RESEARCH OF ACOUSTIC CHARACTERISTICS STABILITY OF THE STAND FOR TEST HYDROEQUIPMENT.

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ABSTRACT

Object of researches was a stability of characteristics of test hydraulic system with pumps for checks of samples of hydraulic devices on hydrodynamical noise (HDN). The test system has long pipelines of a complex configuration and regulating armature throttle valves. At long work of the stand as a result of heating a working environment inevitably there should be an allocation of air dissolved of it in a disperse phase. Bubbles are collecting in air bags, for example, in a cavity of the valve, change acoustic resistance of a liquid path of the pipeline. It in turn should result in change of own frequencies of fluctuations of a liquid path of the pipeline and factors of transfer on the path of acoustic energy of a source. To check up a degree of stability of acoustic characteristics of the stand, was produced a series of measurements with a long interval , on the same mode , at the same variant of a set of the equipment during a labour shift. Results of measurements show, that at long work of the stand its acoustic characteristics can spontaneously vary in rather wide limits, especially on discrete frequencies. Even in rather wide strip, in a 1/3-octave, the size of instability can leave far beyond allowable confidential probability of acoustic measurements.

To provide an opportunity more or less long work on the test system on measurement HDN necessary its modernization is represented. Ways of the modernization was offered.

INTRODUCTION

Research of vibro-acoustical characteristics (VAC) modern armature and the hydroequipment should be carried out at hydraulic stands. Usually, the stand has a long pipelines of a complex configuration. Of inevitably, at long work of the stand, a heating of a working environment is reason there should be an allocation of dissolved air in a disperse phase. The air is collecting in air bags, for example, in a cavity of the valve, and it's deforming acoustic resistance of a liquid path of the pipeline. It in turn should result in change of frequencies own fluctuations of a liquid path of the pipeline and factors of transfer on a path of acoustic energy of a source. All that are changing a degree of stability of acoustic characteristics of the

stand. The stand of concern "Aurora" have only two a points of ventilation in system , one of them is in a test room, on a branch with Dy150 mm, and the second - in a pump room where is vibroinsulator. At such complex and extended configuration of pipelines of these points of ventilation it was represented obviously insufficient and should be a test of stability of acoustic characteristics of the stand.

1. THE DESCRIPTION OF TEST OF STABILITY OF ACOUSTIC CHARACTERISTICS OF THE STAND

To check up a degree of stability of acoustic characteristics of the stand, with a long interval, a series of measurements on the same mode was carried out, at the same variant of a set of the bench equipment during a labour shift. On fig. 1 spectrum of the maximal and minimal values from five direct measurements hydrodynamical noise - HDN during a labour shift.

The spectrum is submitted in a range up to average frequencies (up to 1600 Hz) in which in the greatest image changes in frequencies of own fluctuations on a liquid path of pipelines owing to occurrence and wandering on system of uncontrollable volumes of air affect.

The difference in levels of the maximal and minimal values on some frequencies makes more than 20 dB. The greatest sizes take place on discrete frequencies, except for frequency of 246 Hz - paddle-type frequencies of the pump [1].

Measure of disorder from average value, the standard deviation of results of measurement, is shown on fig. 2.

The greatest deviations are observed also on discrete frequencies. It is represented quite explained since they most soon and are own frequencies of system.

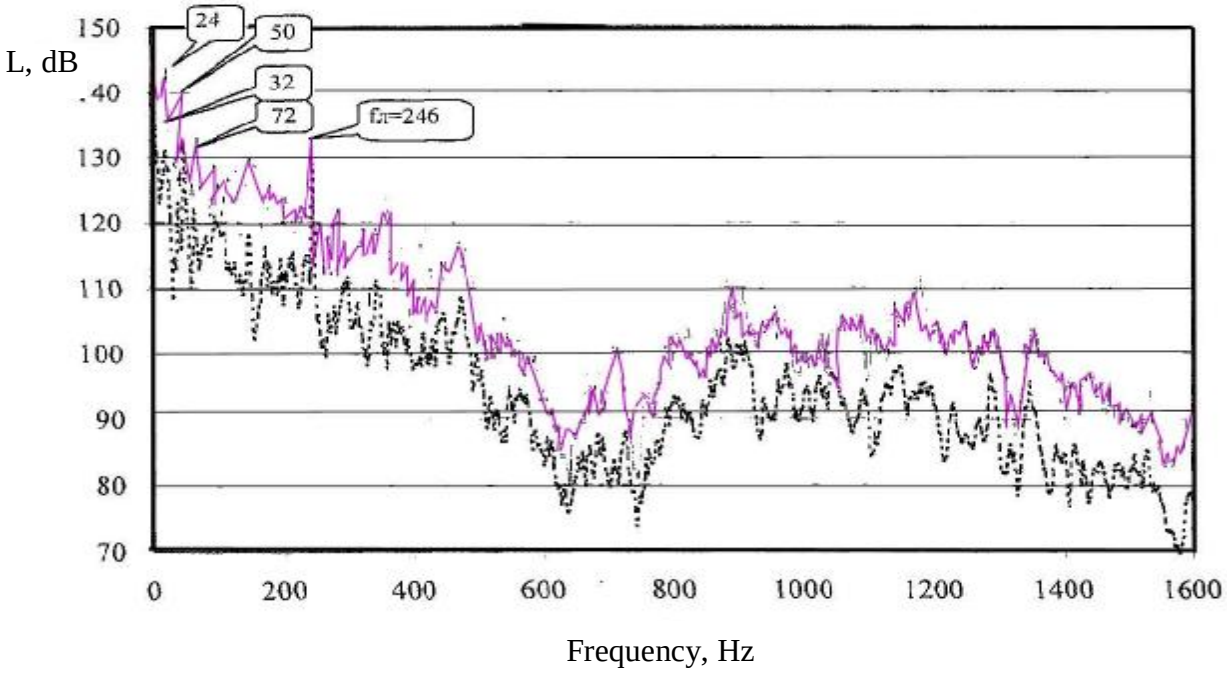

Figure 1. Spectrums of maximal and minimal values HDN in a point on the pipeline, measured during day on one operating mode of the stand (band of analyzing - 2 Hz).

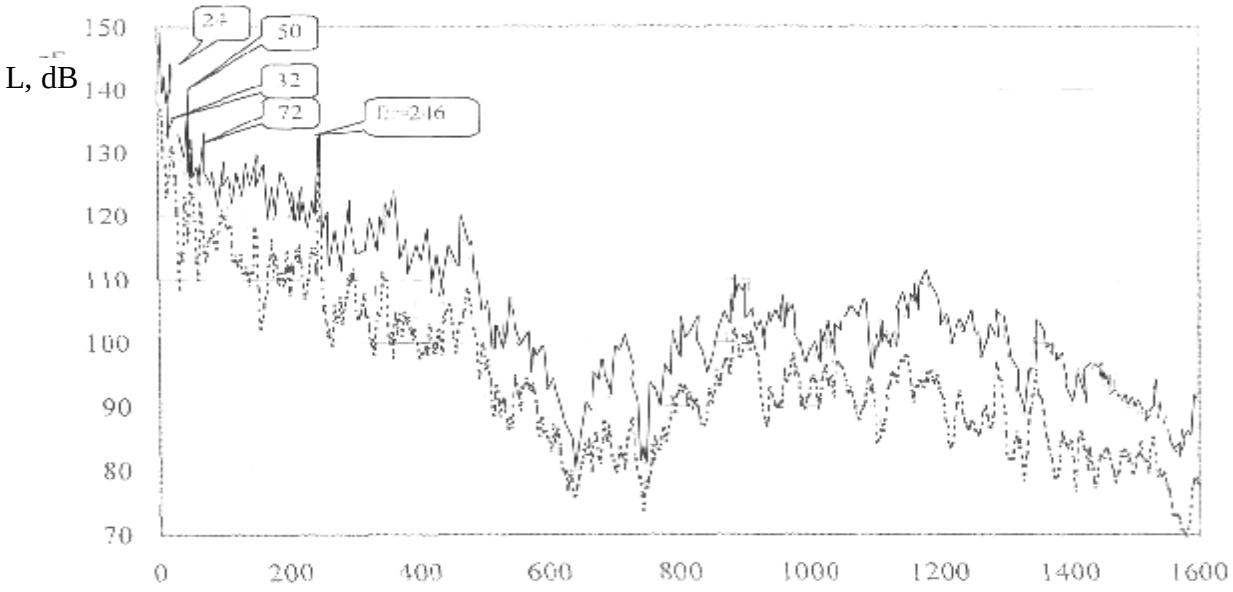

Figure 2. Spectrum of a standard deviation of measurements HDN in a point on the pipeline, measured during day on one operating mode of the stand (band of analyzing - 2 Hz).

Size of instability in wider, than 2 Hz, a band, for example in a 1/3-octave, is other (fig. 3).

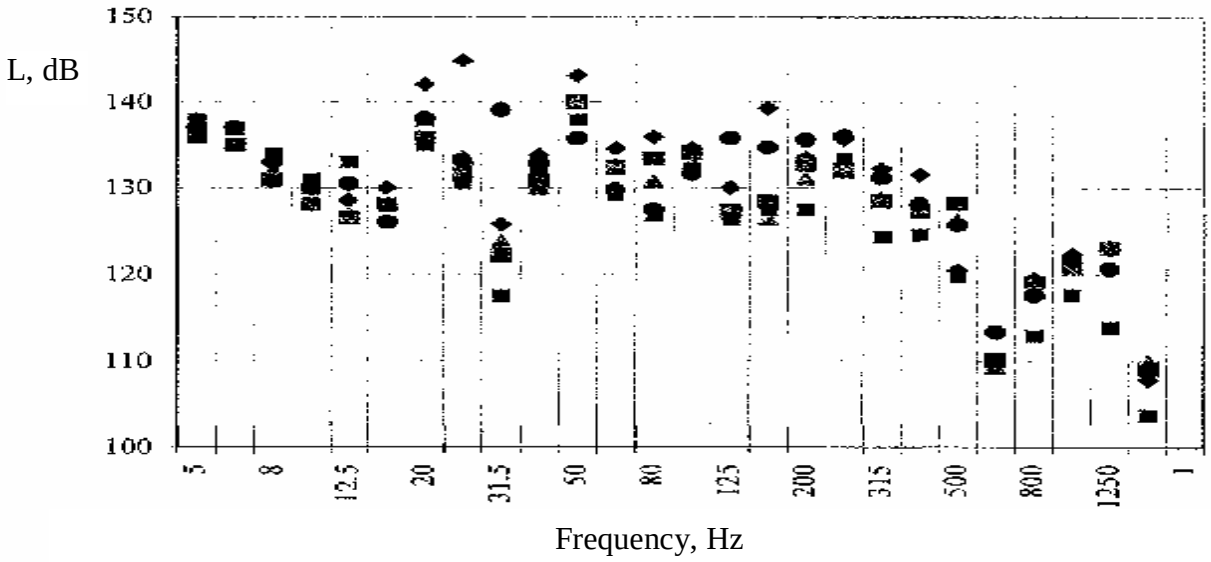

Figure 3. Spectrum of HDN in a point on the pipeline, measured during day on one operating mode of the stand (band of analyzing – 1/3 octave bands).

The standard deviation in a band of a 1/3-octave is resulted on fig. 4.

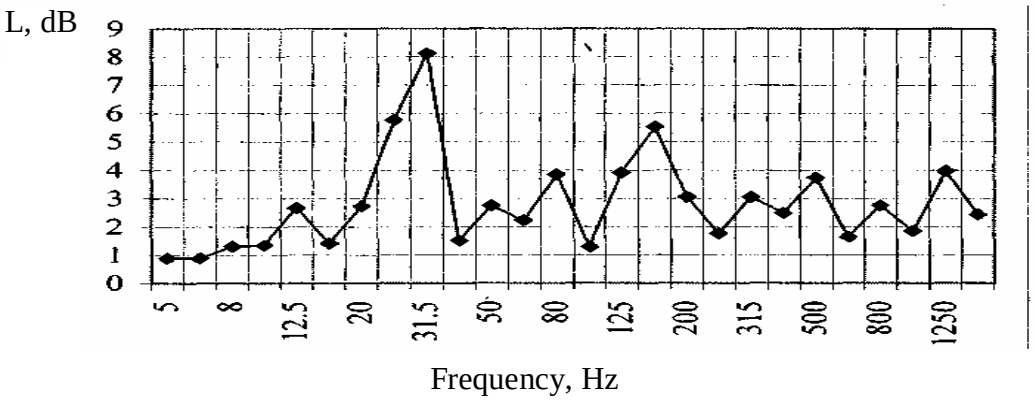

Figure 4. Spectrum of a standard deviation of the measurements in a point on the pipeline, measured during day on one operating mode of the stand (band of analyzing – 1/3 octave bands).

The size of a confidential interval of sample with 95 %-s' reliability according to measurements in a 1/3-octave is resulted on fig. 5.

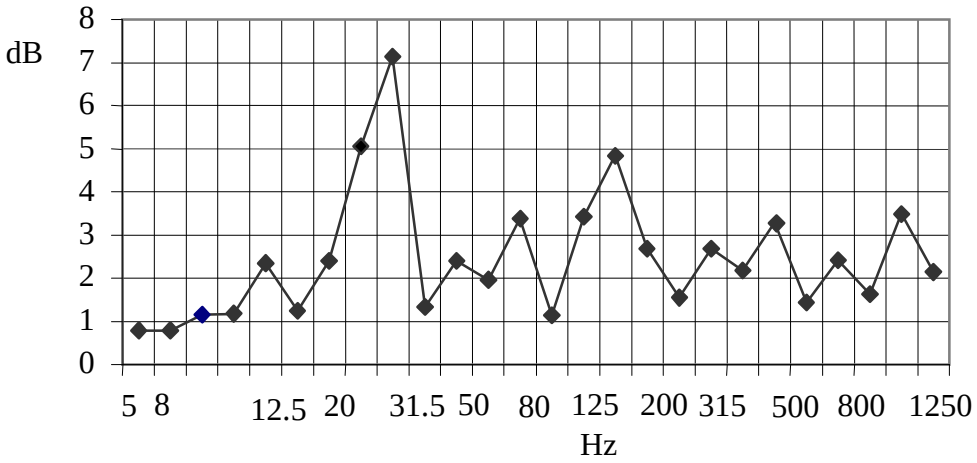

Figure 5. A confidential interval with 95 %-s' reliability in a point on the pipeline measured HDN of 5 times on one operating mode of the stand (band of analyzing – 1/3 octave bands).

CONCLUSIONS

Results of measurements show, that at long work of the stand its acoustic characteristics can spontaneously vary in rather wide limits, is especial on discrete frequencies. Even in rather wide band of analyzing, in a 1/3-octave, the size of instability can leave far beyond allowable confidential probability of acoustic measurements.

To provide an opportunity more or less long work on the test bed on measurement HDN necessary its modernization is represented. In order to prevent occurrence and wanderings of uncontrollable volumes of air on system in it should be established special traps which from time to time during measurements should be ventilated.

REFERENCES

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2. Berestovitsky E.G., Gladilin U.A., Korchanov V. Low level of noise, as criterion of estimation quality of designing the hydrodevices, Proceedings of 30 the International Congress and Exhibition on Noise Control Engineering “Internoise - 2001”, Den Haag, Holland, 2001 August 27 -31.