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PROTECTION OF PRODUCTION SHUMA I VIBRATION

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Article history:	**Abstract:**
Received: 2nd April 2021 **Accepted:** 20th April 2021 **Published:** 15th May 2021	For reasons of occurrence, industrial noise is divided into mechanical (friction and impacts of units and parts of machines and mechanisms) and aerodynamic (movement of streams of air, gases or liquids at high speeds).

Keywords: Noise is characterized by the frequency at which the sound vibrates, the sound pressure, the intensity (strength) of the sound, and the volume level

INTRODUCTION

Vibration is characterized by amplitude, frequency, speed, and acceleration. These parameters determine the impact of vibration on humans, equipment, and building structures. By the nature of the spectrum, noises are divided into wide-pole, with a continuous spectrum of more than one octave, and tonal, in the spectrum of which discrete tones are heard. In terms of time characteristics, noises are constant, the sound level of which during an 8-hour working day changes in time by no more than 5 dB, and non-constant, the sound level of which during an 8-hour working day changes in time by not less than 5 dB. The permissible levels of sound pressure in the working area are set depending on the frequency of vibration of sound waves and are taken for industrial premises in the range from 90 to 74 dB at geometric mean frequencies in octave bands of 63 - 8000 Hz, respectively. If we are guided by the normative data on the sound level in the octave band, then for the working area of industrial enterprises the sound level (with the constant stay of workers in them) should not exceed 85 dB. When developing technological processes, designing, manufacturing and operating machines, industrial buildings and structures, as well as when organizing a workplace, all measures should be taken to reduce the noise affecting a person at workplaces to values that do not exceed permissible.[1-8]

Of the known methods of dealing with industrial noise, the most rational is to reduce it in the sources of its occurrence. To this end, the following measures are taken:

Replace shock interactions of parts with shockless ones, reciprocating movements - rotating ones; damping vibrations of colliding parts and individual units of the unit by joining them with materials with high internal friction (rubber, cork, bitumen, bitumen cardboard, felt, asbestos, etc.); reduce the intensity of vibration by lining them or filling specially provided air cavities with vibration-damping materials or by arranging flexible connections (elastic pads, springs) between these parts by units of the unit that excite vibrations; replace metal parts with parts made of plastics or other non-sonorous materials;provide for careful balancing (static, dynamic) of all moving parts of the unit to reduce the dynamic forces of exciting vibrations; provide for minimum tolerances in the manufacture and assembly of parts of the unit in order to reduce clearances in the joint of parts and thereby reduce the energy of collisions; provide for a system for assembling parts of the unit, in which errors in the joints of parts (distortions, incorrect distance between centers, etc.) are minimized; lubrication of colliding parts with viscous liquids and the imprisonment of vibrating and noisy parts (gear reducers, etc.) in liquid oil and other baths are widely used; if the prevailing noise of the unit is the noise of the bearings, replace the rolling bearings with plain bearings; improve, if possible, the conditions for the flow of air and gas flows around the unit parts (in fans, ejectors, blowers, etc.); noisy units of the unit (gear reducers, chain, belt and other transmissions, colliding parts, motors, etc.) are enclosed in insulating casings. Sound absorption - for this purpose, the walls and ceiling of the room are clad with materials that poorly reflect sound waves. Sometimes, when it is possible due to production conditions, separate equipment is lined with sound-absorbing material or protective chambers and bunkers are arranged, which are lined with sound-absorbing material on the inside.

MATERIALS AND METHODS.

Everyone who works in production should be aware that noise is a harmful factor. Numerous data presented in domestic and foreign literature indicate that noise adversely affects the human body and, first of all, the central nervous system, disrupting its regular function, which leads to disruption of the normal activity of individual internal organs and blood circulation, and hearing loss.[9-16]

Measures to combat industrial vibrations should be planned in the design of buildings, in the design of machines and assemblies, in the construction of industrial buildings, in the manufacture of machine tools and equipment, as well as in their operation.

The identification of sources and causes of vibration should be combined with the registration and study of their spectra. Only based on the study of amplitude-frequency characteristics, it is possible to outline and implement technical measures aimed at eliminating the causes of vibrations.

The correct operation of the equipment, its preventive maintenance and timely repair are of no small importance.

General measures to combat the harmful effects of vibration can be carried out in three directions: engineering and technical, organizational and therapeutic and prophylactic.

Engineering and technical measures include: the introduction of automation and advanced technology, excluding the contact of workers with vibration; changing the design parameters of machines, processing equipment and power tools.

Organizational activities include: control over the installation of equipment at production sites; timely and high-quality scheduled preventive maintenance and repair; compliance with the rules for the technical operation of machines and units.

The following devices are classified as protective equipment: protective, vibration-isolating, vibration-damping and vibration-absorbing devices, as well as means of automatic control, signaling, remote control.

The development and implementation of physiologically grounded work and rest regimes for persons exposed to vibration, as well as providing them with personal protective equipment, is of great importance.

Therapeutic and prophylactic measures provide the necessary microclimatic regime and a complex of physiotherapeutic procedures (water baths, massage, gymnastics and ultraviolet irradiation).

Foundations for machines and equipment with unbalanced parts are made with acoustic breaks filled with porous material and an acoustic joint located in the lower part of the foundation. The lower part of the foundation should be well below the foundation of the building walls in order to reduce the transmission of shocks to them.[17-26]

When installing machines and equipment that create vibrations during operation, an interlayer of vibration-insulating materials is laid under their beds on the interfloor floors.

When calculating the foundation, the vibration amplitude of its base should not exceed 0.1-0.2 mm, and for particularly precise equipment - 0.005 mm. Anti-vibration mountings are placed under the machine beds and equipment housings. To ensure the effectiveness of vibration isolation, their foundations should be as large as possible.

The effectiveness of vibration isolation is determined by the transmission coefficient (KP), taking into account the force ratio R_{osn}, *acting on the foundation in the presence of an elastic bond, to the force* P_{mash}, *acting on a rigid bond:*

$$KP = F_{osn} \ / \ F_{mash}$$

The KP value for effective isolation ranges from 1/8 to 1/15 with a ratio (forced frequency to the natural frequency of the system) equal to 3 to 4.

It is possible to weaken the transmission of vibrations from the source to its base by eliminating rigid connections between them using intermediate elastic elements. As such elements, steel springs or gaskets made of elastic materials can be used: rubber, cork, bituminized felt, etc. machines with a speed of more than 2000 rpm.

At low frequency vibrations, such gaskets are not flexible enough and can even lead to increased transmission of vibrations to the base. The use of vibration isolating devices should be based on the calculation of elastic elements: the thickness and area of the gaskets, the characteristics of the springs.

In the design of machinery and equipment, attention must be paid to vibration reduction, which can be achieved in a variety of ways. So, for example, in kinematic diagrams, dynamic processes caused by impacts, sharp accelerations, etc., should be excluded or elements that would significantly reduce them should be used. This can be done by replacing cam and crank mechanisms with uniformly rotating ones or mechanisms with hydraulic drives. Reducing the level of vibrations in gearboxes and gear drives can be achieved by using gears with special types of gearing (globoidal, chevron, etc.) instead of gears with a straight tooth. It is also advisable to replace the metal of the gears with plastics or textolite. Accuracy of processing and thoroughness of assembly are of great importance.

The imbalance of the rotating masses has a great influence, one of the ways to eliminate which is balancing. In widely used grinding machines, it is essential to reduce vibrations to improve the quality of grinding wheels, including reducing the amount of imbalance, reducing mass and using high-speed wheels with a permissible peripheral speed of 80 m / s or more, equipping machines with special devices for balancing the wheel directly on the machine. It is not allowed to install tools and mandrels on the spindle that are not provided for in the technical documentation.

RESULTS AND DISCUSSION.

In technological equipment, the elimination of resonance modes and vibration damping are essential, which helps to reduce the level of vibrations by converting the energy of mechanical vibrations that occur in the equipment into other types of energy.

Such a transformation can be accomplished by: a) using structural materials with high internal friction; b) applying a layer of elastic-viscous materials with high internal friction to the surface of the product; c) the use of surface friction when introducing an additional absorbing element or coating into the structure, which increases active losses in the system; d) conversion of mechanical vibrational energy into the energy of Foucault currents or an electromagnetic field.

For the same purposes, elastic-viscous coatings in the form of mastic are used with sufficient efficiency, which are applied directly to the elements of machines and assemblies. Lubricants are also used in the form of oil baths for gearing, etc.[27-32]

Structural materials that most fully meet the requirements of vibration damping are plastics, nylon, textolite, delta wood, rubber. These materials are widely used: plastics - for housings and handles, nylon and delta wood - for bushings, textolite - for gears.

Vibration parameters are not constant, they can change significantly during operation on the same equipment. It is very difficult to determine these changes by sensations, as a result of which the need for automatic control and signaling arises.

Remote control is promising and should be widely used. It eliminates the need for a constant presence of vibrating machines and equipment working in the area, and periodic presence in this area is less dangerous for the operating personnel

CONCLUSION.

Various devices are used to protect the hands of workers from vibrations. Riveting hammers are equipped with pneumatic shock absorbers and elastic handles that change the vibration amplitudes to more favorable ones. The use of a lightweight striker made of polymeric materials halves the vibration amplitude of the tool body. For the same purpose, air cushions are provided in the hammer system for shock absorption between the striker and the striker. Air vibration dampers of various systems are used in the design of pneumatic hand-held machines. Some of them are located directly in the handles of handheld machines. Reducing vibrations of rotary working machines can be achieved by carefully balancing the rotating parts. By high-quality balancing of the rotor, the vibration level can be reduced by 10-20 dB.

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