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METHODOLOGY OF DEVICE QUALITY CONTROL METHODOLOGY

1.Introduction

The paper's aim is elaborating the methodology of device quality control on the overhead travelling crane example. Quality of the device is understood as keeping they guidelines characteristic under exploitation phase.

The technical state of the technological device is possible to evaluate on the basis of analysis his exploitation characteristic q change. We take note that device technical state is acceptable, when deviation from nominally characteristic q_0 does not exceed acceptable value $\pm\Delta q$. Device exploitation characteristics is a function of device exploitation parameters a, which are weighting with errors $\pm\Delta a$:

$$q = f(a \pm \Delta a), q \in < q_0 \pm \Delta q)$$

2. The Device Characteristic Shaping

All device exploitation parameters are possible to differentiate as sensitive parameters a^w and non- sensitive a^n as well. The sensitive parameters are parameters which small value changing has essentially influence on device characteristic q (where A is acceptable level of characteristic q changing as needed device quality):

$$\frac{\partial q}{\partial a_i} = \begin{array}{l} < A \;\; dla \;\; a_i^n \\ \geq A \;\; dla \;\; a_i^w \end{array}$$

The above problems are particularly important for overhead travelling cranes, which are classified as large overall dimension rail transport devices WSUT. An example is error in wheels positioning of road wheel against runway in horizontal plane b, which small values generate big horizontal forces (lateral). It results in flat device motion in horizontal plane [1,2].

Determining the exploitation parameters requires the series of tests on device. Moreover, the result of exploitation parameter's influence on device

characteristics should be tested. Methodology of those tests was presented in paper [3], also in Taguchie`s publications.

The accepted characteristic's changes of a device q are a function of the exploitation parameter error's sum. For each exploitation parameter, formulating the allowable changes area is a very complex problem, because of not linear dependence between them. A very useful tool for solving that problem is fuzzy logic control. Formulated problem can be considered as fuzzy exploitation parameter error's control. It aims at maintaining the required device characteristics.

3. Example of Fuzzy Logic Control

The example of application is anti-swing module of overhead travelling crane's truck elaborated by the Authors by use of *Fuzzy* programme *MatLabSimulink*. The exploitation parameter is acceleration (deceleration) in traversing gear of truck. It can result in inconvenient swings of the load hanged on the rod. The aim is to choose such acceleration value, which could enable to minimise swings to zero.

The elaborated fuzzy controller has got two entries (load deflection angle φ and velocity of angle's changes)Δφ and one exit (active force applied to the truck according to its travelling direction). The exemplary results for hoisting winch without anti-swing system and with fuzzy controller applied were shown in Fig.1

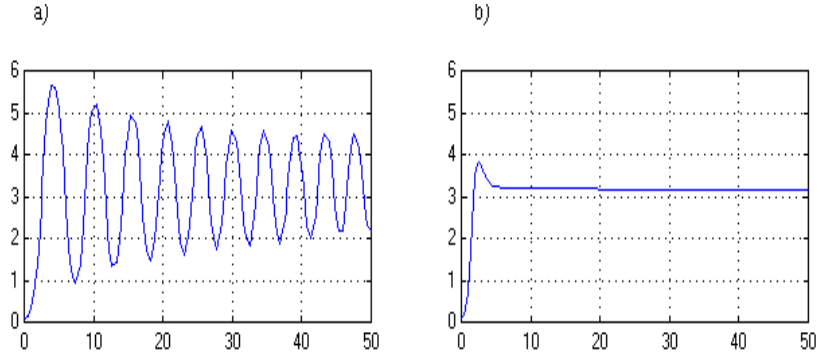

Fig. 1. A goods swing angle changes under unfixed movement of the crab (in displacement Cartesian co-ordinates): a) without anti swing system, b) with swing system implementation

4. Final Remark

Device quality can be created by the proper selection of exploitation parameters and tolerance zone as a function of accepted characteristic changes.

References

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