STRUCTURE OF QUALITY AND DEPENDABILITY OF MACHINEN

СТРУКТУРА НА КАЧЕСТВОТО И НАДЕЖДНОСТТА НА МАШИНИТЕ

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Abstract: Developed structure and proposed qualifications of the properties and performance of the quality and reliability of machines.

Suggested new classification of numerical and functional characteristics of indicators of quality and reliability of production.

KEYWORDS: QUALITY, RELIABILITY, FEATURES, PERFORMANCE, FEATURES

The quality and dependability of production are expressed through a big number of characteristics, attributes and indicators. Their usage without systematic grouping and classification is connected with definite difficulty. In the literature on the question and the normative – technical documentation the attributes, characteristics and indicators of the quality and dependability are not systematized and are not connected with one another and the indicators and characteristics are mixed and are expressed only as indicators.

With the help of the systemic approach the quality and dependability could be structured in three hierarchical levels: attributes, indicators and characteristics, whereas the attributes are expressed by indicators and the indicators – by characteristics.

Quality is an accumulation of attributes which satisfy the needs and/or the requirements of the consumers and the dependability – complex attribute for the preservation of the level of quality in fixed borders, time, regime and condition. The basic elements of the conceptual definition for quality are the attributes, needs and requirements. The attributes of quality are expressed by specific and complex indicators and the indicators by numeral and functional characteristics.

The needs of the consumers are various and complex. Depending on the cultural level they are expressed through different needs which can be defined or presupposed. The needs are defined, written in contracts or normative documents, the needs of the market, the development of the needs of the people and society are presupposed.

The requirements of the consumers are distinguished with great variety and can be expressed in a different way (by contracts for orders and deliveries, normative documents) or to remain latent. As a whole, these requirements are formulated in the modern systems of quality management: the systems of a series of standards ISO – 9000 – 2000 and the system for total quality (TQM).

The basic elements of the conceptual definition for dependability are the level of quality, the defined borders, time, regimes and conditions. (Figure 1)

![Fig.1. Elements for the definition of dependability of production](image-url)

The attributes of quality are those attributes of production which satisfy the needs and/or requirements of the consumers. In the most common case the quality has four groups of attributes: technico-economic, social, bioecological and dependable (Figure 2). The first three groups of attributes define the level of quality and the dependable ones – the alteration (or preservation) of this level with time. The technical-economic attributes express directly the level of quality and are divided in three groups:

- functional, structural, geometrical, constructive, for technical perfection;
- technology of design, manufacture, exploitation, repair and maintenance, transportation;
- economy of design, manufacture, exploitation, repair and maintenance, transportation.
And if all other indicators are expressed by their names, then the indicators for technical perfection include the patent-law indicators which indicate defense for patents and patent frequency of production. The indicator for patent protection characterizes the exclusive right for manufacturing of a given production and the indicator for patent purity – the possibility for its unhindered realization in the country and abroad.

The influence of production on people is defined by the social attributes of the quality which comprise four subgroups: ergonomic, esthetic, organoleptic and safety. Each one of these attributes are expressed by the following indicators: ergonomic-hygienic, anthropometrical, physiological, psychophysiological; esthetic – informational expressiveness; rationality of form, compositional unity, colour decision, perfection of execution; organoleptic – indicators perceived by eyesight, ear sight, smell, sensitivity and taste; safety – mechanical, technical, electrical, chemical and physical.

The influence of the object on the biological species and the environment is defined by the bio-ecological attributes of quality which includes three subgroups: bio-technical, bio-technological and ecological and indicators for the attributes of each of the subgroups are: bio-technical, bio-technicality for plants, animals and microorganisms; ecological – ecological conditions for the air, water, soil, the flora and the fauna.

Dependability is a complex attribute, which can include flawlessness, durability, repair suitability, storage and stability in parts or in combination depending on the kind of production.

The production for one – time-only use has only one of the attributes of dependability – storage and the irreparable objects – two attributes: flawlessness and storage. The object under repair can have four attributes: flawlessness, durability, repair suitability and storage and the processes and systems – all five attributes.

The attributes of dependability are expressed by specific indicators express only one attribute and the complex ones – more than one qualities (Figure 3 and 4).

Fig. 2. Structure and interconnection of the quality attributes

Fig. 3 Attributes and indicators for the dependability of production
Stability is an attribute of the processes and/or systems to preserve their condition with time. Three types of indicators characterize the attribute stability: stability of quality; stability of productivity; stability of the expenditure of resources.

The indicators of quality and dependability can be constant and occasional quantities. As constant quantities the indicators of quality and dependability have only one characteristic – their value and as occasional quantities – characteristics that can be divided to: characteristics of grouping; characteristics of distraction, quant characteristics, special characteristics and full characteristics (Figure 5). The first two groups are number characteristics and the last three groups – functional characteristics. Depending on the type of production (the object) and the character of tasks – they choose one or another of the attributes, indicators and characteristics.

Deductions:
1. The elements of the conceptual definitions for quality and dependability of production are found out.
2. The structure is worked out and a qualification of the attributes and indicators of quality and dependability of production is suggested.
3. The numerical and functional characteristics of indicators for quality and dependability of production are defined.

Literature – Books Cited: