Methodology for investigating acoustic field distribution in power plants of complex spatial structure

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The dissertation is a trial of solving the problem of deficiencies of methodology for determination of acoustic field distribution in power plants of complex structure, especially in closed areas.

The presented testing methodology defines the range of its application as well as the range of use of the classical methods. The author's methodology is an adaptation of the sound intensity method to take measurements of complex sound sources. The guidelines as regards acoustic measurements and structure of calculation model were presented.

A verification of the dissertation thesis was carried out for the typical power plant. Three series of acoustic measurements were taken: the first series for turbogenerator load equal to 100 [%] PN, the second series for load 60 [%] PN and the third series of measurements of the acoustic background. Besides, three acoustic models were created to assess the classical methods and to compare them with the author's methodology: model PN-IEC 1063:1996, model PN-EN ISO 3744:1999 and the author's model. Each of the models was created for nominal power and minimal power. Besides, series of continuous measurements were taken, including the measurements during a warranty startup of the turbogenerator.

The verification tests enabled to confirm the set thesis. The use of author's methodology enabled the author to obtain, through numerical calculations, the acoustic filed distribution that was closer to real distribution, when comparing the results with the results of classical methods.

It was proved that use of the sound pressure method for testing sound sources in power plants of complex spatial structure leads to errors, making proper determination of acoustic field distribution impossible.

Keywords: sound intensity method, sound pressure method, distribution of acoustic field, calculation model, power plants of complex spatial structure.