DYNAMIC AND STATIC MODES OF ELECTRIC DRIVE OF ROD DEEP-WELL PUMPING UNITS

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Sucker rod oil pumps are used for producing oil in most Ukrainian oil fields. The major way of ensuring trouble-free operation and enhancing oil production efficiency is computer control of the work of each pumping unit on the basis of reliable algorithms. Particularities of oil pumping unit electric drive include considerable inertia of the moving mass, variable moment of inertia and cyclical law of load moment change. As a result, processes in the electric drives of oil pumping units are dynamic both in the starter modes and in the stationary ones. Taking into account the wide range of change of crank counterbalance oscillation frequency, it is important to determine which of the operation modes can be regarded as quasi-static, and for which such an assumption results in significant errors. This problem has a big practical value, since the analysis of dynamic modes of oil-pumping unit operation requires applying quite complicated mathematical models, and if the problem is treated as static, the unit operation can be controlled using simple mathematical models.

The paper solves the problem of determining for what rotary speed of the crankshaft static equations are applicable and in what cases such an assumption causes serious errors, and dynamic equations should be used instead. It is proposed that a decision on the applicability of static equations should be made on the basis of standard deviation between the load moment and electromagnetic torque. The paper offers dependence of standard deviation in percents on the rotary speed of the crankshaft for the normal mode of the unit operation. This dependence is proposed for determining the applicability of static equation in the control algorithm to analyse the work of the oil pumping unit.