Results of Investigations of the Recovery Factor of Stratum B₂ of the Zol’nen Field by the Flooded-Zone Method (Isochrons of Flooding)

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During production it is generally not possible to follow the water-oil interface in observation wells after passage of the injection front because of the limited number or absence of such wells. In this connection, various approximate methods are used to monitor the processes of flooding, in particular, the method of investigation of recovery factor by zones.

Recovery factors of individual flooded zones were examined by V. I. Kolganov (1) in the example of stratum B₂ of the Zol’nen field. In the works of M. L. Surguchev and A. P. Morgunov (2, 3) the idea of analyzing the working of pools according to zones of flooding was further developed. These studies led to proposal of a method of studying recovery factor and extent of flooding which can be called the method of flooded zones or isochrons of flooding. This method is used to analyze the current status of the working of the pool and for estimating recovery factor. In this connection it is necessary to use all available geological and production information, particularly the map of movement of the internal margin of the pool (map of flooding) and the map of initial oil-saturated thickness of the stratum.

Investigation of the process of flooding using the method of flooded zones for blanket type pools is carried out in the following succession. On the map of movement of the internal margin of the pool, zones of flooding are marked off successively to \( n \). The boundaries of each zone are two successive positions of the internal margin of the pool plotted on the map at 1-2 year intervals.

The first zone in the series of 1, 2, 3...\( n \) is the outer zone of the pool between the external and internal margins of the pool. The map of flooding of the pool with the zones marked off is superposed onto the map of initial oil-saturated thickness of the stratum. On a basis of the composite map and production data, the following are determined:

1) Zonally increasing area of the purely oil part of the pool \( S_o \) that is embraced by flooding along the trend:

\[
S_o = \sum_{i=2}^{n} \Delta S_{oi}
\]  

where \( \Delta S_{oi} \) is the area of one zone.

2) Zonally increasing initial oil-saturated volume of flooded part of pool \( V_{si} \):

\[
V_s = \sum_{i=1}^{n} \Delta V_{si}
\]  

where \( \Delta V_{si} \) is oil saturated volume of one zone.

3) Zonally increasing initial geologic reserves of oil in part of field flooded \( N_{si} \):

\[
N_s = \sum_{i=1}^{n} \Delta N_{si}
\]  

where \( \Delta N_{si} \) is geologic reserves of a zone.

4) Increasing (accumulative) yield of oil from pool on each date at which the position of the front of injection is determined.

\[
Q_n = \sum_{i=2}^{n} \Delta Q_{Hi}
\]