EXPERIMENTAL STUDY OF THE CHARACTERISTICS OF THE NOISE DIAGNOSTICS SYSTEM MODEL OF THE HEAT-AND-POWER OBJECTS

Polobyuk Tatiana Anatolievna2, **Beregun V.S.**[1]

[1] – *NTUU «Igor Sikorsky Kyiv Polytechnic Institute», Kyiv, Ukraine*
e-mail: viktorberegun@i.ua

[2] – *Institute of Engineering Thermophysics of NAS of Ukraine, Kyiv*
tel. (044) 453-28-57, e-mail: polobyuk@gmail.com

Objective. The noise diagnostics system of heat-and-power objects is an information-measuring system that is characterized by quality and accuracy of measurements. In this regard, for the developed layout of the system, it is necessary to obtain the characteristics of the hardware.

Results. The construction of noise diagnostics systems according to the modular principle allows the use of standardized and unified elements, which increases the reliability of systems, reduces the time and cost of their design. The basic elements of the developed system are: electro-acoustic transducers, a matching amplifier (charge amplifier), a filter, an ADC, a processing unit implemented on a PC. In the processing unit, on the basis of statistical methods and algorithms for digital signal processing, the array of input data is converted into an array of diagnostic parameters related to the state of the diagnostic object. Since the proposed diagnostic system consists of elements from different manufacturers, it is necessary to obtain characteristics of the elements of the system when they work together.

It is established that the gain of the charge amplifier is 24 dB. The amplitude-frequency characteristic of the electrical path was obtained. The intrinsic noise of the system is investigated. With a uniform 14-bit quantization in the input voltage range of ± 1.25 V, the standard deviation of the quantization error is 22.1 μV. The dynamic range for input voltages within ± 1.25 V was as follows: a harmonic signal – 65 dB, a Gaussian signal – 53 dB. The spectral density of the noise of the measuring path is almost constant in the frequency range up to 10 kHz and is equal to 24 dB/Hz. Verification of the digital channel showed that with the installation sampling frequency of 200 kHz, the bias of the main frequency did not exceed 0.1%. Parasitic inter-channel transmission does not exceed the error of the ADC conversion.

Conclusions. The developed model of the noise diagnostics system of heat-and-power objects is suitable for multichannel study of fluctuation and rhythmic signals arising from the operation of heat-and-power equipment in the range up to 10 kHz. In the future, it is necessary to test performance on real objects.