Looking more closely at Fig. 7a and b, it can be seen the deposited fibrous SPP acted as a plaster covering the cake voids, leading to a de- crease in the permeability of mud cake, and subsequently, the dramatic improvement in the filtration behavior.

The presence of 3wt % of the SSP in the fluid significantly improved the fluid's yield stress and consistency index by 223.3% and 94.4%, respectively compared to those of the base mud. The filtration performance and cake formation results confirmed a 45% enhancement in the permeation barrier behavior of the fluid containing 3wt % SPP powder. Furthermore, having SPP as an organic green additive would leave no damaging effects on the surrounding environment and ecosystem.

References

1. Davoodi S. et al. Application of a novel acrylamide copolymer containing highly hydrophobic comonomer as filtration control and rheology modifier additive in water-based drilling mud //Journal of Petroleum Science and Engineering. – 2019. – T. 180. – C.747-755.
2. Davoodi S. et al. A novel field applicable mud formula with enhanced fluid loss properties in high pressure-high temperature well condition containing pistachio shell powder //Journal of Petroleum Science and Engineering. – 2018. – T. 162. – C.378-385.
3. Ghaderi S. et al. Application of sustainable saffron purple petals as an eco-friendly green additive for drilling fluids: A rheological, filtration, morphological, and corrosion inhibition study //Journal of Molecular Liquids. – 2020. – T. 315. – C. 113707.

INVESTIGATION OF THE STRESS-STRAIN STATE OF THE PROCESS PIPING OF THE COMPRESSOR STATION UNDER THE DYNAMIC LOADS

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During the operation of the compressor station on the technological piping of the gas compressor unit (hereinafter GCU), in addition to the static load from the pressure of the transported gas, there is a dynamic vibration load transmitted from the gas compressor unit [1].

In this work, the pipeline fittings of the gas compressor unit, modeled in the software, were analyzed for static and dynamic loads. The mean square value of the vibration velocity and changes in the elevations of the pipeline over time at characteristic points were also experimentally determined. Also, a dynamic analysis of pipeline fittings was carried out when setting the operating pressure in the frequency range from 0 to 2000 Hz, as a result of which the most dangerous point of the GPA pipeline fittings and ways to reduce this load were determined, taking into account damping properties.

During the operation of the gas compressor unit, dynamic loads occur, presented in the form of vibration, which reduces the reliability of pipeline valves. These loads can be expressed in terms of RMS vibration velocity at characteristic points of the GPU. Figure 1 shows the points on the supports where the root mean square velocity was measured.

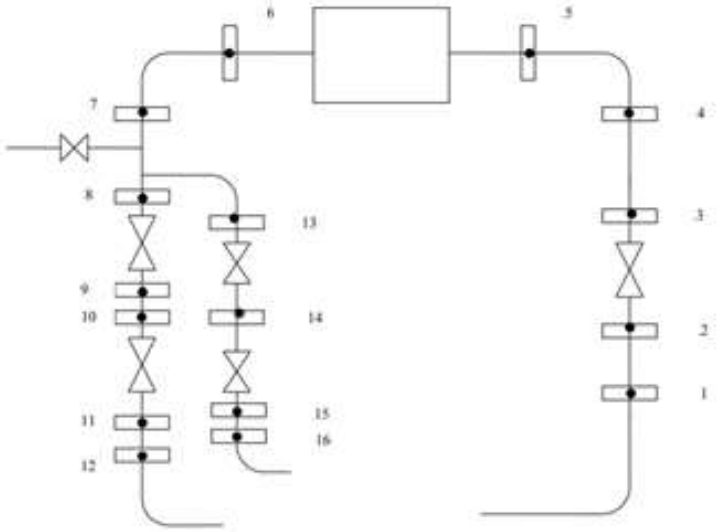

Fig. 1. Scheme of point location for measuring vibration of piping supports

Based on the results obtained empirically, a graph of the RMS vibration velocity at characteristic points was built.

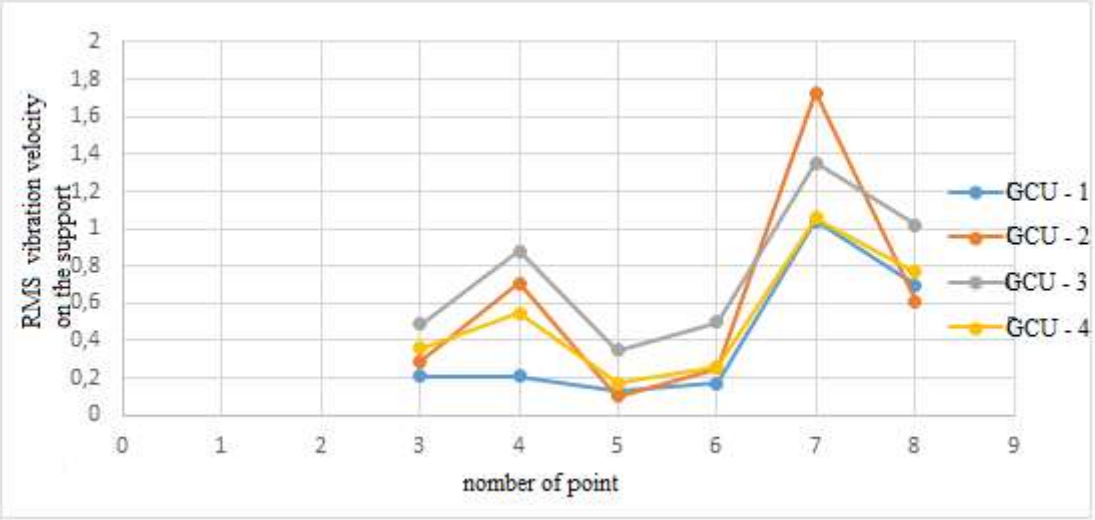

Fig. 2. Vibration velocity RMS at characteristic points

For this purpose, the working pressure pulsation (5.4 MPa) was set in the frequency range from 0 to 2000 Hz

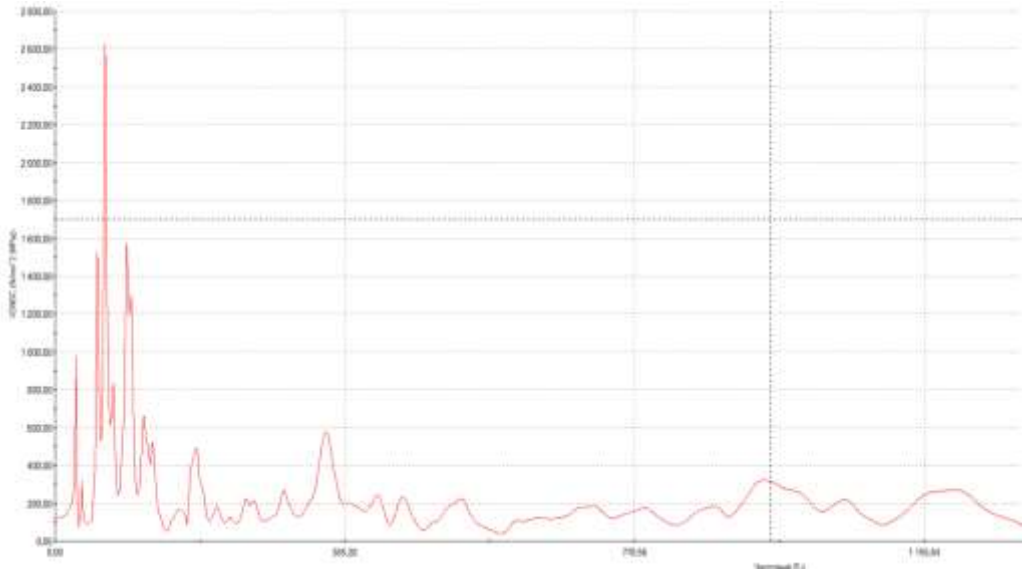

Fig. 3. Frequency response of piping

As can be seen from the graph, the maximum stresses arising in the PCS are in the frequency range from 4 to 200 Hz. It can be concluded that the optimal operating mode of the piping lies in the range from 200 to 2000 Hz. As a consequence, this model makes it possible to determine the frequency range in which the lowest stresses occur, as well as the local areas of these places, which are the most dangerous and require special attention.

References

1. Diagnostirovanie sostoynia tryboprovodnx obvyazok kompresornx stanziy / Ramazanov R.M., Ramazanov R.M., Gubaidullin K.Zh. // Zhur. «Dostizenie nayki I obrazovania», 2020, № 2, c. 5-11.
2. CTO Gasprom 2-2.3-324-2009 Diagnostirovanie vibrojbsledovanie texnologicheskix truboprovodov kompresornx zexov c zentrobezhnmi nagnetatelyami.
3. Bruyaka V.A.. inzenernsi analiz v ANSYS Workbench: Yhebnoe. pocob./ V.A. Bruyaka, V.G. Fokin, E.A. Solduova, N.A. Glazunova, I.E. Adeyanov. – Samara: Samar. gos. texn. yn-t, 2010. – 271c.