illustrates the confusion matrix for classification process based on ANN classifier. The central diagonal of confusion matrix, shows the percentage of correctness in classification results for analyzed formations.

Predicted

Actual	Bazhenovskaya	Georgievskaya	Kiyalinskaya	Kulomzinskaya	Paleozoic	Tarskaya	Tumenskaya	Vasuganskaya	Σ
Bazhenovskaya	92.1 %	2.0 %	0.0 %	2.0 %	0.0 %	0.0 %	2.8 %	1.0 %	492
Georgievskaya	10.6 %	61.7 %	0.0 %	20.2 %	0.0 %	0.0 %	1.1 %	6.4 %	94
Kiyalinskaya	0.0 %	0.0 %	94.7 %	3.2 %	0.0 %	1.6 %	0.3 %	0.2 %	14058
Kulomzinskaya	0.1 %	0.0 %	12.1 %	84.8 %	0.0 %	1.3 %	1.0 %	0.6 %	5080
Paleozoic	0.0 %	0.0 %	0.0 %	0.0 %	93.0 %	0.0 %	6.9 %	0.1 %	3047
Tarskaya	0.0 %	0.0 %	43.5 %	11.2 %	0.0 %	44.3 %	0.5 %	0.4 %	1405
Tumenskaya	0.1 %	0.0 %	0.6 %	1.3 %	1.2 %	0.1 %	92.6 %	4.1 %	6665
Vasuganskaya	0.7 %	0.7 %	7.6 %	5.7 %	0.2 %	0.9 %	34.2 %	49.9 %	1519
Σ	486	82	14699	5115	2918	935	7024	1101	32360

a)

Predicted

Actual	Bazhenovskaya	Georgievskaya	Kiyalinskaya	Kulomzinskaya	Paleozoic	Tarskaya	Tumenskaya	Vasuganskaya	Σ
Bazhenovskaya	94.7 %	1.2 %	0.0 %	1.4 %	0.0 %	0.0 %	2.2 %	0.4 %	492
Georgievskaya	8.5 %	70.2 %	0.0 %	7.4 %	0.0 %	0.0 %	7.4 %	6.4 %	94
Kiyalinskaya	0.0 %	0.0 %	91.8 %	3.7 %	0.0 %	3.8 %	0.3 %	0.5 %	14058
Kulomzinskaya	0.1 %	0.1 %	9.5 %	85.9 %	0.0 %	2.3 %	1.1 %	1.0 %	5080
Paleozoic	0.0 %	0.0 %	0.0 %	0.0 %	97.8 %	0.0 %	2.2 %	0.0 %	3047
Tarskaya	0.0 %	0.0 %	35.0 %	8.3 %	0.0 %	55.4 %	0.8 %	0.6 %	1405
Tumenskaya	0.1 %	0.2 %	0.7 %	0.9 %	1.1 %	0.1 %	91.7 %	5.2 %	6665
Vasuganskaya	0.2 %	0.5 %	4.0 %	2.8 %	0.3 %	1.5 %	22.3 %	68.3 %	1519
Σ	485	95	13985	5126	3060	1452	6637	1520	32360

b)

Fig.3 Confusion matrix a) for ANN classifier; b) for cascade network

The worst result was obtained for deposits associated with: vasuganskaya - 49.9%; taraskaya - 44.3%; and georgievskaya - 61.7% formations. This result can be explained for georgievskaya formation by low numbers of points that were used for training network. Georgievskaya formation has the smallest thickness against the other analyzed formations.

The best results were obtained for deposits of the kiyalinskaya formation - 94.7%, paleozoic deposits– 93%, tumenskaya – 92.6% and bazhenovskaya – 92.1%, and also deposits of the kulomzinskaya formation - 84.8%. For the deposits of vasuganskaya and tarskaya formations the same trend was observed that the greatest number of wrong classified points are relate to formations the are overlaying or underlying the analyzed one. Therefore, 34.2% of the data points of vasuganskaya formation deposits were erroneously referred to tumenskaya formation and 43.5% data points of tarskaya formation were wrongly classified as deposits of the overlying kiyalinskaya formation, and 11.2% to underlying kulomzinskaya formation. The next type of classifier is a cascade network. This type of classifier not only shows best results for high-scale classification process, but also has the fastest speed of training. Therefore, it was needed less time for training process and this make this classifier even more suitable. The classification accuracy for the cascade of networks is shown in Figure 3b. Therefore, in comparison with the previous classifier based on single complex ANN, the classification accuracy has increased particularly for all classes. However, for the deposits of kiyalinskaya formation accuracy decreased by 2.9%, however still has the value of 91.8%. The accuracy for previously worth classified formation such as vasyuganskaya, tarskaya and georgievskaya formations was estimated as 68.3%, 55.4% and 70.2%, respectively.

Artificial neural network is a useful tool for creating automatic formation classification based on well logging data analysis. The results of current project show that almost all formations were classified with sufficient accuracy. More over the use of cascade classifier increase the speed of training and improve the results of classification process.

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INTEGRATED ASSET MODELING AND DEVELOPMENT OPTIMIZATION OF A SECTOR OF OIL-GAS CONDENSATE FIELD X

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This project is dedicated to optimizing the development of the X field sector (Kazan Oil and Gas Condensate field) using an integrated asset modeling. Field X has two separately developed formations. The refusal of joint operation of formations (having a similar character of saturation and close hypsometric marks) is caused by a significant difference in both the physicochemical properties that saturate the hydrocarbon fluids and the petrophysical properties of the objects under consideration. [3]

In the overlying reservoir, an oil reservoir (volatile oil) has been identified, and in the underlying reservoir, an oil and gas condensate reservoir with a gas condensate cap. The very low viscosity of oil and the relatively high permeability of the U_1^1 reservoir determine by almost an order of magnitude the higher mobility of its oil compared to the U_1^2 reservoir. [5]

In general, the field has a single joint site for the collection and treatment of oil and gas. 80% of the initial reserves are concentrated in the underlying reservoir. [1]

Therefore, the development of these reservoirs should be designed in such a way as to achieve optimal maximum potential indicators for each reservoir. Modeling these layers separately from each other leads to incorrect results, since does not take into account the boundary conditions of the collection system and leads to an overestimation of development indicators.

To meet the conditions of the site of preparation, it is necessary to reduce the level of production in one of the layers. Creating an integrated reservoir-collection-system model in this case allows optimizing both the collection system and the development system to achieve maximum performance for each of the layers. [4]. The project presents an algorithm for optimizing the production of a field, discusses development options, taking into account the limitations imposed by a single collection system.

As a result of the calculations, an optimal variant of joint reservoir development was obtained, which takes into account the characteristics of the production system, collection and preparation of products in justifying production levels.

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THE APPLICABILITY OF ESTABLISHED RULES OF THUMB IN THE MODERN PARADIGM OF INTERPRETATION WELL TESTING

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Rules of thumb evolve in every civilization and culture as humans experience and observe cause and effect relationships. Rules that don't work are discarded; rules that do work become part of the culture, tradition, practice, or science.

The rules can be both general and quite specific. Although these rules can assure us of false security or even make a fatal mistake.

These rules, whether general or more specific, are empirical and can be based simply on common sense, even if the physical, economic, social or other principles underlying them are not well understood. They allow us to reduce the time to make a decision, but at the same time, they can lead us to a costly mistake. As experience increases, we can independently derive and adopt new rules of thumb. It is very important that we periodically, or at least at the beginning, check these rules for compliance in each new situation.

Various rules of thumb apply in well testing. This paper presents some rules of thumb used by practitioners in well testing, examines their validity and limits, and in some cases, develops their theoretical basis.

The rule of the «1½ logarithmic cycles». The rule of 1½ logarithmic cycles was first introduced by Wattenbarger.

It was found, that pressure build up and pressure decline curve form the search straight area in semi-log coordinates of about 1½ logarithmic cycle, after the graph of the dependence ΔP on log Δt deviates from the straight line with a slope of 45˚. However, for wells with low values of the CDe2s parameter characterizing the condition of the bottomhole zone, a straight line in semi-log coordinates could be watched after 1 logarithmic cycle and for wells with a high parameter CDe2s this interval grew to 2 or more logarithmic cycles. We consider a well researched model of the formation with one impenetrable rift as to illustrate this principle. The figure 1 explains how to apply the rule 1½ logarithmic cycles. The impact of the borehole volume ends at $\Delta t = 0.1$, moving along the time line by 1½ logarithmic cycle, we'll have $\Delta t \approx 3$. The result is consistent with the beginning of stabilization of the curve derivative, which defines the radial inflow.

If the bottem-hole/formation system has not yet reached the radial regime of inflow, errors may occur in definition the «straight area» after 1½ logarithmic cycles.

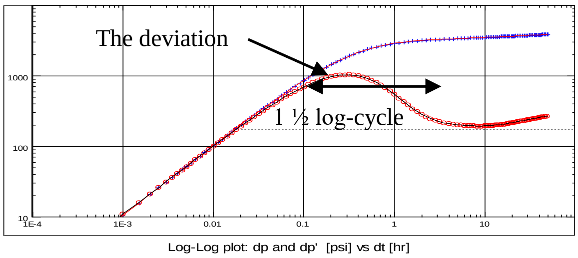

Fig. 1 Pressure build up in well with the skin effect/effect of the wellbore storage with an impermeable boundary

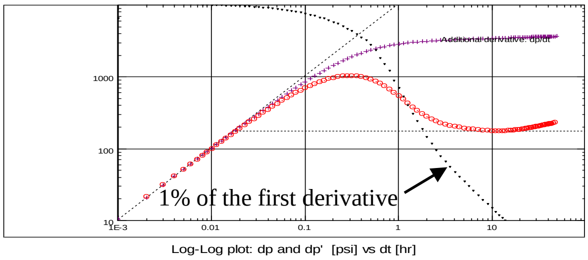

Fig.2 The Rule of 1% of the first derivative

The rule of the «1% first derivative». This is one way of an evaluation the time of finishing of the wellbore storage effect. Matthews and Russell suggested that the after-operation inflow (the wellbore storage effect) be insignificant when the volume of fluid flow to the well decline to 10% of the initial flow.