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NOISE AT SAW AND WOODWORKING INDUSTRIES IN RUSSIA: FROM THEORY AND EXPERIMENTS TO PRODUCTION SECTOR WANTS

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The noise deteriorating effect on the efficiency of labour and human health is commonly known. In the past decades the noise quieting problem in developed nations of the world, and our country as well, has become a top-ranking one.

The noise effect on the worker's body goes beyond the influence on the organ of hearing only. Hygienists have found out that in some noisy branches the general morbidity rate rises by (10…15)%. It is proved that even the levels of (40…70) dBA have an effect on the vegetative nervous system irrespective of the subjective noise perception of the person. The habituation of the person to noise is illusive, as noise affects even the sleeping person.

The action of noise is often coupled with the effect of other destructive for human health factors: vibrations, irradiations, dust and gas content, etc. It also accentuates the requirements to restrict noise exposure and promotes the untimely retirement benefits.

It must be emphasized that the USSR was the first in the world to initiate the noise attack by law (The Resolution of the Council of Ministers of the USSR 1960, 1969, 1973).

In 1971 the "Sanitary standards of industrial institutions" CH 245 – 71 and "Hygienic standards of sound pressure and volume tolerance levels at work places" ГН 1004 – 73 were developed. The Committee of Measures and Active Measuring Instruments at the Council of Ministers of the USSR established a series of Noise National Standards included into the "System of Labour Safety Standards". Nowadays the sanitary norms CH 2.2.4/2.1.8.562 – 96 work, where the noise norm for working places makes 80 dBA on the sound level.

The requirement toughening for noise from 90 dBA (according to CH 245 – 71) up to 80 dBA forced us to work in 3 directions in this problem solution [1 – 6].

1. The investigation of noise, causes and noise making objective laws of active processing equipment as part of processing lines and departments. The saw and woodworking equipment is, as is known, characterized by a high efficiency, at which one has to appoint process speeds from 40 to 100 (and even faster) m/sec with feed velocities up to 150 m/min.

Let us note that the quantity of working tools (saws, shaft arbors) to provide the efficiency achieves the number of 4-10 and more in one machine. For the moment of our works starting (meeting of 60-70s of the past century) there was no slightest hint in the operating equipment and technological designs to any noise reducing solutions in the constructions, working areas, plant and seliteb (by-plant) territories. On the active processing equipment, at the minimal interference with the construction, we developed the devices with due consideration of rather various methods of noise control: the acoustic suppression in the generation places, sound protection and absorption, acoustic shielding and noise localization methods. A noticeable (5…10 dBA) effect was obtained. In some instances we managed to interfere with the mainstream technology as well, when the equipment location was determined by the technology requirements only. The shop drawings of the devices were sent by us in a great amount at the request of numerous enterprises (not only saw and woodworking industries).

The dominant requirement, which would exclude the rejection of antinoise devices by the workers, was sustained by us in the direction of technological capabilities non-reduction of a machine or aggregate.

2. The results of theoretic and experimental research have served the foundation for the leading engineering materials complex development for production workers, design engineers, original equipment (methods, guidance, instructions, drawing albums) manufacturers. All of them have come through the stages of reconciliation with the State design institutes of the branch, production engineering design consultancies, main engineering department on woodworking processing equipment design, Research and development institutes of the branch and original equipment manufacturers, trade union Central Committee of the branch before the approval of the Ministry of Forest Industry. So that the design engineers "were not afraid" of acoustic designs (and it would be a novelty for them), we carried out a week training. The following years of communication with engineering designers testified that necessary theoretical knowledge on noise, methods of design policy for all possible technological situations, types of shop floors and equipment stock, illustrated with plenty of numerical examples, allow them to lead acoustic designs without any difficulties.

With the appearance of data-flow computers we created the computation algorithms and programs

included into 2 instructions on computer-aided acoustic design systems application.

3. The work with the Machine-tool Industry Ministry, its plants and development laboratories promoted the operating equipment modernization positive results shift to the series-produced one.

Let us note that many technological solutions were performed by us taking into account the world's patent novelty. It, naturally, promoted a more active advance of research ideas into production.

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NON-CONTACT INSPECTION OF ROTATING MACHINE PARTS

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Due to safety and economical reasons the interest to diagnostic and monitoring systems is growing rapidly in industry. Besides safety, there are quality control requirements. The greatest attention at machine-building enterprises is paid to quality control of working surfaces of commutators and contact rings of electric machines [1]. However, the experience shows that the existing quality control is not efficient enough since it is functioning only in steady-state mode with the help of micrometer heads or industrial indicators and does not take into consideration the whole range of centrifugal, vibratory and temperature loads, influencing the commutator in working electric machine.

The majority of existing diagnostic systems are based on vibration diagnostic and they cannot provide information about cross section of rotating part or its surface quality. In order to fulfill these requirements, a diagnostic system 'MICROCON' was designed at Tomsk Polytechnic University. This complex is used for non-contact precision control of cross sections of shafts, commutators and contact rings of machines in static and dynamic modes, measurement of linear micro-movements and vibrations of machine parts.

Designed measuring complex has better technical characteristics compare to other systems due to original design of eddy current sensor, patented method of master correction of measurement results and special mathematical processing methods of measurement data. Eddy current sensor of measuring system has a narrow sensitivity diagram which allows differentiate profile levels of commutator plates with tangential dimension of 1.5 mm or wider.

'MICROCON' has high protection from external influences (dust, vapor, oil fog, etc.). It allows determination of object micro-movements, specific electric resistances, as well as surface temperature (if temperature via specific electric resistance is known). Non-contact measurement of specific electric resistance is especially important for thin-film structures supervision.

With the help of the designed diagnostic complex and special mathematical processing methods, the unique experimental data concerning the change of commutator profile of high-speed electric machines during the lifetime period, shape and value of bearing vibrations were collected.

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