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ANALYSIS OF RESULTS OF APPROXIMATE ESTIMATE OF REDUCING CYCLIC LOADING WHEN USING VARIABLE FREQUENCY DRIVE OF MAIN PUMPS ON OPERATED OIL PIPELINES

Background

One of the ways to regulate the mode of oil pumping through main oil pipelines is the method of cyclic pumping. This cyclically changes the pressure in the pipeline, and the pipe metal of main pipelines operates under loading that cyclically changes due to the internal pressure change. The use of variable frequency drive (VFD) reduces the cyclicity of the pipeline loading. In general, the calculations for the reduction of cyclic loading can only be performed with the use of algorithms to determine the frequency of pump unit rotation, significant baseline data and special computer programs.

Aims and Objectives

To develop a simplified evaluation method (forecasting) of cyclic loading during operation of the pipeline using a VFD, convenient in engineering practice.

Methods

The method of approximate estimation of the process area cyclic loading reduction, used in assessing the effectiveness of VFD application.

Results

Results of calculations for the prediction of cyclic loading in the case of using VFD on oil pipelines operated at present without VFD. To perform the calculations by the approximate method information on compliance with the modes of operated pipeline is sufficient. The coefficient of cyclic loading reduction was calculated for 65 technological areas. The range of obtained values of the cyclic loading reduction coefficient is wide: from 1.00 to 789.73. For most technologic areas the values of the coefficient of cyclic loading reduction are close to unity. This means that cyclic pumping in such technological areas is almost never used, and installation of variable frequency drive (VFD) does not change the failure rate and repair costs of the pipeline. In 24 technologic areas the values of the coefficient of cyclic loading reduction exceeds 1.5. For such technologic areas, it is expedient to continue research and calculations to make decision about efficient use of VFD. It is shown that in linear approximation of exponential distribution of failure rate the relation between the failure rates of aging oil trunk pipelines in operation without VFDs and with VFDs is approximately equal to the value of the coefficient of cyclic loading reduction.

Key words: variable frequency drive, main pipeline, main pump, cyclic loading, pressure change

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