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ANALYSIS OF FACTORS INFLUENCING IN BRINGING OPERATING INDICATORS OF CENTRIFUGAL SEDIMENTATION PUMPS TO STABLE MODE

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Abstract:

This article presents the results of monitoring and analyzing the performance indicators of centrifugal submersible pumps used in oil wells when they are stopped under the action of well pressure, as well as when centrifugal submersible pumps are stopped due to technical and geological conditions, and the degree of influence of the flow direction device on the heating temperature of the pump, preventing overheating of the submersible electric motor of the pump.

Keywords: Oil, well, centrifugal pump, steady state, product, flow, formation fluid, dynamic mode, level, system, multiphase mode, improvement, automation, electric motor, killing fluid.

INTRODUCTION

One of the most notable trends in mechanized oil production over the past decade has been the increased use of electric-driven centrifugal pumps (EDPs) over other oil production methods. The number of operating wells using these devices worldwide increased by 15% between 2008 and 2019. The primary stage of EDP commissioning is to bring the well to stable operation. The primary goal of this stage is to maintain the EDP's operating life and prevent complications, failures, and emergencies.

PURPOSE AND OBJECTIVES OF THE WORK.

To increase the performance and efficiency of the pump unit during the commissioning of the MQCHEN , it is important to simultaneously study and improve the technological process of the MQCHEN operation in a stable operating mode , develop and modernize technical devices for stabilizing the dynamic fluid level and cooling centrifugal electric motors. It is also important to create automatic monitoring and control systems for the operation of the MQCHEN in wells equipped with MQCHEN, taking into account the influence of changes in reservoir productivity and the characteristics of the produced fluid on the operating parameters of the pump unit [1].

The issues of increasing the efficiency of the MQCHEN and BIR during operation were considered at various times by Vedernikov Yu. A., Guk V. Yu., Ivanovsky V. N., Konoplya D. V., Listritsky V. M., Maltsev N. V., Mishchenko I. T. and others. The main decisions aimed at increasing the efficiency of the MQCHEN were related to the development, design and improvement of the efficiency of technical devices (for example, gas separators), technological systems, in particular, the supply of reagents to the inlet of the centrifugal electric pump drive, automation systems (control stations with intelligent algorithms) and control and management systems (decision support systems - DMS). However, there was no comprehensive solution that would include the introduction of technical devices, information systems and the improvement of the well commissioning process itself.

Aminev M.Kh., Davletov I.Ya., Polyakov D.B. etc. issues of improvement of technical systems to stabilize the working regime of MQChENs were considered. The authors proposed dynamic level control systems based on the monitoring of pressure measurements in the well annulus. However, the indirect dynamic level determination based on the pressure values in the well annulus may not be accurate enough, so the

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development of a system that can monitor the dynamic fluid level is an urgent issue.

RESEARCH METHODOLOGY

To determine the laws of influence of the efficiency coefficient and the properties of the suppressing fluid on the change of the working parameters of MQChEN during the commissioning of scientifically based technological and technical solutions for the development of a device with a fluid flow converter and a dynamic fluid level stabilization system to limit the increase in the temperature of a centrifugal sedimentation electric motor.

Modeling the temperature regime of the centrifugal electric motor and the formation of multiphase fluid flow in the non-stationary operating mode of the formation and during well start-up, taking into account the changes in the production coefficient of the suppressant fluid and the formation, and subsequently equipping the well with a cooling device for the electric motor with a flow diverter.

ANALYSIS AND RESULTS

1. Analysis of the impact of complicating factors on the operation of centrifugal submersible pump units during well commissioning. Study of the temperature profile of the pump assembly when driving liquids with variable properties under non-stationary well operating conditions.

Development of a numerical model of the well operation process with a wellhead , including an improved integrated mathematical model of the operation of a centrifugal submersible electric motor pump for non-stationary operation in a layer-well-wellhead system .

3. Development of a device for stabilizing the dynamic fluid level in a well equipped with a centrifugal submersible electric motor pump during the transition to a stationary operating mode.

4. Development of a device with a fluid flow converter to limit the rise in temperature of the submersible electric motor by forced flushing during well start-up.

5. Development of recommendations based on the improvement of the technological process of starting submersible electric motor pumping systems, changes in formation productivity and the influence of driven fluid properties on MQChEN operating parameters[1].

CONCLUSIONS AND SUGGESTIONS

The theoretical significance of this study is to determine the laws of multiphase fluid flow in the formation-well-MQCEN system during temporary formation and well operation, taking into account the removal of the suppressing fluid and changes in formation productivity. The study also studied the laws of temperature development of the sedimentary electric motor during temporary formation and well operation during well rise, as well as the temperature profile of the motor when the well motor is equipped with a cooling device and a flow diverter.

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