

Measurement of Noise and Vibration at Designed Plants X

Kurbonov Azimjon Zhuraboy coals., Oblakulov Sohob Tolliboy coals.

National Research University "Tashkent Institute of Irrigation and Agricultural Mechanization Engineers", assistant, department of biological railways

Abstract: The article provides information about noise and vibration that occurs in industrial enterprises. By its physical nature, noise is a mechanical oscillatory motion. The main physical parameters of noise are: sound pressure, sound intensity, frequency response of sound. Noise and vibration cause noise and vibration diseases, and this is their complex effect on the central nervous system, motor system and cardiovascular activity of a person. The article provides a description of a portable sound level meter and the results of calculations from fans and draft equipment.

Keywords: Noise, vibration, equipment, fans, parameters, people, noise, vibration diseases.

Introduction. By its physical nature, sound is a mechanical oscillatory movement. Vibrations with a frequency from 20 Hz to 20,000 Hz are perceived by humans as sound. Noise vibration is mechanical vibrations with a frequency from 12 to 8000 Hz.

From the point of view of hygiene, noise is usually understood as a set of sounds that have an adverse effect on a person. All sounds that prevent him from thinking, working, or resting are called noise and vibration. The noise can be of various origins - shock, monotonous, whistling, creaking, etc. The main physical parameters of noise are: sound pressure, sound intensity, frequency response of sound.

Literature review. From literary sources we see that noise and vibration have a negative impact on humans; therefore, the study of the effects of noise and vibration on humans is relevant [1-10].

Noise and vibration cause noise and vibration diseases, and this is their complex effect on the central nervous system, motor system and cardiovascular activity of a person. The normalized noise characteristic at constant noise pressure is the sound pressure levels in decibels in eight octave bands with geometric mean frequencies 63, 125, 250, 500, 1000, 2000, 4000, 8000 Hz. At lower frequencies noise vibration is affected.

Experimental technique. When designing industrial buildings and structures, after their construction, before commissioning in accordance with Construction and Sanitary Standards, noise and vibration measurements are carried out at each enterprise, at all workplaces where there are vibration and noise-active equipment and compared with standard values (Fig. 1), if they exceed, then measures are developed to reduce them.

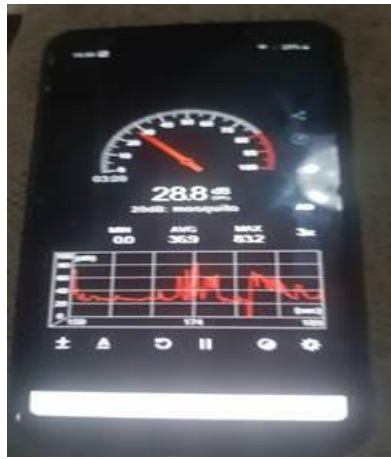


Figure 1. Portable sound level meter for noise measurement

The sources of noise at the enterprise are technological equipment and ventilation and air conditioning systems. There are sanitary protection for people and technical protection for equipment. Protection of people is needed to prevent them from various diseases, this was discussed above. There is technical protection of buildings, structures and equipment to protect them from damage and reduce the impact of, for example, noise and vibration to the occurrence of internal stresses in the metal and cast iron bodies of machine tools, that is, loss of accuracy of this equipment.

Along with this, public buildings located 800 meters from the enterprise are protected from noise, depending on the wind rose for a given area.

Results and its discussion. The sources of noise at the thermal power plant are the draft equipment of the KVGM-50 boiler (open layout). Hydraulic fracturing electric substation "Oktyabrskaya".

The rotating mechanisms of the KVGM-50 boiler are located in an open area .

The total sound power levels in dB of draft equipment are given below in tables 1, 2.

Table 1. Noise generated by the smoke exhauster DN-21 GM

Frequency Hz operating mode	63	125	250	500	1000	2000	4000	8000
Pumping	110	110	115	108	107	100	96	85
Suction	110	105	107	108	107	100	96	85
Corpus	94	100	97	97	97	100	96	85
Total	113	111	116	116	110	105	102	90
	-26	-16	-816	-816	-3	+1	+1	-1
	87	95	107	108	108	106	103	89

The sound power level of the smoke exhauster in dBA is 113 dBA.

The fan sound power level in dBA is 113 dBA.

The total sound power level from draft equipment is:

$$113\text{dBA}+113\text{dBA}=116\text{ dBA}$$

Table 2. Noise generated by fan VDN – 15

Frequency Hz operating mode	63	125	250	500	1000	2000	4000	8000
Pumping	110	112	110	110	110	105	101	96
Suction	110	112	110	110	110	105	105	100
Corpus	94	95	94	94	94	95	90	83
Total	113	115	113	113	113	108	102	101

In accordance with SNiP 11-12-77, the sound pressure level in a building is calculated using the formula:

$$L = L_p - 151gr + 101g\Phi - \frac{Bcr}{1000} - 101g$$

where, L_p - sound power level;

r - distance;

$$\Omega = 2\pi$$

F - 1 for uniform radiation;

B_a - sound attenuation in the atmosphere is taken into account at distances greater than 50 m.

The sound level in a residential building at a distance of 135 m, taking into account its propagation in open space and taking into account attenuation, will be:

$$L = 113 - 151g125 - \frac{3 \cdot 125}{1000} - 8 = 74 \text{ дБА}$$

The permissible level in residential buildings at night is 45 dBA, taking into account the correction for the location of the object of 50 dBA. The excess in residential buildings is 24 dBA. It is necessary to take into account the noise shielding by the building of the main building of about 25 dBA. Taking into account shielding, noise levels in residential buildings will be within the normative limits according to SNiP for residential buildings.

The source of noise is hydraulic fracturing and gas pipelines through which gas passes under high pressure. The noise from hydraulic fracturing depends on the soundproofing properties of the enclosing structures of the hydraulic fracturing building and is insignificant outside it. There are no jobs in this area.

At the Oktyabrskaya electrical substation there are two Transformers with a capacity of 2x16 MBA. The noise level near the station is expected to be within 69 dBA, the acoustic discomfort zone is 150 m, taking into account the spread of noise in open space. Considering the noise shielding of the substation building and thermal power plant in a residential area, the noise from it will be insignificant.

Vibration on the object. All draft equipment and pumps are sources of vibrations. For vibration isolation purposes, this equipment is installed on vibration bases (first on foundations and then on vibration pads). The fans are connected to the air ducts through flexible inserts. Supply and recirculation air ducts, smoke exhausters, fans and pumps are insulated with sound and vibration insulating lining. Electromagnetic fields at the facility. The sources of electromagnetic fields are an electrical substation and high-voltage power transmission lines of 110 kV overhead lines. In the area where high-voltage lines pass, the sanitary protection zone along the 110 kV overhead line on both sides and the distance of its border from the projection of the outermost wires to the ground is 28 m.

Table 3. Calculation of the expected noise level emitted by air conditioners into the environment

Position	Unit change	Geometric mean frequencies of octave bands Hz.							
		63	125	250	500	1000	2000	4000	8000
Air conditioners	dB	97	99	93	87	83	77	73	66
Network losses:	dB	10	10	10	10	10	10	10	10
Conditioning chambers	dB	10	10	10	10	10	10	10	10
Air intake chamber									
LP - E < L pi	dB	77	79	73	67	63	57	53	46

n= 7 10 log	dB	85.5	86.5	81.5	75.5	71.5	65.5	61.5	54.5
Buildings ~ =800 t. 15 lg r		43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5
= 2; 10 lg		8	8	8	8	8	8	8	8
L in work.t	dB	34	35	thirty	24	20	14	10	3
L into the room	dB	24	25	20	14	10	4	-	-
Norm PS-25(-5)	dB	50	39	thirty	24	20	17	15	13
Exceeding the norm		-	-	-	-	-	-	-	-

Conclusions. Having studied the object for the impact on the environment and humans (vibration and noise diseases, hearing loss and other diseases), sources were identified, measurements were taken and calculations were made of the expected noise level from these sources; their value is 77 dBa, which corresponds to standard values - less than 80 dBa .

To prevent noise and vibration from impacting the environment and humans, a number of measures are provided.

1. The technological workshop is designed without windows, as air conditioning will be provided. The distance to public buildings is quite large.
2. To reduce the level of sound pressure of process ventilation and air conditioning, the project provides for the placement of ventilation equipment in separate rooms (ventilation chambers), and dust collection units in filter chambers. The partitions of the chambers are made of brick lined with mineral wool slabs. The equipment is installed on special vibration absorbers, so-called vibration pads. Suction and discharge lines have flexible inserts.

LITERATURE

1. Analysis of optimization of labor protection measures aimed at improving workplace conditions Kurbonov, AJ, Saidxonova, NJ, Oblakulov, ST, Djumakulova, KA, Nazarova, NN E3S Web of Conferences .,2024, 471, 01005
2. Analysis of the optimization of labor protection measures in engineering work Kurbonov, AJ, Yuldoshev, OR, Saidxonova, NJ, Oblakulov, ST, Djumakulova, KA E3S Web of Conferences., 2023, 443, 04013.
3. Karagodin L. _ N. _ Zh ravlev V.P. On the creation of the physical foundations of the dust equation. - "Occupational Safety in Industry", 2001 No. 5
4. Tikhomirov V.B Planning and analysis of the experiment. M. "Light Industry", 2004
5. Shakirzyanova L.G. Pasyнкеev A.A. Bobylev M.B. On the issue of assessing the safety of rental equipment. -In the book: Occupational health and safety in ferrous metallurgy. Issue 4.M. 2006