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В збірнику представлені тези доповідей науково-педагогічних працівників, наукових співробітників, аспірантів та студентів НУБіП України, провідних вітчизняних і закордонних вищих навчальних закладів та наукових установ, в яких розглядаються завершені етапи розробок.

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GENERAL STRUCTURE OF GRAIN HARVESTERS AS SOURCES INCREASED NOISE

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At this time, there has been a significant expansion of grain harvesters of other brands and other producers [1]. So, according to data, the leading exporters of grain harvesters to Ukraine are Case and New Holland, with a frequent import share of 29.5%, and John Deere – 26.9% of the market for imported combines [2]. But in the minds of the Kiev region, as has already been stated, one of the most advanced grain combines among the farming dominions was the KZS-9-1 –“Slavutich” grain combine [3]. In the future, the reduced price - the strength and reliability of the combine have given it an advantage among the farming dominions of the region. The very width of this combine served as one of the main reasons for the introduction of power to combat noise on this machine itself, and even in the era of informational supremacy.

Also, one of the most important warehouses that will ensure improved comfort and mental health for the operating personnel of the combines, and a reduction in noise at the operator’s workplace [4]. In a current combine, as John Deere respects,

the noise level in the middle of the mechanic's cab is supposed to be in the range of 74.3 – 80.1 dB (A), which is installed in line until it is adjusted to a certain extent. presentation machines are in accordance with ISO 5131. Also in Companies respect the amount of noise that lies in the fluidity and strength of the engine, the adjustment of the separator, the field and selective minds, as well as the type of vicorized platform cutter [5]. At that time, according to data from machine testing stations, the sound level in the cabin of combines of the Yenisei family is 79 - 85 dB (testing protocols: 01-43-98, 01-39-01, 01-50-03, 01-39-04, selection and threshing of PPK - 3), and with open windows and doors, the indicators grew even more [6].

Let us now take a look at the currently accepted methods for analyzing the level of noise at the combine operator's working place. It is important to note that the main components of combine noise are: the engine, fan and radiator of the cooling system, working parts and elements of the combine transmission. It is customary to dilute the noise carefully from the middle of the widening of the spring conduits for: a) windings, the transmission of sound from the engine to the point of caution in the interior or through the enclosure structures and b) structural, the viprom. in the presence of noise and vibration of the structure that is being protected. Frequency range of surface and structural noise readings in Fig. 1.

For the theoretical value of the noise levels in the cabin, it is important that, first of all, a mathematical description of the levels of the sound pressure from the skin edge. Equal to the noise in the cabin during the one-hour influx of a large number of jets, which sound is determined by the principle of subsumption. With this approach, it becomes possible to identify contributions from different horns in the sound field of the cabin, as well as to identify significant excesses above the standard values of the corresponding frequency intervals and on this basis to select methods for bringing the noise characteristics and the maximum permissible limits. іВНІВ. For a mathematical description of vibroacoustic characteristics, similar analytical methods and experimental methods are used. Similar analytical methods look at simple structured circuits of the combine, as systems of discrete elements. For example, the affected warehouse noise in the combine cabin is indicated through equal sound pressure to the engine housing, exhaust, and working parts; flattened cabin enclosure elements; average sound absorption coefficient in the cabin, area of the internal surface of the cabin; stand from the working place to the exhaust pipe, the end of the engine, and the working parts; soundproofing of fence elements and additives to soundproofing of fence elements must be carried out by moving the cabin to the sound level; Effectiveness of acoustic screens To reduce structural noise, an acoustic model of the combine cabin was designed in the form of a rectangular parallelepiped. The predetermined structure-based noise reduction system is reduced to the specified amplitude of the vibrations of the substrate, the skin of the walls and the floor of the cabin. To simplify the breakdown of organs, energy methods are used.

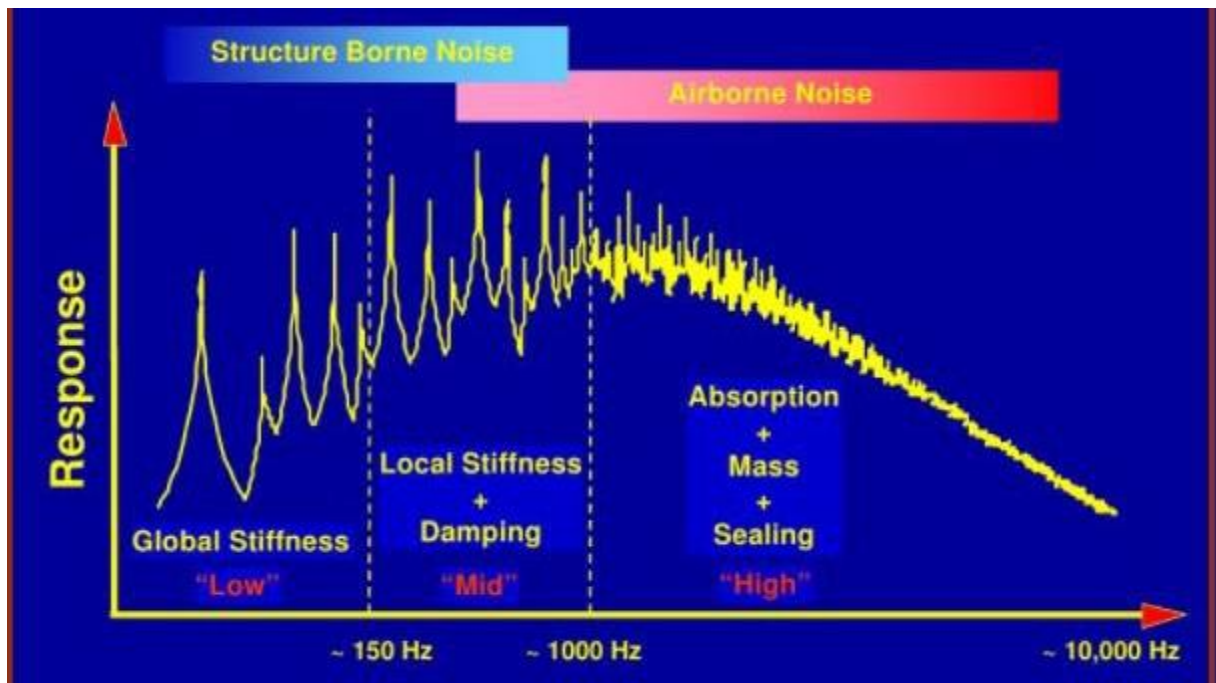


Fig. 1. NVH analysis. Frequency range. 2019 SAE NVC Structure Borne Noise Workshop. All X – frequency, Hz. All Y – sound (sound pressure, dB). The frequency range is divided into low frequencies (up to 150 Hz), mid frequencies (150-1000 Hz), high frequencies (over 1000 Hz). Structure Borne Noise produces noise at low and mid frequencies, and Airborne Noise occurs at mid and high frequencies.

Similar analytical methods make it possible to calculate the level of noise of the approximate deposits from the main cores, but the accuracy of such calculations is low, and the vicorized development models need to be simplified, as they do not solve the folding geometric model. form of knots and parts. Experimental methods are considered important for improving the vibroacoustic characteristics of machines, which is clear. They are based on an energetic method, and all necessary coefficients are determined experimentally. A current approach to established experimental methods is transfer path analysis (TPA). Transmission path analysis is a procedure based on experiments and simulations that allows the flow of vibroacoustic energy from the core, through a number of output transmission paths, to be detected until it is transferred. The aim is to determine the contribution of the skin to the transmission of the device before the intake, then to identify the components of this process that need to be changed to solve the problem – and, perhaps, to optimize the design, not choosing general characteristics for these components. When creating a model for analyzing transmission paths, the system is divided into active and passive parts. The active part is the vengeance of the dzherela, and the passive part is the point of acceptance, in which the voice is vibrating. A consistent link between the active and passive parts, which characterizes the relationship between the receiver and the driver and the transfer function (TF) in terms of noise, also called frequency characteristics of the Vikorist model, sound pressure (sound pressure) at the receiving point You can express it like this:

$$y_k(\omega) = \sum_{i=1}^n y_{ik}(\omega) + \sum_{j=1}^p y_{jk}(\omega), \quad (1)$$

$$y_k(\omega) = H_{ik}(\omega) F_i(\omega), \quad (2)$$

$$y_k(\omega) = H_{ik}(\omega) Q_j(\omega), \quad (3)$$

where $y_k(\omega)$ – the response (sound pressure level) at the reception point k ; $y_{ik}(\omega)$ – contribution of i -th transmission paths of structural noise; $y_{jk}(\omega)$ – contribution of j -th paths of air noise transmission; $F_i(\omega)$ – impact (force) on i -th transmission path of structural noise; $Q_j(\omega)$ – impact (productivity or volume velocity of the source, m^3/s) on the j -th path of air noise transmission; $H_{ik}(\omega)$ – PF i -th transmission paths of structural noise; $H_{jk}(\omega)$ – PF j -th air noise transmission path; ω – circular frequency (rad/s); n – the number of structural noise transmission paths; p – the number of air noise transmission paths.

PF measurement can be performed by direct measurement methods and measurements using the principle of reciprocity. Direct measurements of PF of structural noise are carried out by exciting the structure with a vibrator or a measuring hammer and measuring the sound pressure at the microphone workplace. PF of air noise is measured by sounding the structure using a non-directional "point" source with measurement of sound pressure at the workplace using a microphone. In measurements using the principle of reciprocity, a non-directed "point" source is located at the workplace of the harvester operator, and the response (sound pressure for air noise and vibration speed for structural noise) is measured on the structural elements. In this case, the following ratios are valid for the PF:

$$\frac{P_1}{Q_1} = \frac{P_2}{Q_2}, \quad (4)$$

where P_1 – the sound pressure at the operator's workplace; Q_1 – performance of a non-directed "point" source; P_2 – sound pressure on the structural element; Q_2 – performance of a non-directed "point" source when measured using the principle of reciprocity;

$$\frac{P}{F} = \frac{v}{Q}, \quad (5)$$

where P – the sound pressure at the operator's seat when measured by the direct method; F – impact (force) applied to the structural element; v – vibration speed per structural element; Q – the performance of a non-directed "point" source, the source is located at the workplace of the combine operator.

Measurements based on the principle of reciprocity in many cases have a number of advantages compared to direct measurements. Thus, at the present stage, for the systematization of research and proof of the design, calculation-experimental methods of calculating the sound level at the workplace of the combine operator can be applied, but their application is limited by the need to conduct long-term

experiments.

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