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E-LEARNING FACILITY MANAGEMENT MDM-MODELING

Technical and economic problems describing the development of the buildings in time to be associated with degradation of user-defined pre-design source functions of buildings.For some construction projects the functionality is decreasing. Technologies are becoming obsolete and morally obsolete.It is therefore necessary to know the timing of the expected degradation. Calculation of the rate of degradation – the aging facility – may warn of errors made by even in the choice of structural parts of the technical part of the design stage. One of the suitable tools for solving is dynamic modeling.

The modified dynamic model – MDM – (Beran, Dlask, 2005), is a tool for simulation, and used, among other things, to test hypotheses for long-term sustainable development. Result values are calculated by the standards of individual elements of the model. Graphic visualization of the results of some hypotheses are confirmed or refuted. In MDM simulations the calculations of the relationships between individual elements with outdoor influence, parameterization and simulation hazards can be carried out. All these calculations give the numerical results, which can be visualized. Graphical representation of calculation contributes to a better perception of the results.

The development of degradation of the building can be shown on an example. Assume that the project of multi-storey apartment building was proposed in a time $t = 0$, and in the original standard, $X(0)$, see table. And it's divided into six functional parts, which are creating the required functionality of the buildingin the process of using.The degradation causes by the impacts such as wear and tear due to usage, moral degradation, random external events degrading nature and external events of a positive nature. Characteristics of the observed properties of the object are shown in table. For MDM modeling of interactions between elements and the initial conditions equivalent rating scale in the range of {-1;1} is used.

Characteristics of the mutual influence of the object

Functional object elements	1	2	3	4	5	6	Original standard $X(0)$
1. Facade	0	-0,05	-0,20	-0,10	+0,30	-0,15	0,50
2. Fillingapertures	-0,10	0	-0,20	-0,10	+0,10	-0,10	0,60
3. Externalinfluences	0	0	0	0	0	0	0
4. Internalinfluences	+0,20	+0,10	0	0	+0,40	+0,30	0,20
5. Roof	0	0	-0,10	+0,05	0	-0,15	0,60
6. Wiring	-0,10	+0,15	-0,05	-0,20	+0,15	0	0,40

Due to the gradual aging of structural parts is provided by lowering the initial draft standard up to a level that leads to the decision to update the individual functional elements.This is a loss under the draft standard, due to aging and wear of materials due to the use of the object by its users. From the characteristics of the curves (fig. 1), noticeable gradual degradation of functional objects elements.The calculation of this phase does not involve any interventions to maintain or upgrade.

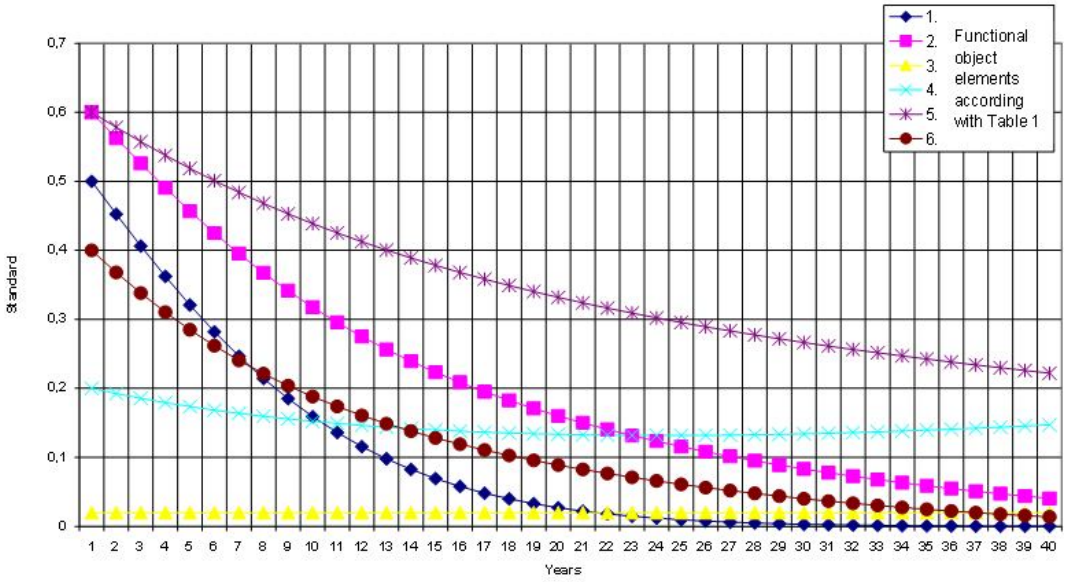

Fig. 1. The degradation of individual functional parts of the building of standard point $X(0)$ to stage 40 year life cycle without maintenance and upgrades

The technical maintenance takes care for a user's minimal standards of object, and focused at four elements numbered 1, 6, 5, 2. I note that is not required to accurately determine the start of the maintenance, the time of the beginning may be unknown.Analysis of the current state of an object determines the need to begin or not its technical maintenance.

The influence of external changes is shown in fig. 2 in the time periods indicated on the horizontal axis when characteristic of object element is lowered below a minimum standard, user-defined. The changes with an update cycle for a facade is interesting because after the update function of the element is aging faster.

Change the qualitative properties of the functional elements of the object allows us to delay the need for major investment in one-time upgrade, reconstruction. As a result of changing life expectancy of the individual features and structural object elements to a reasonable degree.The results of the MDM-modeling for update all the elements shown in fig. 3. In comparison with fig. 2 their decreasing is clearly, causes exception is necessary renovations and raising the capacity for effective use of available financial resources.

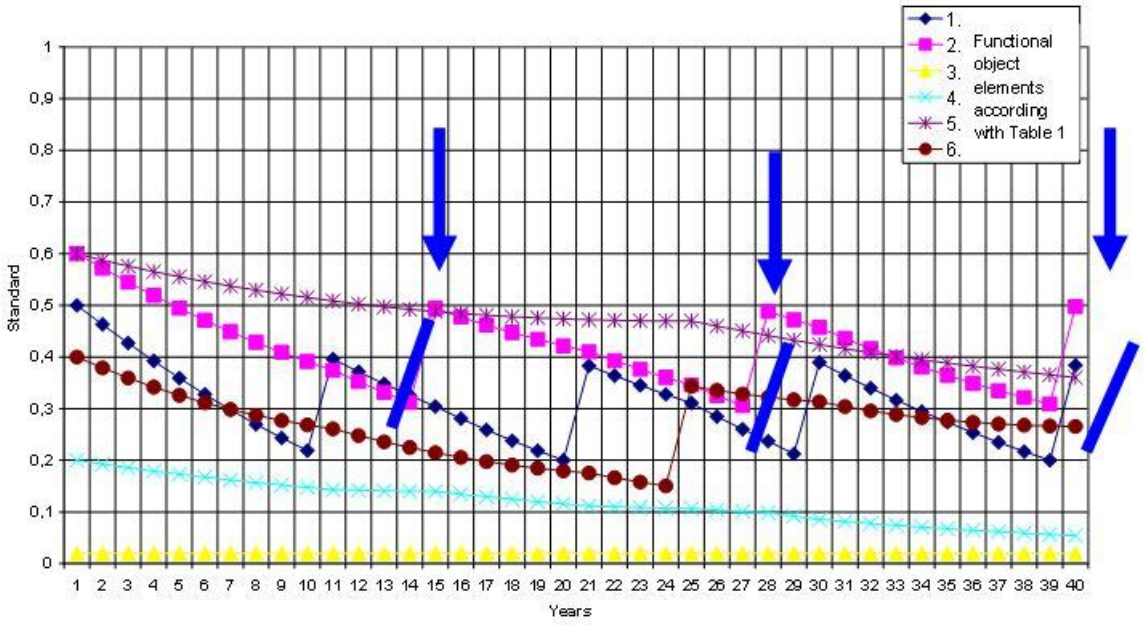

Fig. 2. The degradation of individual functional parts of the building of standard point $X(0)$ to stage 40 year life cycle due to the changes

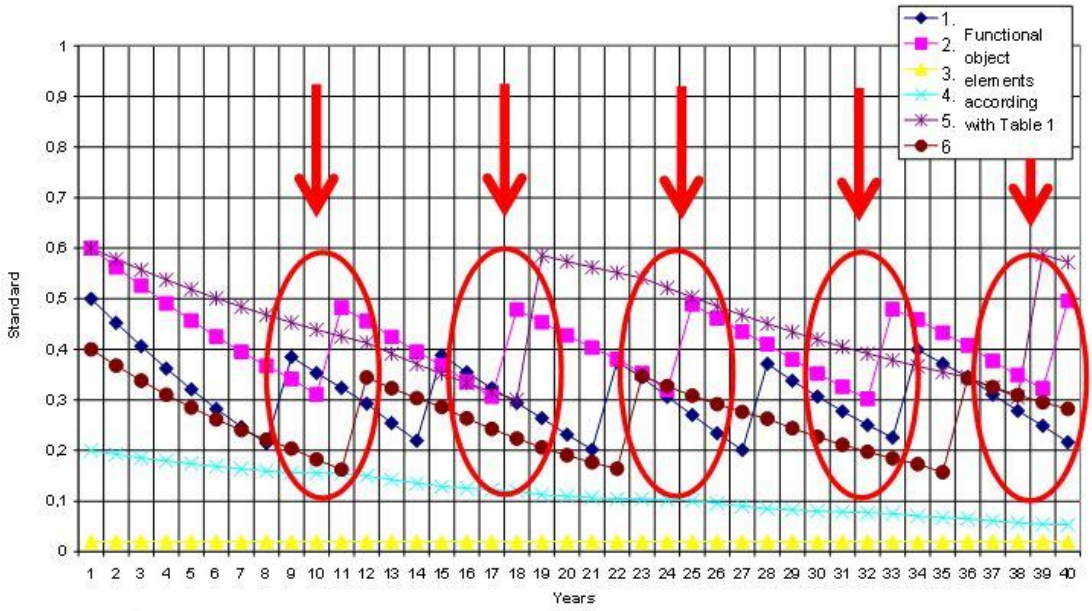

Fig. 3. The degradation of individual functional parts of the building of standard point $X(0)$ to stage 40 year life cycle after beginning the cyclical maintenance for functional object 1

Comparison of changing the input MDM parameters without maintenance and with maintenance is presented in fig. 4.

Effective management of technical infrastructure is a managerial influence: changes in organizational processes, methods of implementation, the introduction of new technologies. The long term goal for the owner and manager is the application of Facility Management in the life cycle of buildings, and MDM-modeling is an advanced tool to reduce the costs of operating instructions of technical infrastructure of buildings.

The model was applied in the framework of the research program "WD – INVESTIGATIONS TO ADDRESS REGIONAL DISPARITY" of the Ministry for Regional Development of Czech Republic in 2007–2011 yrs.

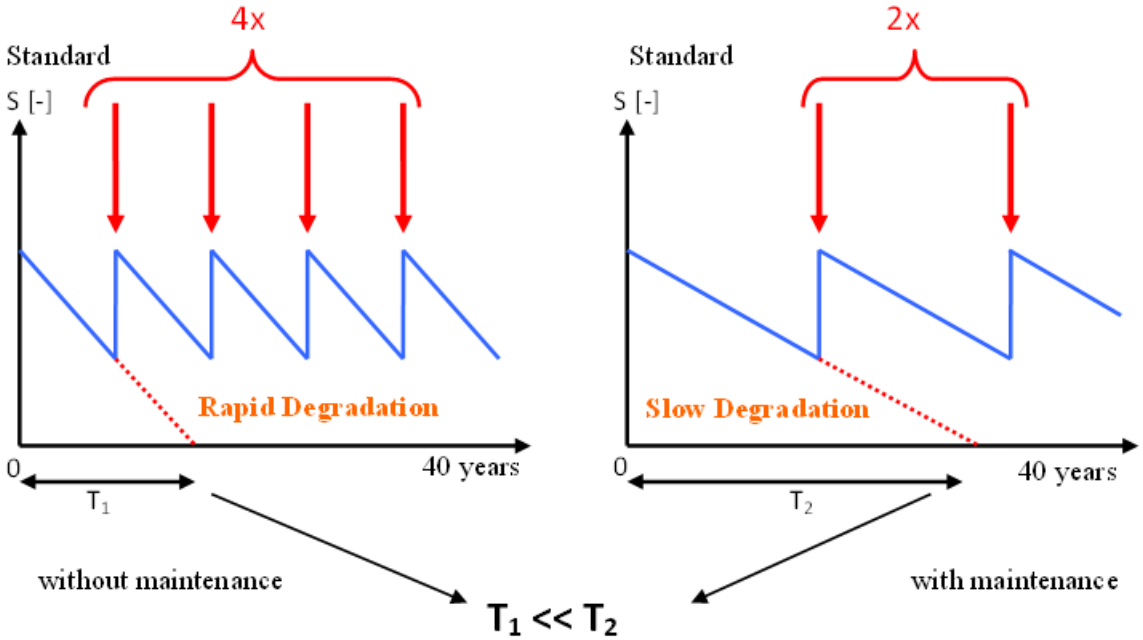

Fig. 4. Comparison of changing the input MDM parameters

MDM-modeling may be simply implemented in Facility Management e-learning by modern communication technologies of Internet for university education and professional trainings in Russian International Educational Centre of Facility Management founded on the base of Faculty of Economics and Management of the Urals State Forest Engineering University.