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METHODS FOR SECURING OF RELIABILITY IN REPRODUCTION PROCESS

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ABSTRACT: Reproduction process of the products creates three main stages introduced be-low. If we should take into consideration also safety then all reproduction process should be finished through safe ecological liquidation of the product that has be-come a waste. From this point of view it is very important to realize that every product before or late will become the waste.
KEYWORDS: reliability, design, production, reproduction process

INTRODUCTION

What will it become with the waste it is designed into large measure already in the design phase?
Reliability of design: It depends from construction abilities of designers and projectors. This ability is determined with a technical sentiment of project designers, experiences from similar solutions, choice of construction politics that supports reliability and existing level of available technological conditions. It is possible here to include prices of materials, possibilities of production and availableness of parts produced in series.
Reliability of production (workmanship): It depends from holding on technological processes of manufacture and assembly of machineries, from suitable reliable technology, from suitable choice of diagnostics and checked places at critical points of the technological processes.
Reliability of utilizing (operation): This reliability depends from holding on prescribed operation conditions, from holding on maintenance measures and utilization of technical diagnostics.
It is necessary to solve methods of reaching high reliability at once after analysis of a system state. We emphasize the reality that maintenance in narrower sense is only one from the methods of securing reliability. On the other hand it is the most frequent method utilized for practical aims. The reliability of the objects is reached by means of:

- good constructional solution (design reliability),
- application of reserved systems (design reliability),
- securing reliability of production, assembly and transport (production reliability),
- adequate education (qualification)of attendance (reliability of use),
- reduction of unfavourable influences from environment of the object (reliability of use),
- utilizing suitable maintenance and technical diagnostics (reliability of use).

METHODS FOR ACHIEVING OF BETTER RELIABILITY USING DESIGN MEANS

It is possible increase of reliability through lowering number if possible undesirable interaction of elements:

1. We reach it by lowering number of object main functions. It has an effect a simpler construction but also lowering functional properties. It is the certain optimum measure of functional properties number that designer shall elect. For per-forming arbitrary work function of machinery in the given quality it is necessary always-equal number of main functions. It is decisive from the standpoint of re-liability and amenities that functions let from designer to an attendance respectively a user and that will be secured by the machinery.
2. We reach it by integration of elements on the common material porter. The number of functions lowers total reliability only in this case if single functional parts have final limited life. It is in majority of cases fulfilled. At the object without reserved elements what it is also fulfilled in majority of cases, total reliability of objects is something lower or equal to reliability of the least reliable element of the given object. For increasing reliability of single elements from a standpoint of their mutual interactions we integrate (situate) elements on the common material porter. Possible number of undesirable interactions is lowered with it and total reliability of the object is increased. At right constructional solution it is possible to reach an

expressive growth of single elements reliability. A measure of mutual influence of elements and environment depends from density of material functions porters that can enter into mutual interaction and so to be damaged. Judging depends from toughness of single parts from grades of freedom and also possible loading influences beside existing functions. These factors determine reliability of single parts that it is possible only hard exactly to describe. In this regard it is suitable judging by analysis of reliability. At the analysis it is possible to coordinate weight coefficients and on the basic of experiences and simulation of failure possibility to assign a measure of reliability.

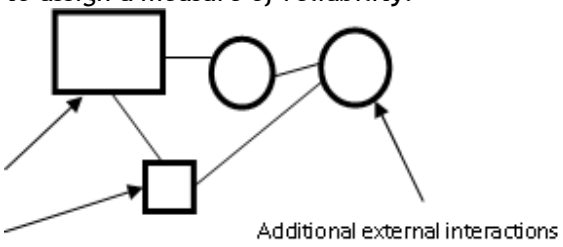

Figure 1. Non-integrated elements

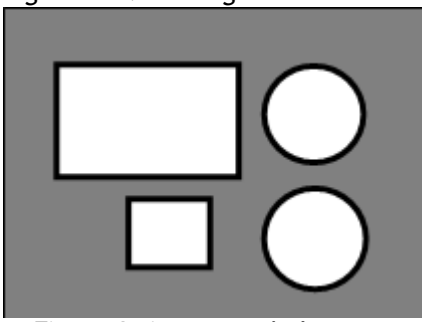

Figure 2. integrated elements

Increase of reliability is possible by suitable constructional design preventing of influence of sources of degrading processes. To preventing it is possible to come from a choice of two tactics of protection:

Tactics of object parts resisting to unfavourable failure influences,

Tactics of object functional activity temporary abolition during duration of unfavourable failure influence. At this tactics protection becomes with it that during object activity stopping possibility of arise relevant failures is pre-vented.

TACTICS OF FAILURE PREVENTION

1. *We perform it through reduction of loading of the functional parts. We can reach it through over-dimensioning sizes and lowering work speeds, outputs etc. The designer performs these measures up to the state when he reaches demanded or optimum life of the functional parts.*

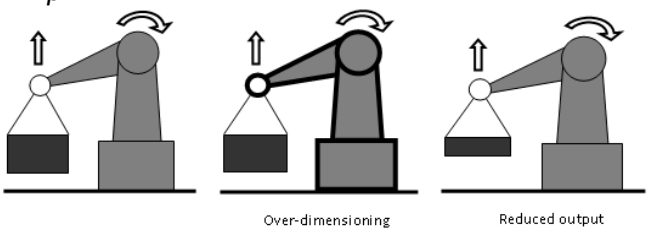

Figure 3. Loading of functional parts

2. *We perform it through limitation of outside unfavourable influences e.g. the application of preset stabilized electric source of voltage in front of device, covering of the functional parts, application of resisted covers etc. In this case we influence only indirectly the influence of loads resulting from the function of machinery.*

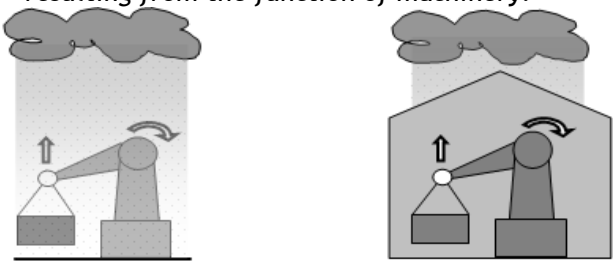

Figure 4. Limitation of external unfavourable influences

3. *We perform it through limitation of dynamic load internal sources. We reach it through choice of optimum exactness of parts, counterbalancing of rotating elements, leading heat with cooling or other methods, isolating source vibrations etc.*

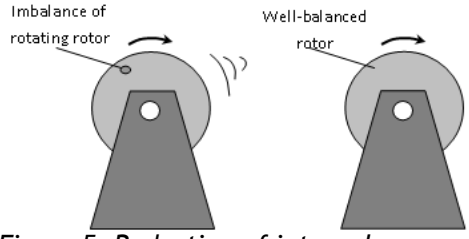

Figure 5. Reduction of internal causes of dynamic loading

4. *We perform through making out of functional parts from constructional materials of higher resistance and through development of material (hardening, alloying, alloys, composed materials etc.). By such tactics also we can reach a wished life.*

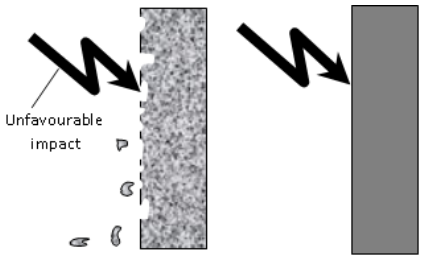

Figure 6. Functional parts of construction materials increased resistance

5. *We secure through dynamic protection with feedback. Regulation system fulfils automatically a dynamic protection on higher level. E.g. system with correction shifting of functional exhibited part.*

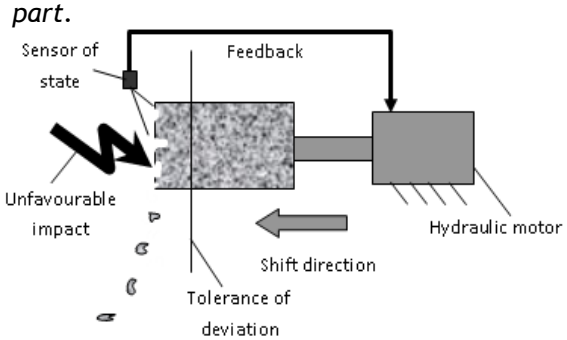

Figure 7. Dynamic protection with feedback

TACTICS OF TEMPORARY SHUTDOWN OF FUNCTIONALITY

1. *We perform through intentional weakening of functional nodal points that it is possible light to change or again to put together. At load beyond measure the functional nodal point crumbles. So activity of the function is interrupted but it does not come to relevant damages of nodal point parts. In every case it comes however to a manifest failure.*

Example: We can arrange here also the bias protection of electronic elements with fuse. In this case more it is prevented also to further activity of unfavourable influence. Restoration of the function rests in a change of the fuse.

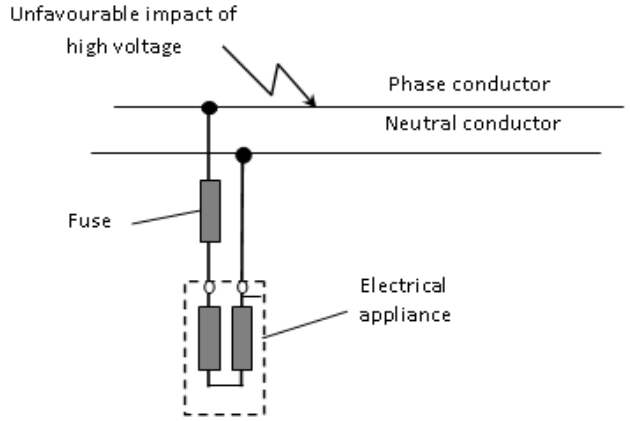

Figure 8. Protection by shutdown of operation

2. *We reach by automatic technical diagnostics (on-line diagnostics).*

In this case becomes alarm or blocking of the functional activity of the object at one as the system discovers an occurrence of the critical (unfavourable, unacceptable) state.

- ☐ *on a functional part of the object (machinery),*
- ☐ *in surrounding of the object.*

The alarm system is utilized at relatively slow development of the relevant failure. On the other hand the blocking system is utilized for prohibiting to quick development of a failure into the relevant failure.

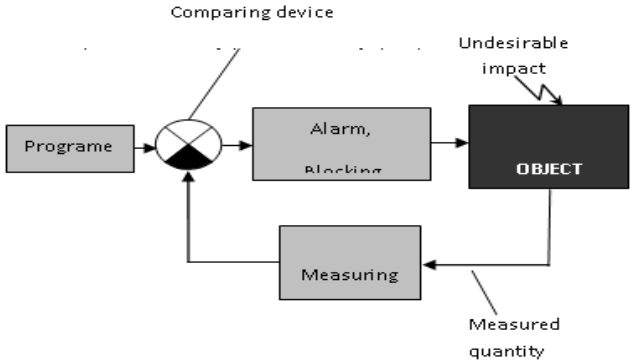

Figure 9. Application of alarm system

The tactics are the followings:

1. ***Tactics of avoiding***

At this tactics main defend factor of the animal is to shirk to working unfavourable influence of the aggressor. The basic of shirking is measurement of unfavourable influence measure and succeeding performing shirking manoeuvre. Majority of the animals assigns of course such a type of behaving. Typical feature is speed and freshness. We can choice as a representative a cat. In technical practice regulation system and technical on line diagnostics corresponds to this tactics. We can shift here also application of fuses. The fuses block the further activity of the object that would lead to arise of the relevant failure.

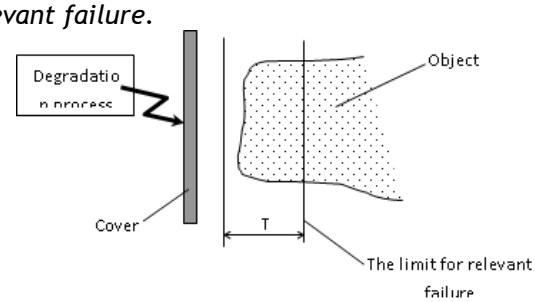

Figure 10. Tactics of hide

T-tolerance field in that material of the object can by worn without arise of the relevant failure.

2. ***Tactics of attack***

At this tactics the main detection factor of the animal is to liquidate influence of an enemy.

It is possible with the active or passive attack. The passive attack rests in taking advantage of liquidating element on the surface of protection zone e.g. they are spurs of a hedgehog or poisonous skin of South-American frogs and similar. The representative of active attack a badger can be. It is known about it that it does not give in its territory without fight. In technical practice e.g. application of additional element on detection of functional surface against wear. Such an element can be a layer of lubricant between friction surfaces. The lubricant on the surface liquidates the influence of degradation between mutually moving parts. The case of active attack is already harder to illustrate on technical machinery because machines with its function need not work against lowering outside degradation processes. It is not however fully excluded possibility.

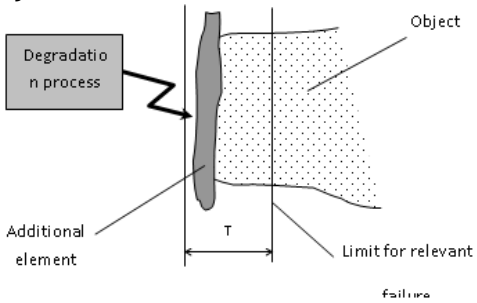

Figure 11. Tactics of attack

3. ***Tactics of avoiding***

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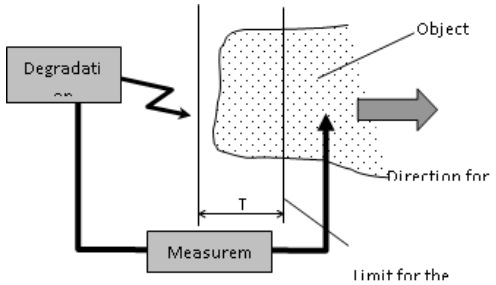

Figure 12. Tactics of avoiding

4. Tactics of avoiding

At this tactics the main defend factor of the animal is the utilization of detection cover that is a part of the animal body. The main representative is a frog with its firm armour.

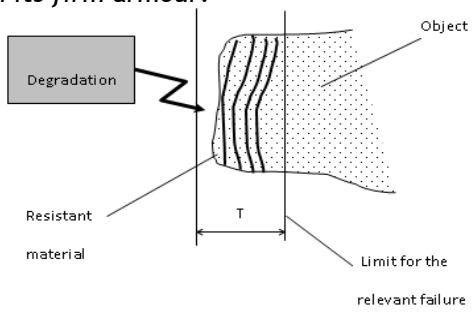

Figure 13. Tactics of resistance

In technical practice the utilization of resistant materials with good strength properties corresponds these facts. Against other tactics the material with better properties is dominant so that it is manifested with increased reliability with regard on the given degradation influence.

CONCLUSIONS

The technical diagnostics has the narrow continuity with the maintenance of machines and devices and is one from methods of securing total reliability of objects. The reliability is an important part of the object quality. The final aim of all technical effort is a satisfaction of people need. The most general notion expressing this need is the quality.

The satisfaction of people need has its philosophical limits as the need of people is various and variable with time. We can however receive a simple agreement that the best satisfaction of need it is possible to reach through high quality of products.

Reliability is the general property of the object resting in ability to fill demanded technical functions in the given tolerance and stated time of application at the given technical conditions. Reliability is the complex property which at determination of the object and its conditions can include single properties e.g. without failures, life, holding and storage.

Technical conditions are understood whole of specifications of technical proper-ties prescribed for demanded function of object further methods of its operation, storage, transport, maintenance and corrections.

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