e.g. bridge database, bridge inspection). This study summarizes the results and draws up the further steps.

The efficient management of the traffic infrastructure in any country can be performed exclusively by using a scientifically based up-to-date management system. The bridge maintenance, improvement and rehabilitation demands also in Hungary exceed the available financial sources. The Hungarian Transportation, Communication and Water Mangagement recognized this fact and has made efforts to implement and operate a Bridge Management System. Bridges are complex structures, the materials of bridges are very sensitive for environmental effects (e.g. air pollution, deicing systems). Bridges are the most dangerous parts of road network, according to growing of traffic (both number of vehicles and load axle). Simultaneously, failure of bridges cause a serious economical disadvantages for road users. Repairs or replacements need a lot of society expenditures. For the solve this complex technical-economical optimalization task (and the analysis of possible alternatives) more and more country apply Bridge Management Systems.

The basis of all kinds of maintenance and improvement work is the bridge registration and inspection. The computer based bridge registration was introduced in Hungary in 1965. In the 1980's the National Road Databank was established, which put the data of the bridges on record. The other base of the bridge management is the bridge inspection, which should be done by a bridge engineer on every bridges at least once a year according to the Hungarian rules since 1956.

The main decisions, steps in the introducement of the Hungarian BMS were made in the 1990's, and there were 2 programmes:

- a Middle-Term Bridge Maintenance and Improvement Program for the Years 1992-2000;
- implementation of the PONTIS Bridge Management System (network optimalization system for bridge improvements and maintenance, Pontis is an outgrowth of Federal Highway Administration Demonstration Project 71, USA).

The main aims of the Middle-Term Bridge Maintenance and Improvement Program for the Years 1992-2000 were the followings:

- the state characterization must be unified and must be as objective as possible;
- in spite of limited funds the program has to give exact results for the decision-makers.

The bridge network was inspected in detail (condition state, needed action with quantity) referred to 1272 bridges.

The data about the bridges were analysed as follows:
- condition-analysis and expense analysis of the bridges;
- changable parameter ranking of the bridge to maintain.

During the processing of the condition analysis we had the following experiences: we can say - taking into consideration the comparison of the condition-qualification and the age of the bridge - that according to the operating policy of the last years, the deterioration of the surface and substructure is 40-50 years, the bridge deck and accessories are 20-25 years and the environment is 10-15 years, after passing the mentioned years it stagnates at the same level. The stagnation of the qualifying numbers certificates the right of the 'steady state' of the PONTIS.

The Hungarian Bridge Management Task Group dealing with Hungarian BMS suggested in 1994 to introduce the American PONTIS-system (developed by the Federal Highway Administration). Utilizing the flexibility of the original system we developed a bridge element system which depends on structural function and material and is guided by the Hungarian features. We determined the definitions of the elements' condition states, the feasible actions and the costs of each actions. We named the system converted into the Hungarian features - as distinction from the American version - PONTIS-H.

According to the first runs of the program we can state during how long time and in case of which maintanance cost the maintanance backlog grows, stagnates, reduces or disappears (Figure 1.).

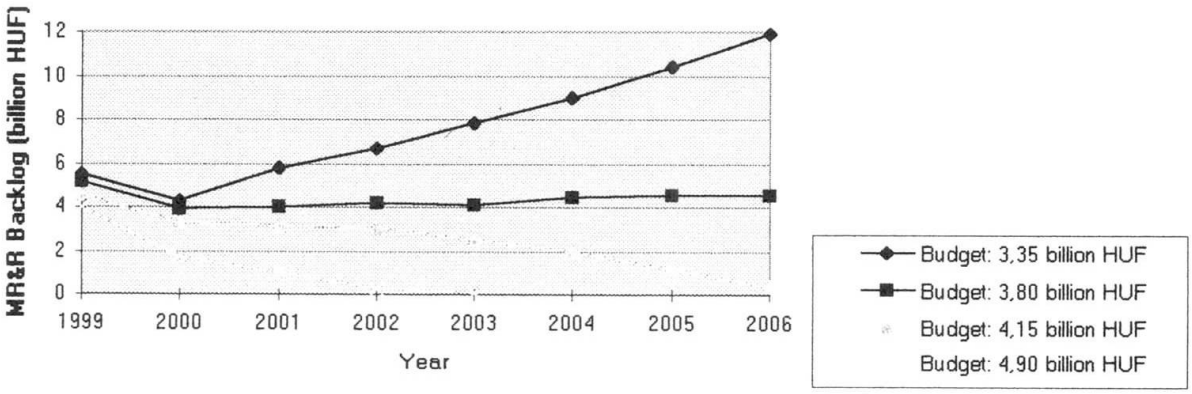

Figure 1. MR&R Backlog at various annual budgets.

We tested the established system, then we made the first version of the condition state and quantity recording system final in accordance with PONTIS-H by analysing of the summarized experiences. PONTIS makes also part results in that certain bridge owners are interested: for example what is the optimal condition state like in case of a bridge element, what kind of character the difference of the current condition state from that has. In 1997 condition state examinations started in accordance with PONTIS-H. By the end of 1998 correct PONTIS database was at disposal about 36,7% of the stock.

Development of PONTIS-H has run in two ways. The Project Oriented BMS based on the PONTIS-H. Using the results of the optimalization modul on network level the project oriented Bridge Management System develops it in the way of project level. Our aims were during the mathemathical developing of PONTIS optimalization method: optimalization of all bridge elements at the same time; handle of the interrelated elements together; network-level optimalization of the so-called span types of bridge containing the same bridge elements.