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Try to Exhaust the Materials

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Abstract: Structures, especially machine parts, are often subjected to directional stresses. Under the influence of repeated variable loads, some parts of machines suddenly break due to unknown plastic deformation. If it is exposed to static loads, they can work for a long time at such a voltage. They degrade under alternating loads in the same way as brittle materials.

Keywords: fatigue, deformation, structure, brittle material, machine parts, alternating stresses, durability, periodicity.

The science of resistance of materials is a science that studies the methods of calculating the strength, uniformity and priority of building construction parts and structural elements.

In particular, the issue of fatigue testing of structural elements in the resistance of materials is of great importance. Structures, especially machine parts, are often subjected to directional stresses.

Under the influence of repeated variable loads, some parts of machines suddenly break due to unknown plastic deformation. If it is exposed to static loads, they can work for a long time at such a voltage. They are eroded under the influence of variable loads, just like brittle materials.

The problem of calculating the durability of structural parts arises as a result of continuous repetition of alternating stresses. The main essence of the durability phenomenon is that when the parts are exposed to continuous alternating stresses, they are destroyed due to stresses that do not reach the strength limit or the yield point: before the destruction, cracks are formed on the surface of the part, which then sink into the body of the part and deepen. and there is a risk of decay. Such a state is called exhaustion.

Even stress below the critical point in the elastic zone of the material leads to insignificant deformations due to local residual stresses in the part. As this effect is repeated continuously, the material gradually begins to deteriorate and eventually causes the material to break.

If the value of alternating voltage exceeds the norm, very small microscopic cracks will gradually form in the material. Over time, these cracks grow together. These cracks become the center of stresses and cause them to grow. As a result, the cross-section begins to erode and unexpectedly changes its performance. When not only the value but also the direction of the voltage changes, the decay is accelerated. The change in material properties under the influence of alternating stress, the formation of cracks and, as a result, the risk of its collapse is called material fatigue. The sheared surface consists of two zones.[1]

Various factors can affect the fatigue of the material and they can be divided into the following groups. For example, the following factors affect the stresses generated in the details: The concentration of stresses causes a decrease in the resistance of the details working to alternating stresses, differently

from constant stress. This situation is observed not only in brittle materials, but also in plastic materials.

As we know, the concentration of stresses is mainly formed where there are sharp changes in the dimensions of the parts. There are several technological methods to reduce it. [2-5]

- Making sudden changes in dimensions through a radius, not at an angle;
- Radius wheels should be installed in them by creating rotating pits near the passage.

As a result of detail processing, lines, small scratches and traces of corrosion are formed on its surface, which cause concentration of stresses. These, in turn, reduce the fatigue resistance of the part, as a result, the endurance limit of the material decreases.

Currently, there are several technological processes that increase the fatigue resistance of parts. They are:

- Cleaning the surface with fine sand particles and rollers;
- Surface cementation, nitriding and cyanide;
- Surface treatment with high frequency current.

The influence of the external environment on material fatigue can be explained as follows: Metals corrode in the presence of gases and liquids. Corrosion causes high stress concentrations. They are especially accelerated at tensile stresses. Corrosion under alternating stresses reduces the fatigue resistance of light alloys in particular. The degree of reduction of resistance to fatigue depends on the influence of the external environment. For example, sea water reduces the durability of the material more than normal water.[1, 6]

If the alternating stress is in a complex stress state, alternative strength theories are used to calculate strength. Schematic limit stress diagrams are used to determine the safety factor in case of arbitrary loading with variable symmetrical stress.

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