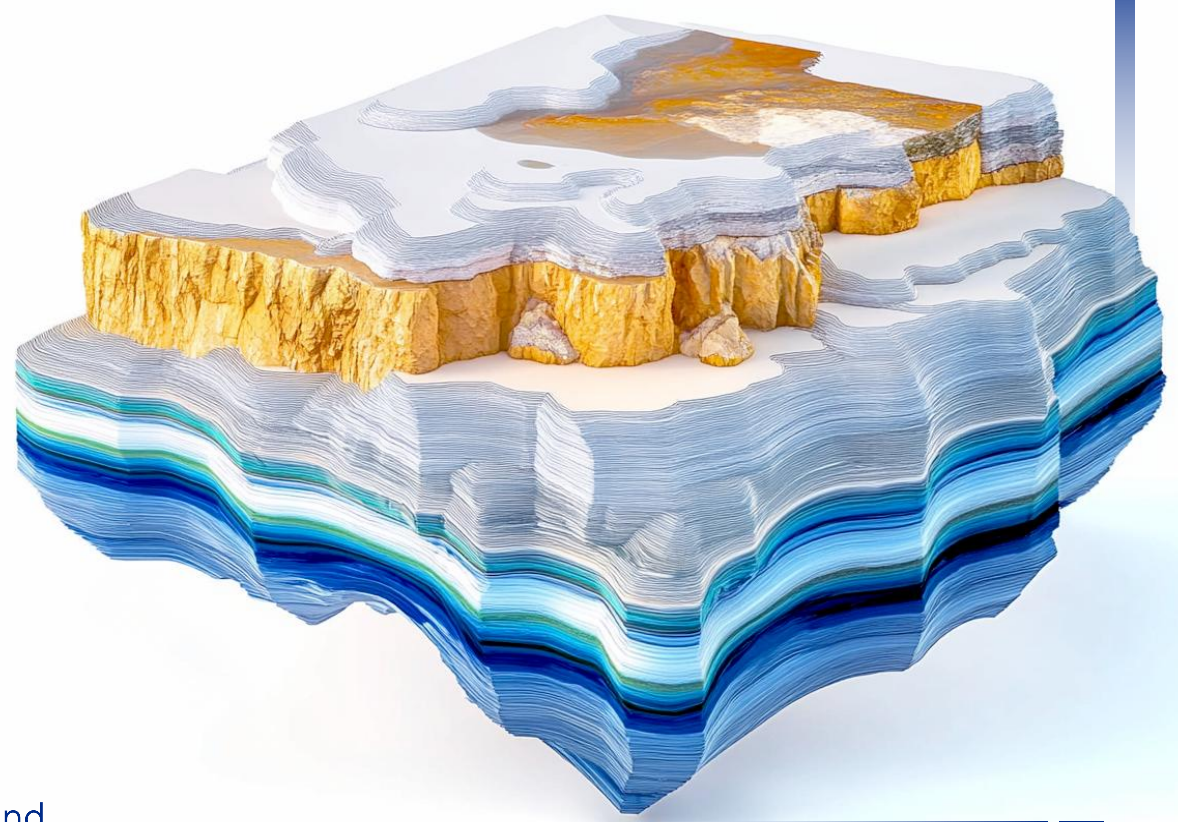
Geological risks mitigation and non-productive costs reduction

to address the challenges in localization and recovery of high residual oil reserves, identify missing deposits in complex reservoirs using digital technologies



ALMA

Farid Salimov

Head of Digital Geology and Oil and Gas production

ALMA SERVICES COMPANY

ALMA Group is a reliable partner for oil, gas and oilfield services companies in the Russian Federation and worldwide

Our Clients benefit from:

In-house software development

AI and ML-based technologies

Consulting and services in IT, operations and management

2017
Founded in

200+
In-house employees

35+
Projects delivered

alma@almaservices.ru
+7 (966) 050-49-56

Consulting services in

- Management
- Operations
- IT projects

Engineering/custom software development and IT-integration

- Pre-FEED, FEED
- FC - Flooding Control technology
- Mitigation of geological risks
- CTC (Computer Training Complexes)

Project Management and Control

- PMC - Project Management and Control
- Main Automation Contractor (MAC)
- Integrated planning

Supervisory Control and Data Acquisition (SCADA)

- ALPA Software (in-house development)
- System integration based on partner products

Equipment reliability

- ASTRA SMS (in-house development) Rotating equipment monitoring
- VR and Computer Training Complexes
- Remote monitoring centers for rotating equipment

Process control and computer modeling

- WellTrack (in-house development) automation of well workover control and logistic services
- APC - Advanced Process Control
- Modeling the processes for the development of production facilities digital twins or simulators for process operators

Life cycle management of submersible equipment

- Remote monitoring centers for ESP submersible equipment
- Ecosystem of CycleOp products (in-house development)

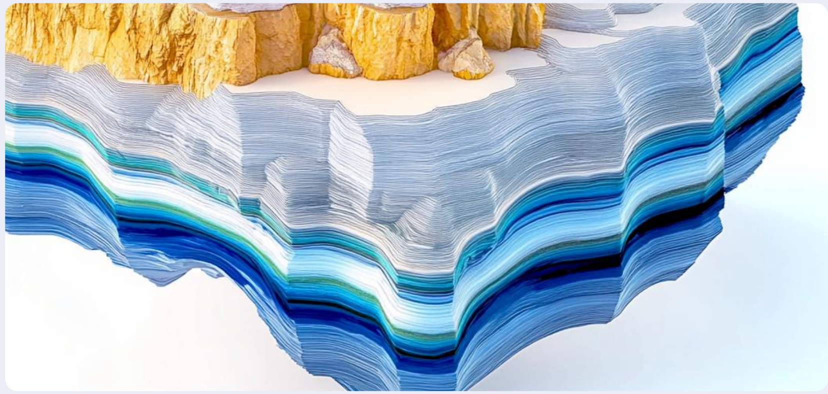
CycleOp Ecosystem

1. Well operation model
2. Selection of main artificial lift methods of oil and gas production
3. Digital warranty certificate
4. Anomaly detector and failure prediction

Goals and objectives

Goal

To increase the efficiency of field development, including that at mature stages, involve undeveloped and poorly developed intervals, reduce non-productive costs, enhance the development profitability.



Objectives

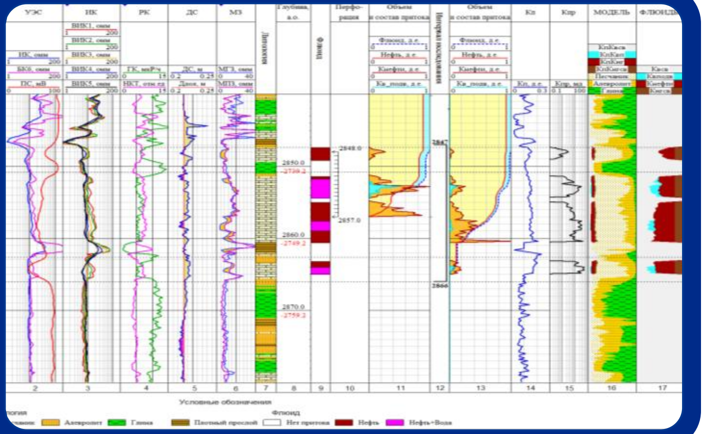
Implementation of AI-based methodology that ensures the acquisition of extended geological data without carrying out expensive studies, determination of actual reservoirs saturation, oil reserves structure:

- Development of 3D lithologic and facies geological and geomechanical formation model with identification and delineation of features of different rock classes
- Identification of missing oil-saturated intervals
- Planning of well intervention activities including sidetracking with the calculation of optimal trajectory of the horizontal section
- Optimization of drilling and well spacing, including horizontal wellbores

Geological survey techniques to study oil and gas fields structure

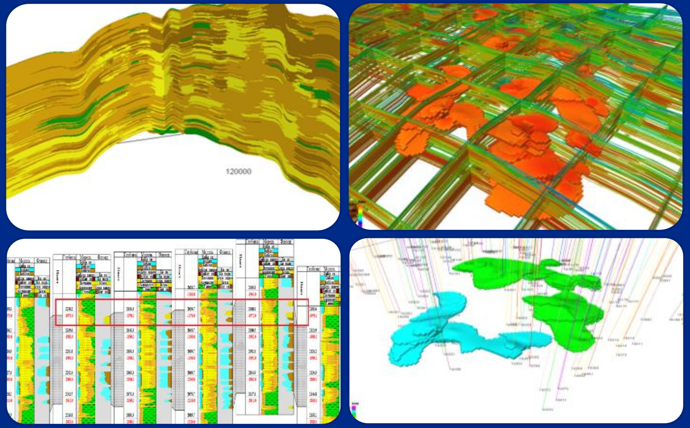
01

Database of extended interpreted logging data obtained via the ESKS-TABC technology to determine the structure and mineral composition of rocks throughout the profile



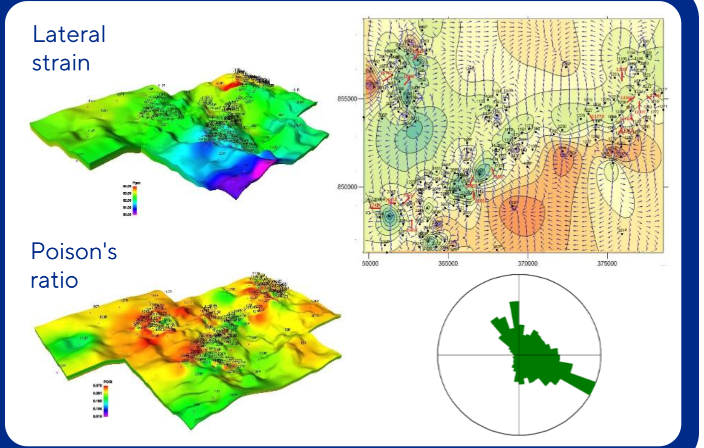
02

Llithofacies geological simulation with features delineation according to the specified criteria



03

Geomechanical modeling



04

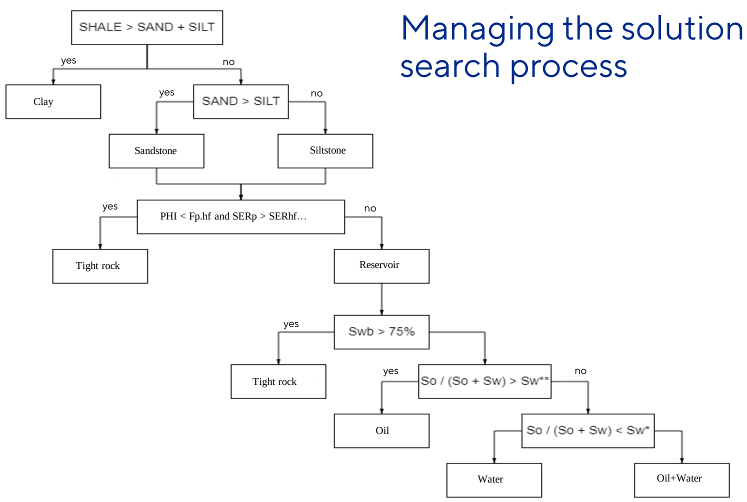
Reserves structure and estimation based on 3D geological model considering connate water and actual permeability of reservoir rocks

Total reserves, kt	Range of porosity factor, d.q	Reserves in rocks of the defined filtration and volumetric properties, kt — Range of permeability factor, mD: <2	2-8	8-20	>20	Ultimate reserves distributed by porosity factor, kt	Total reserves interest, %
UV1-1							
67678	<0.12	277	36	8	32	353	0.5
	0.12-0.15	8762	4612	902	400	14676	21.7
	0.15-0.18	5200	18027	12411	8571	44209	65.3
	>0.18	310	1691	2457	3975	8433	12.5
Total reserves interest, %		21.5	36	23.3	19.2	100	

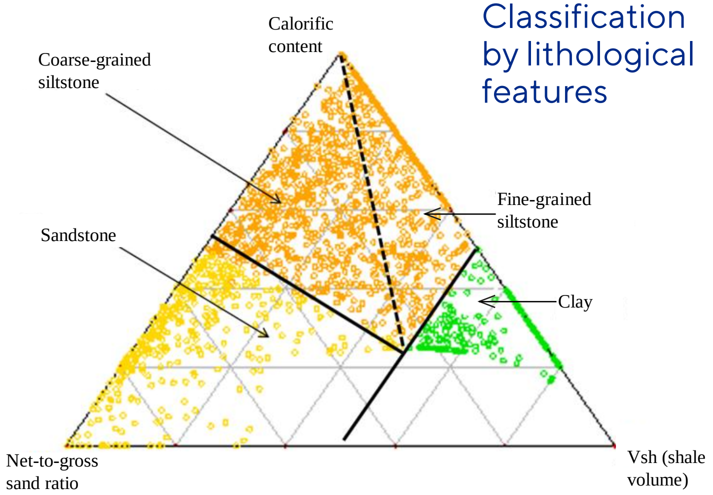
Class 1 | Class 2 | Class 3 | Class 4

Geological survey techniques to study oil and gas fields structure, ESKS expert system

Classifications using the decision tree by reservoir properties, lithology and saturation



Managing the solution search process



Classification by lithological features

Tight rock

- Reservoir
- Tight rock

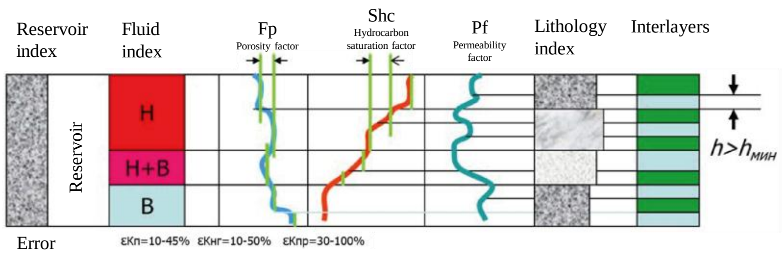
By lithology

- Sandstone
- Siltstone
- Clay
- Coal

By inflow pattern

- Oil
- Oil+water
- Water+oil
- Water

Identification of quasi-homogeneous interlayers based on processing



Delineation of quasi-homogeneous interlayers according to geological properties based on smart analysis and rocks classification by properties determined during automated interpretation at each step of discretization

Geological survey techniques to study oil and gas fields structure, ESKS expert system

Function

Managing the integrated interpretation of geological and geophysical data continuously across the profile opened by the wellbore using automated interpretation technologies for terrigenous (TABC) and/or carbonate (CARB) rocks

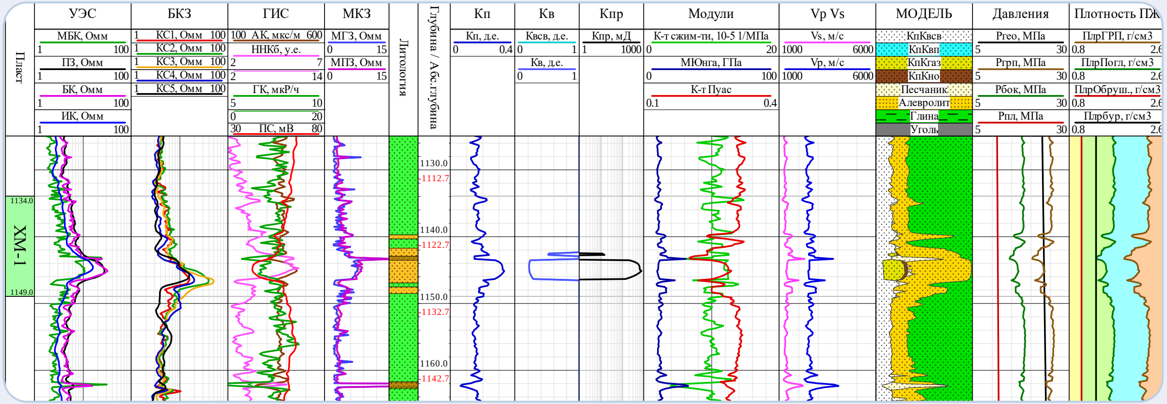
Features

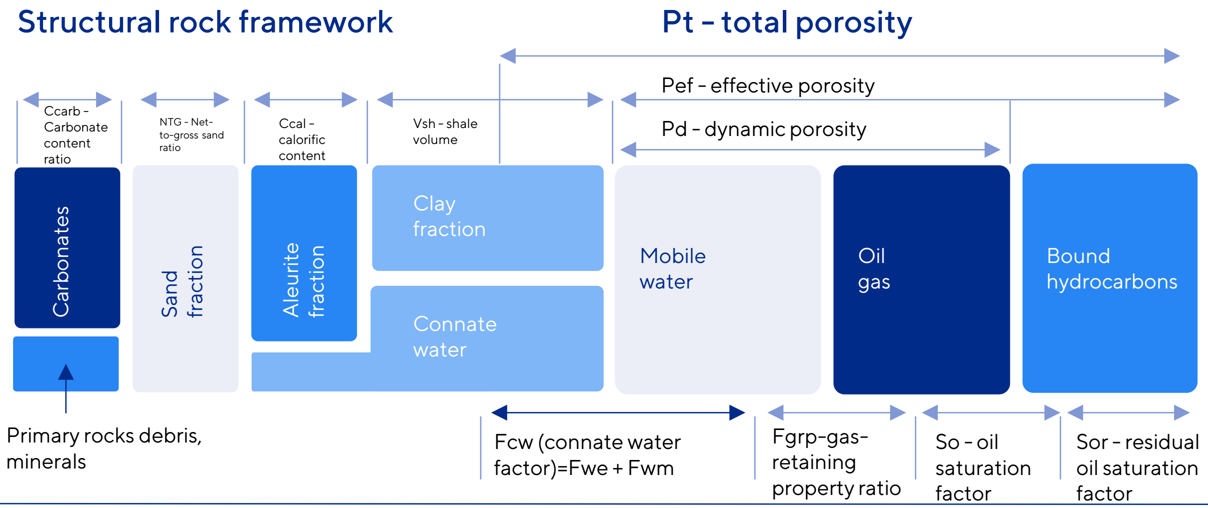
The ESKS expert system is based on logical deduction and decision-making procedures and a knowledge base implemented as a complex of facts and logical deduction rules about the rock classification by structural and lithological, reservoir, volumetric and fluid properties.

Benefits

Unequivocal and comparable result for similar cases of great uncertainty. Definition of an extended set of parameters relating to the geological properties of rocks

TABC - technology of automated interpretation of well logging data for terrigenous rocks





Original set

Specific electric resistivity (using induction logging, lateral logging, lateral sounding etc.)

SP - Self-potential

GR - Gamma-ray logging

Wnl-hydrogen content defined by neutron log, AL-acoustic logging, GGLd-gamma-gamma density logging

Output parameters

Structural and mineralogical model

NTG-net-to-gross sand ratio, Vcal-calorific value, Vsh-shale volume, Ccarb-carbonate content, Ccoal-coal content, Pf-porosity factor

Fluid model

Sw-factor of connate or residual irreducible water saturation, Sw-water saturation factor, Sg-gas saturation factor, So-oil saturation factor, Sor-residual oil saturation factor

Reservoir filtration properties

Pf-permeability factor, Pf.w-water phase permeability, Pf.g-gas phase permeability, Pf.o-oil phase permeability

Prognostic curves of inflow profile

Water cut estimation

Rocks mechanical and velocity properties

Poison's ratio, Young modulus, Vp, Vs, seismic trace

Pressure

Ph-hydrostatic pressure, Prl-rock lateral pressure, Pf-formational pressure, Phydr-hydrodynamic pressure, Pfrct-fracturing pressure

Theoretical curves

SER (Specific Electric Resistance) and SP (Self-potential) for water saturation factor Sw=100%, DT, RHOB, W

TABC - technology of automated interpretation of well logging data for terrigenous rocks

Function

Constant layer-by-layer processing of logging curves throughout the interval of the terrigenous profile

Features

Follows a patented mechanism based on the in-house research and development

Benefits

Smart algorithm of the TABC technology includes generalised petrophysical models built on the basis of studying the regularities of changes in the adsorption as well as filtration and volumetric properties of rocks

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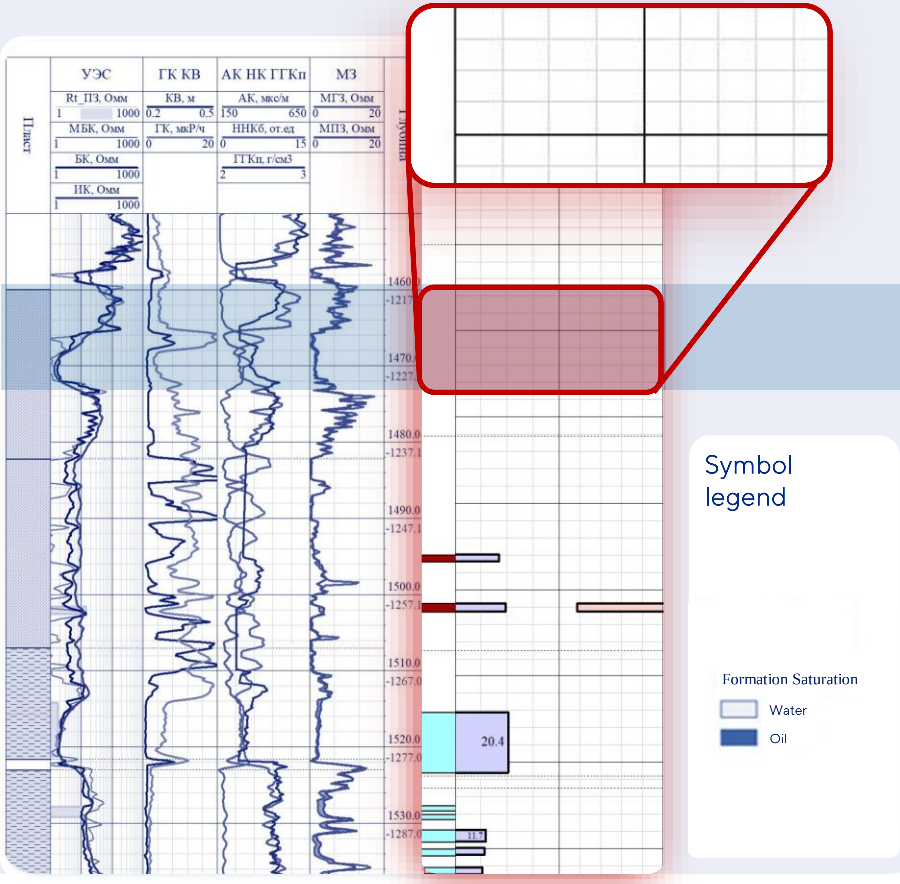
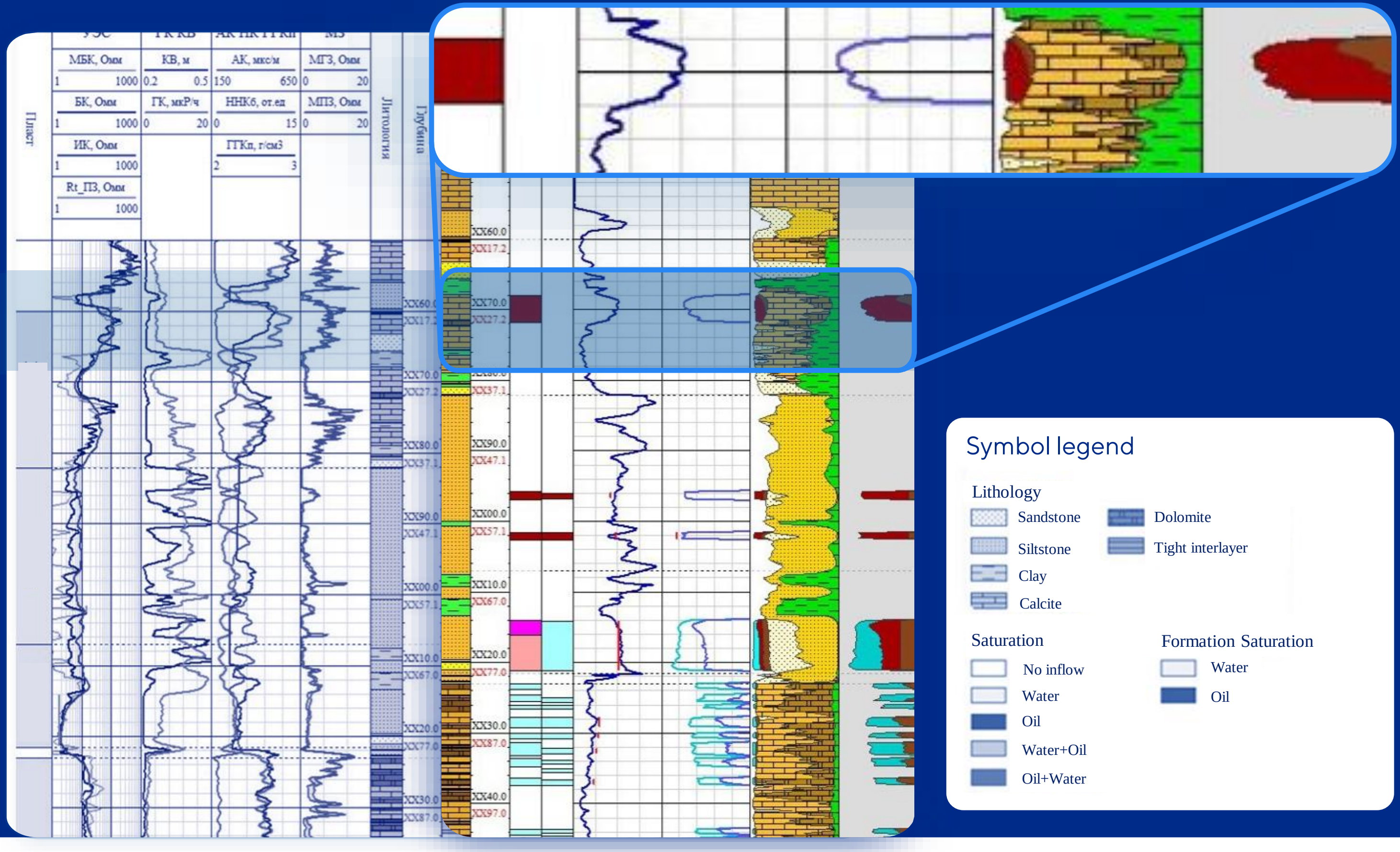
Example of new data acquisition

Russian conventional technology



ESKS-TABC technology implemented in the Gintel software



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Comparative analysis of well logging interpretation methods

Indicators	TABC Methodology	Conventional technique used in polymer flooding
Determined parameters: 1. Structural and mineralogical model	Kp-porosity factor, Ksand-Net-to-gross sand ratio, Kcal - calorific content, Kcl-clayiness index, Kcarb-Carbonate content ratio	Fp-porosity factor
2. Rocks' fluid model	Fcw (connate water factor), NTG-net-to-gross sand ratio, Shc-hydrocarbon saturation factor	Ws-water saturation factor, Shc-hydrocarbon saturation factor
3. Filtration properties	Pf-permeability factor, Pf.w-water phase permeability, Pf.g-gas phase permeability, Pf.o-oil phase permeability	Permeability factor
4. Lithology	Sandstones, siltstones and mixtures thereof, clays, carbonates	
5. Saturation	gas, oil, mobile water, connate water	gas, oil, water
Interpretation rock model	**Triple-component** Sandy - silty - clayey	**One-component** Skeletal structure - pore volume
Petrophysical support	A system of generalized petrophysical models developed in accordance with international standards, adjusted to the geological conditions of Romashkinskoye field: SP, GR, IL, AC, NL, DLL, Sw, Fpr, Fpr.w, Fpr.o, Fpr.g	Set of stochastic connections for single-component rock: Kp(APS), Kp(NL), Kp(AC), P(Kp), Pn(Sw), Pf(Kp), etc.
Specifics of the methodology of well logging data interpretation	1. Processing of all types of rock in the section in two stages: - calculation of rock and fluids properties curves, - identification of homogeneous interlayers related to geological and reservoir properties, and saturation 2. Confidence Rating of well log interpretation in each well, both without and with core data	1. Processing of just the pre-selected intervals in the section 2. Confidence Rating is conditional (the core was used to buildup the stochastic connections themselves)

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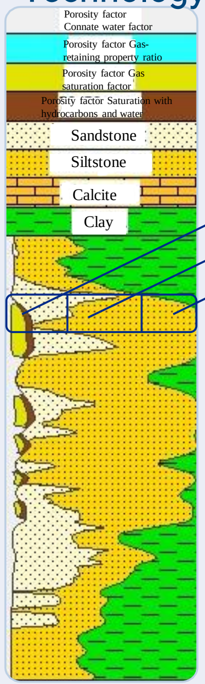
Lithological modeling based on the rock classification

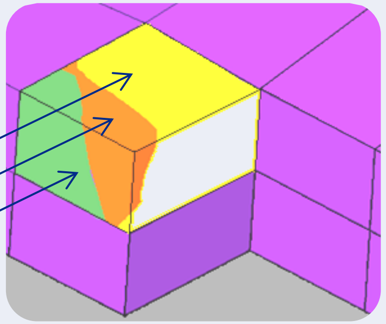
01 Complies with the principles of lithology identifying in a well at the stage of logging data interpretation

02 Compliance with the lithological types determined based on core fraction composition studies

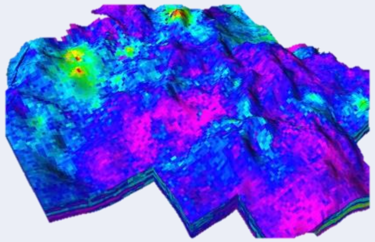
ESKS-TABC Technology



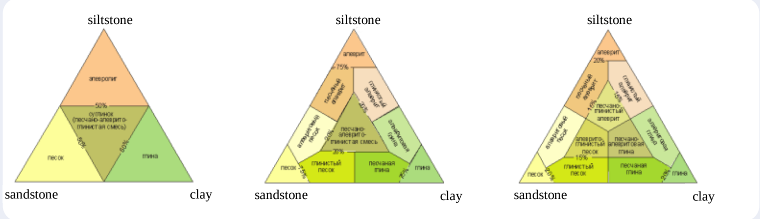
Cube slices

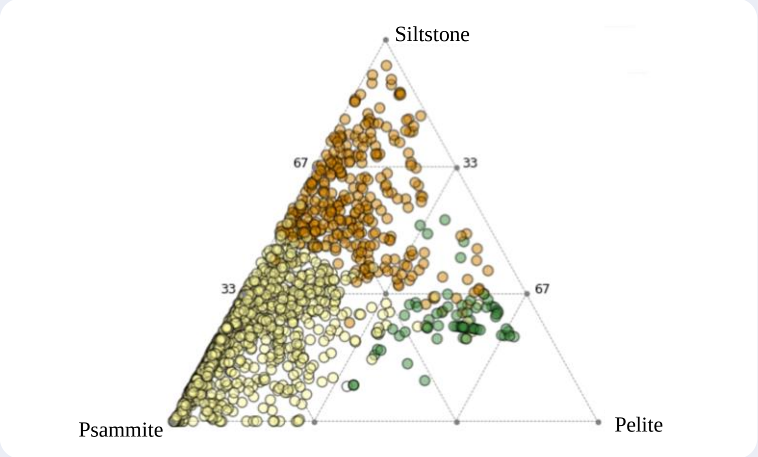


Seismic trends

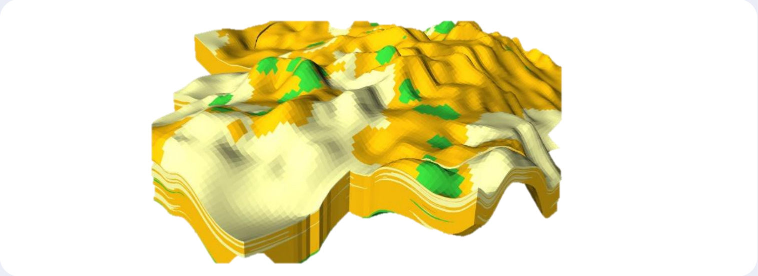


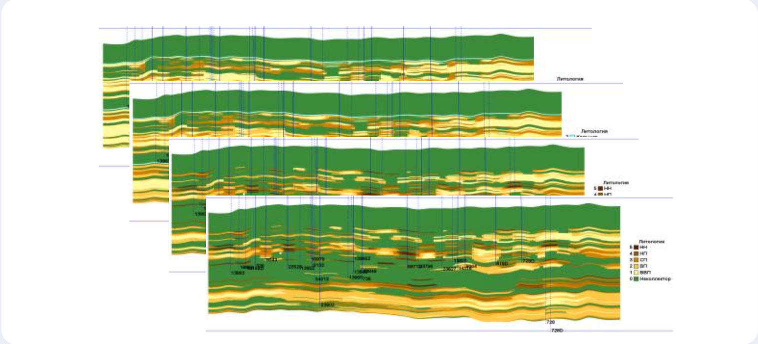
Classification of the terrigenous rock





Implementation of the lithology cube according to the rock classification





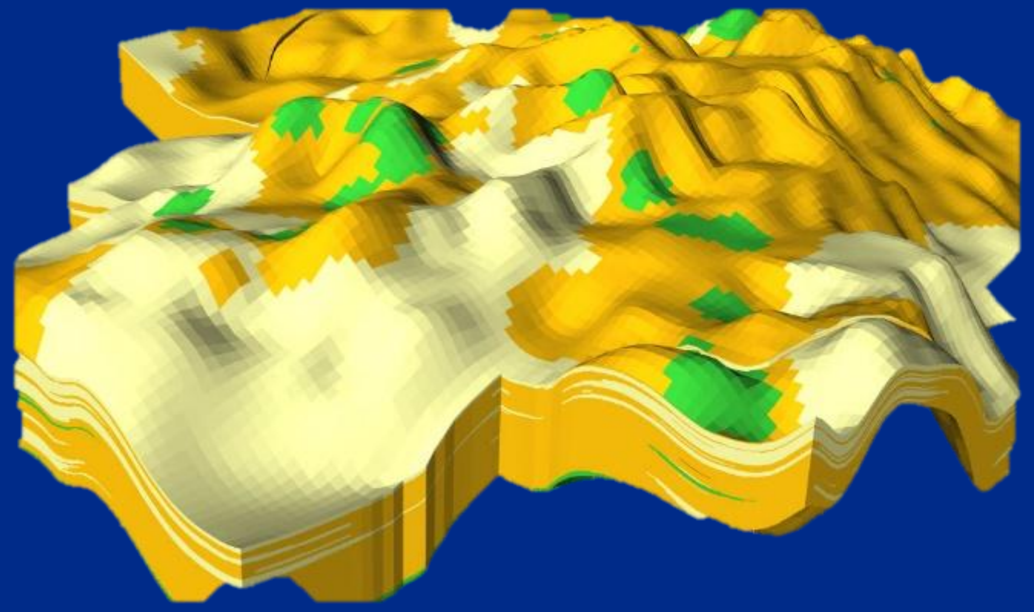
Lithological modeling based on the rock classification

01 Complies with the principles of lithology identifying in a well at the stage of logging data interpretation

02 Compliance with the lithological types determined based on core fraction composition studies

The curves of the sand, silt and clay fractions content calculated along the wellbore enable the application of any existing classifications to determine the lithological type of rock at any point along the wellbore profile.

The proprietary classification of rocks is developed for each field and depends on the required level of heterogeneity detail



Integration of seismic data and logging interpretation results

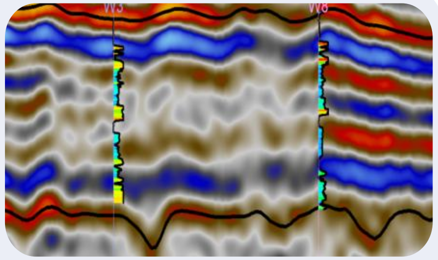
using ML-based ESKS-TABC technology

Integration methods

- Petroelastic modeling
- Conventional

machine learning

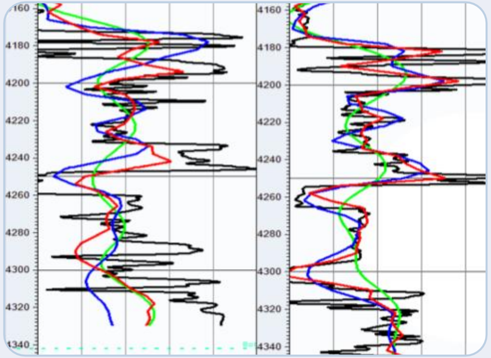
Initial data



- Results of logging data interpretation using ESKS-TABC
- Seismic data

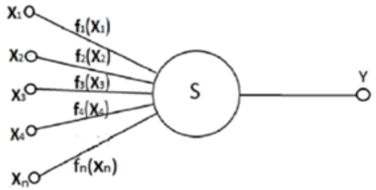
- Acoustic impedance cube Zp
- S-waves impedance cube Zs
- Velocity ratio cube Vp/Vs
- Density cube

Comparison of measured and prognostic porosity curves



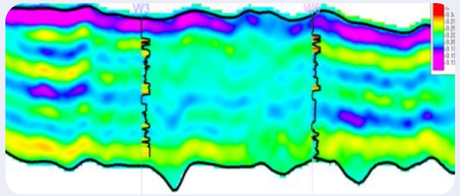
- Well logging
- Linear regression
- Standard NN
- Kolmogorov NN

Kolmogorov Neural Network

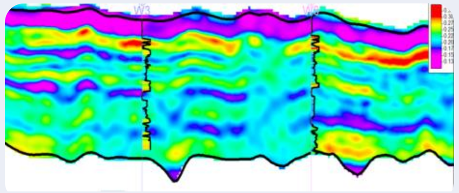


Comparison of porosity prediction cubes

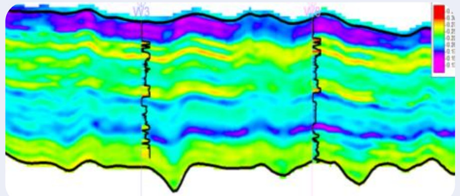
Linear regression



Standard neural network



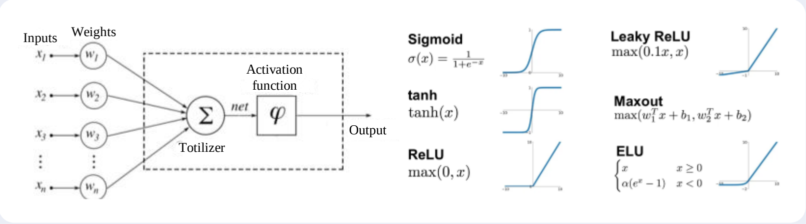
Kolmogorov Neural Network



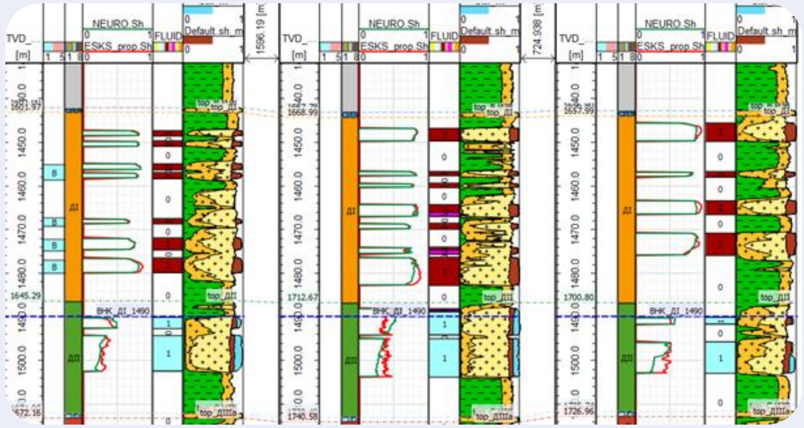
Enhanced forecast quality

ML-based modeling of producing formations saturation

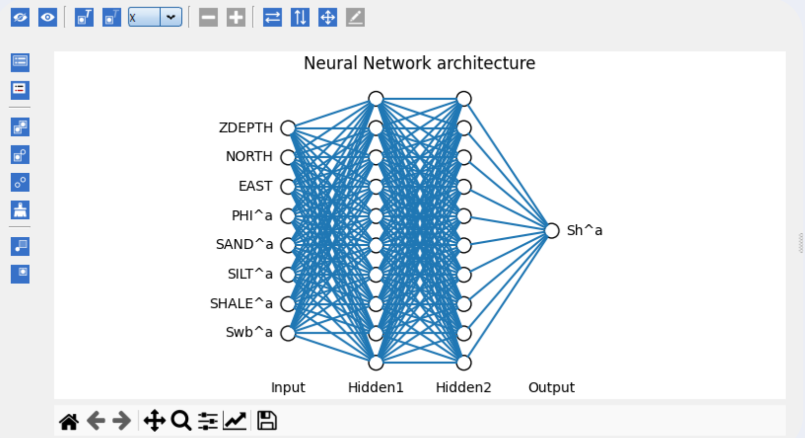
Selection of topology and activation



Calculation of saturation in wells and in the cube model



Justification of perceptron architecture



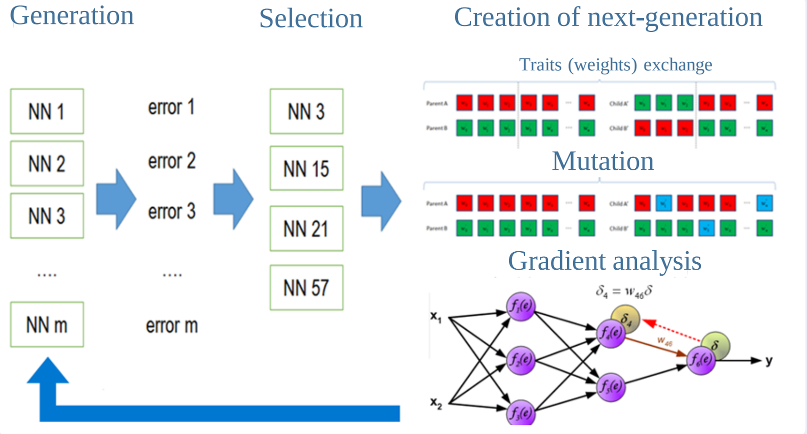
3D position

- NORTH and EAST coordinates
- True vertical depth

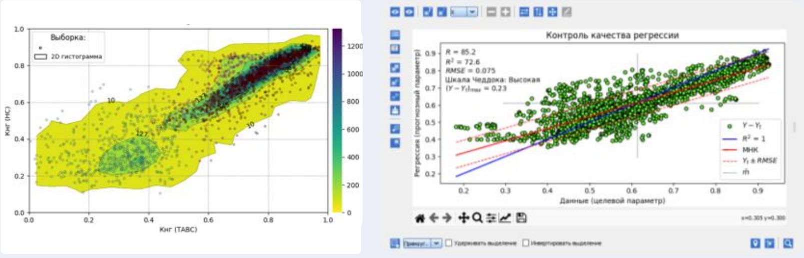
Grain composition of the rock

- Psammitic fraction content
- Aleurite fraction content
- Pellite fraction content
- Porosity factor
- Connate water ratio

Training a neural network



Quality assessment of the forecast model



ML-based modeling of producing formations saturation

Hybrid combination approach to genetic and gradient-based algorithms

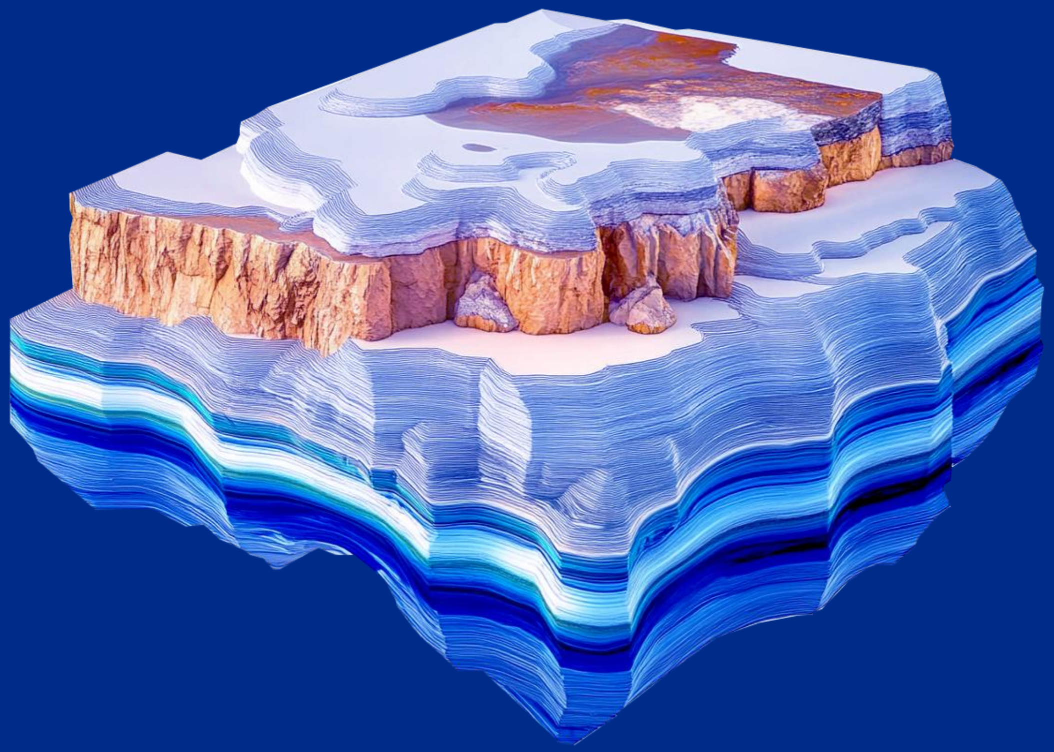
(Kobrunov & Priezzhev, 2016)

Intended for training feed-forward neural networks

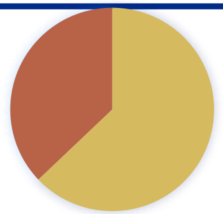
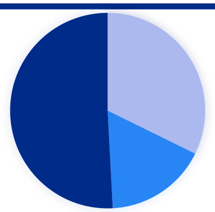
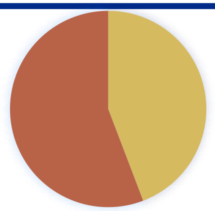
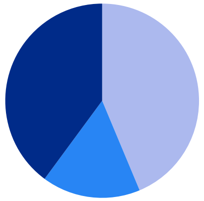
Tikhonov's algorithm of prognostic operator

(Tikhonov and Arsenin, 1977)

For data regularization of the initial layers of deep neural networks

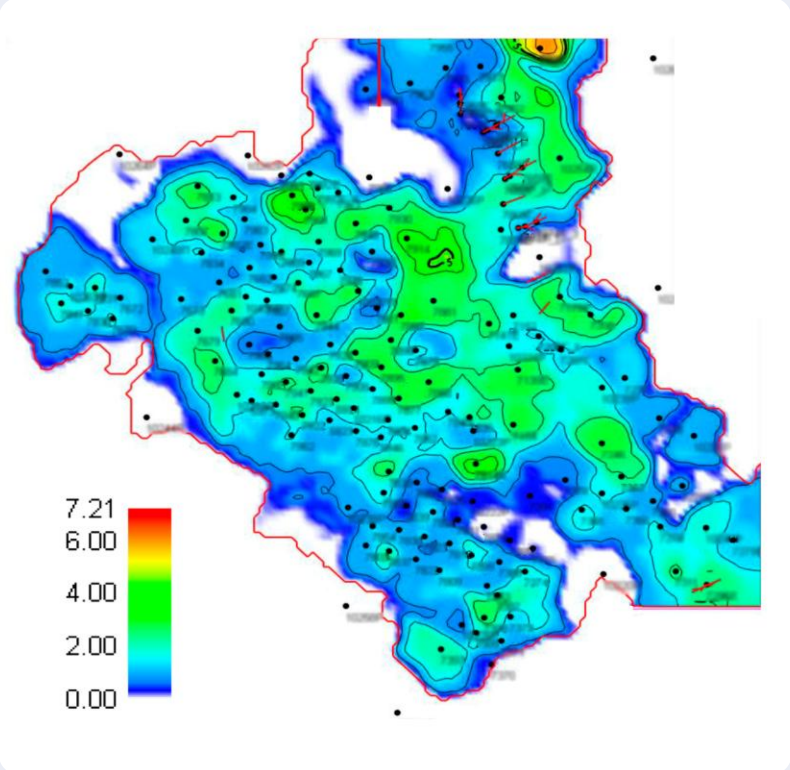


Reserves structure calculation in geological model

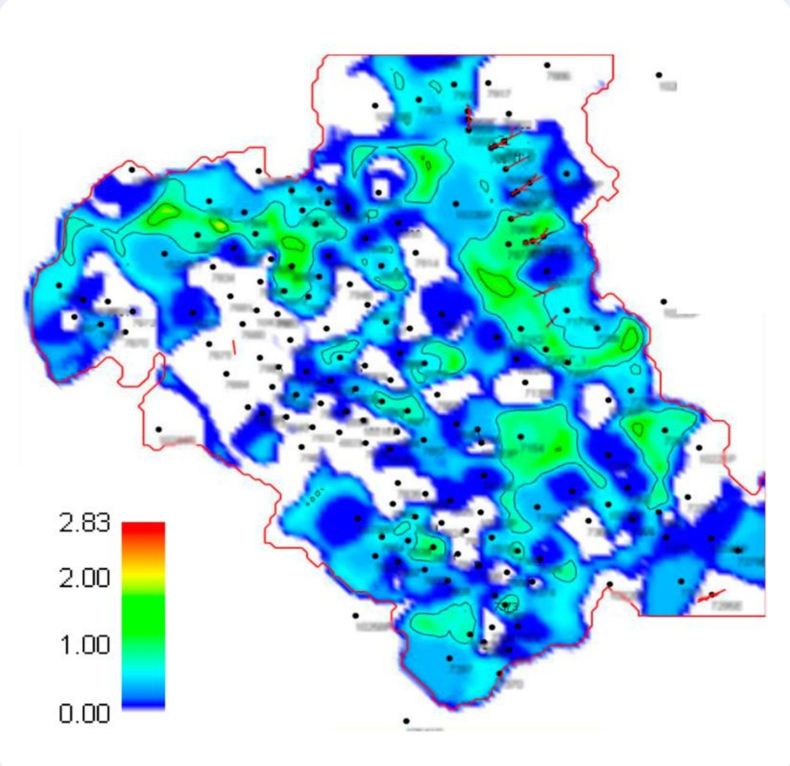
Total reserves, kt	Reserves in rocks of the specified porosity and permeability, thous. m3					Shading according to the predominant lithology type		Shading according to range of porosity and permeability		
	The range of porosity factor, decimal quantity	The range of permeability factor, mD			Total reserves by porosity factor, kt	**Sandstone**	**Siltstone**	**Easy-to-recover reserves**	**Interstage reserves**	**Hard-to-recover reserves**
		<10	10-40	>40						
X-1 Formation										
19897	< 0.171	6099	545 [1]	26	6670					
	0.171 - 0.187	3470	2957 [2]	455 [3]	6882					
	> 0.187	379	3030	2933	6342					
X-2 Formation										
12757	< 0.171	3345	520	98	3963					
	0.171 - 0.187	1221	1843	958	4022					
	> 0.187	156	1567	3046	4769					

Reserves structure calculation in geological model

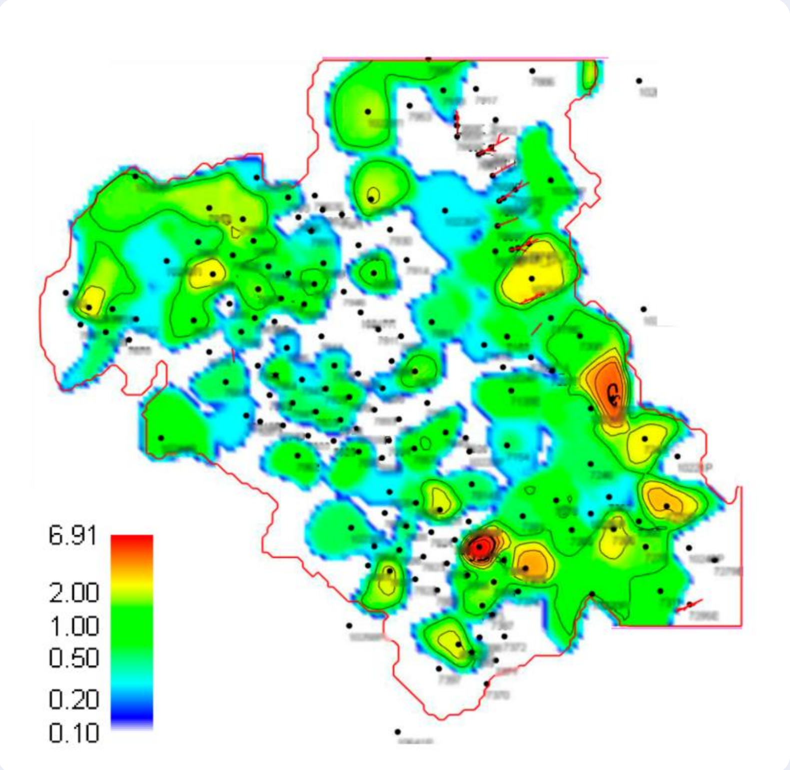
1



2



3



Delineation of features formed in different facies environment

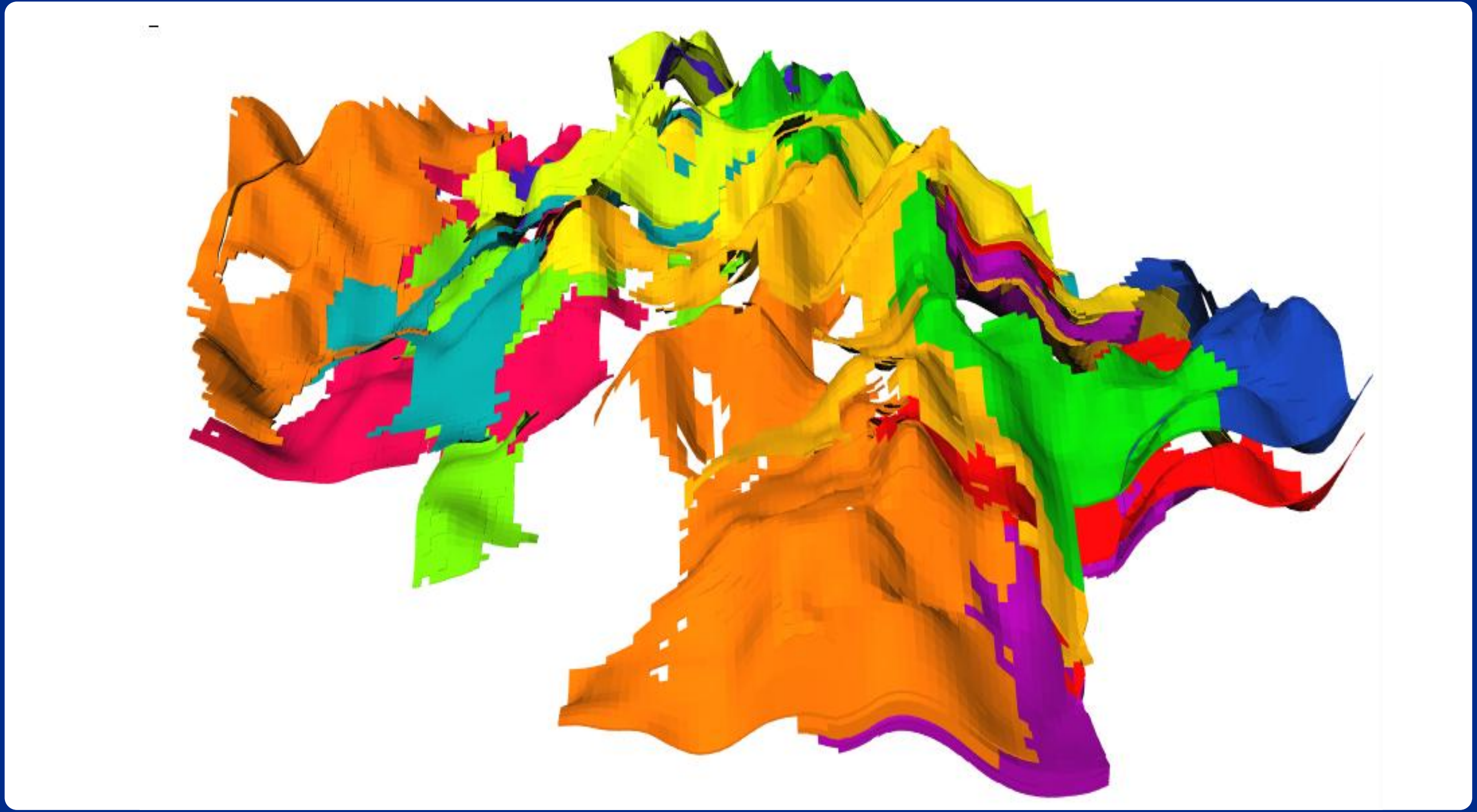
and characterized by different fractional composition and degree of being graded

27 features have been delineated

Class 1
- 7 features
- Permeability factor> 40 mD
- Porosity factor> 18.7 %
- 6 < Volume < 41 MCM

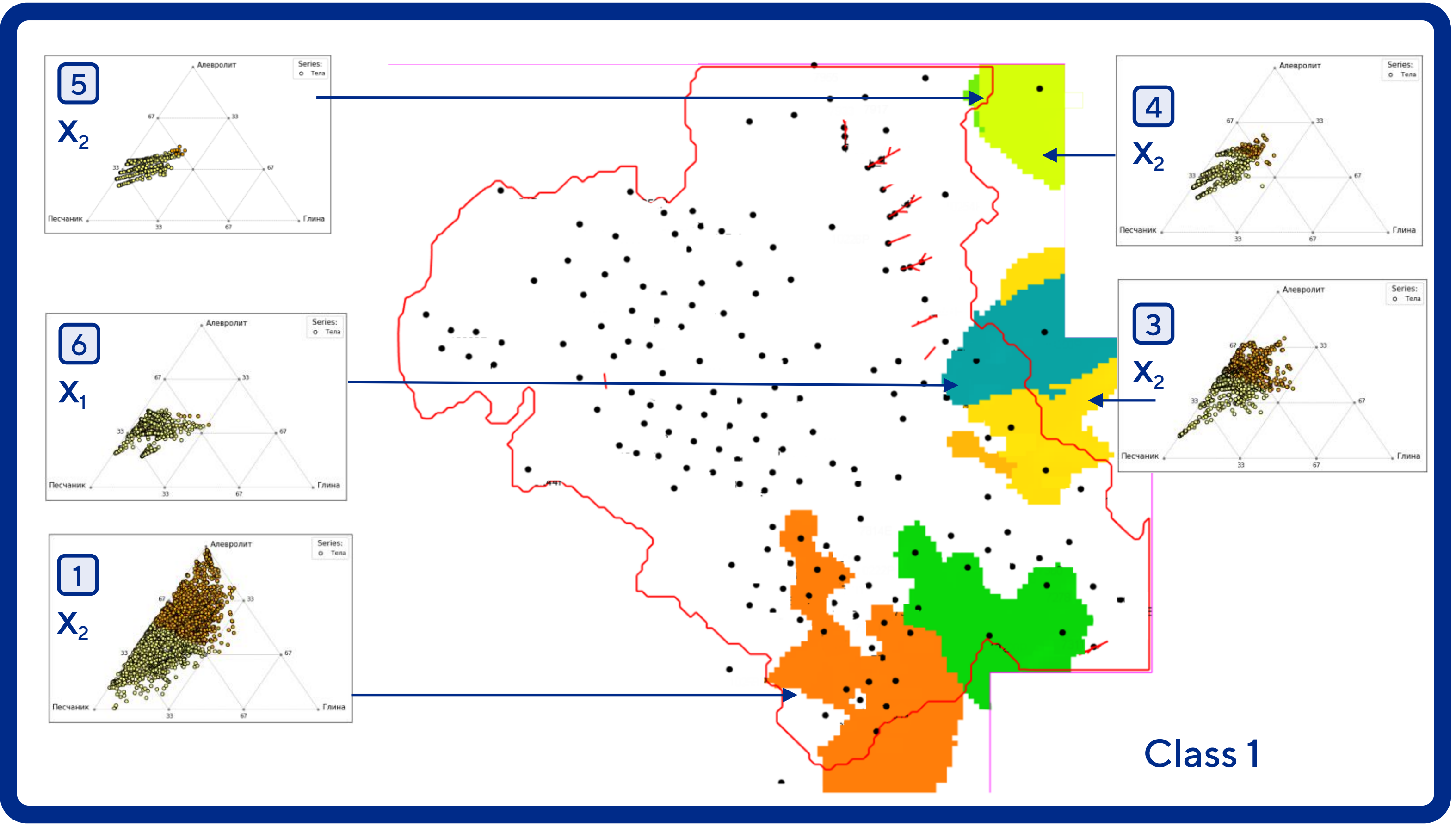
Class 2
- 8 features
- 10 mD < Permeability factor < 40 mD
- 17.1 < Porosity factor< 18.7 %
- 6 < Volume < 21 MCM

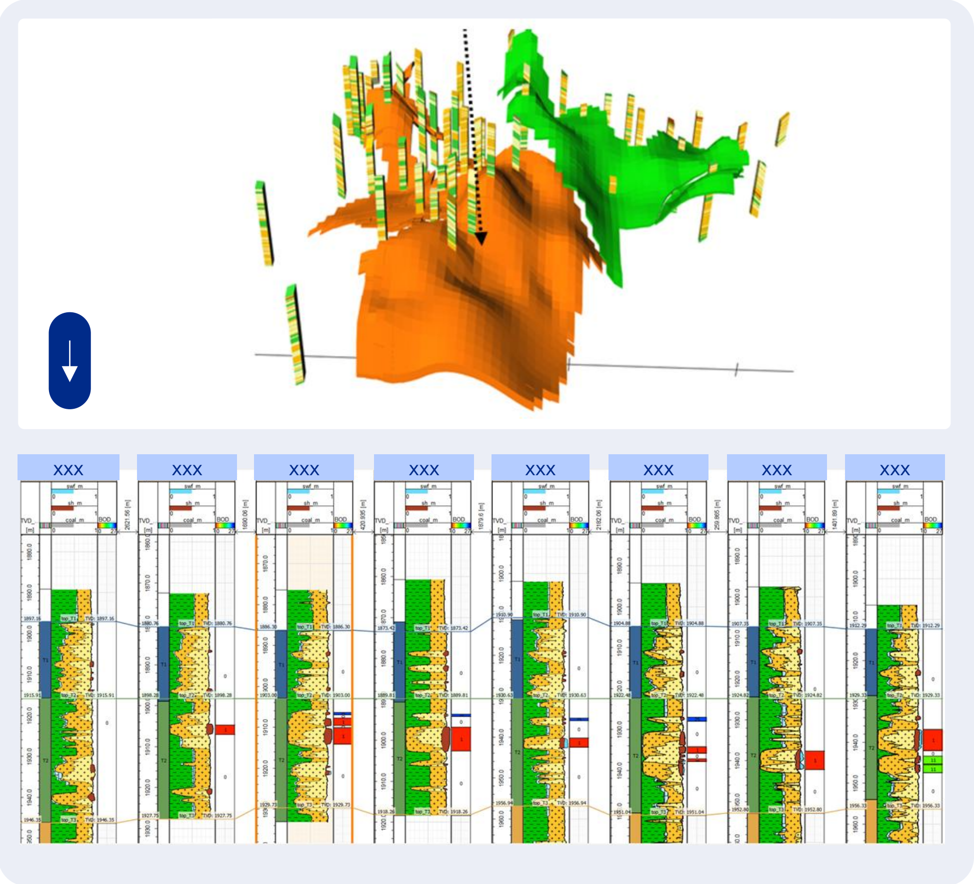
Class 3
- 12 features
- Permeability factor< 10 mD
- Porosity factor< 17.1 %
- 6 < Volume < 29 MCM



Delineation of features formed in different facies environment

and characterized by different fractional composition and degree of being graded





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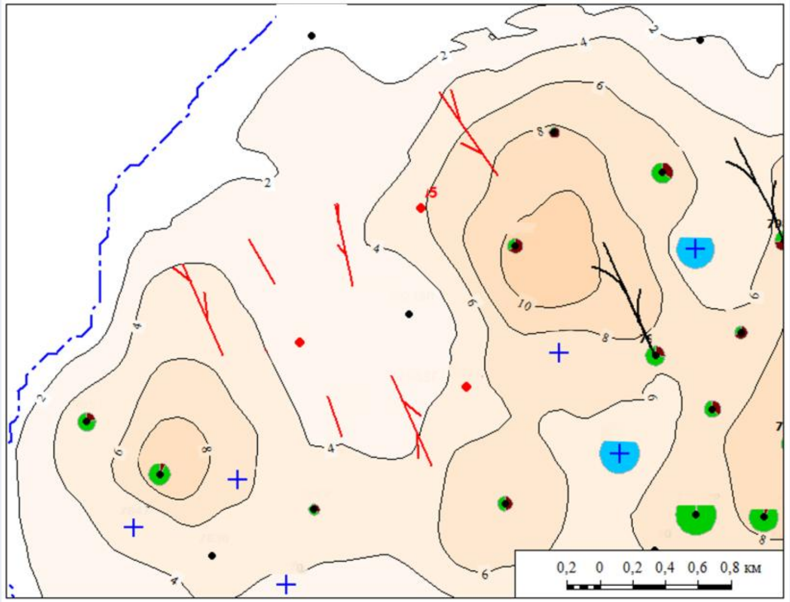
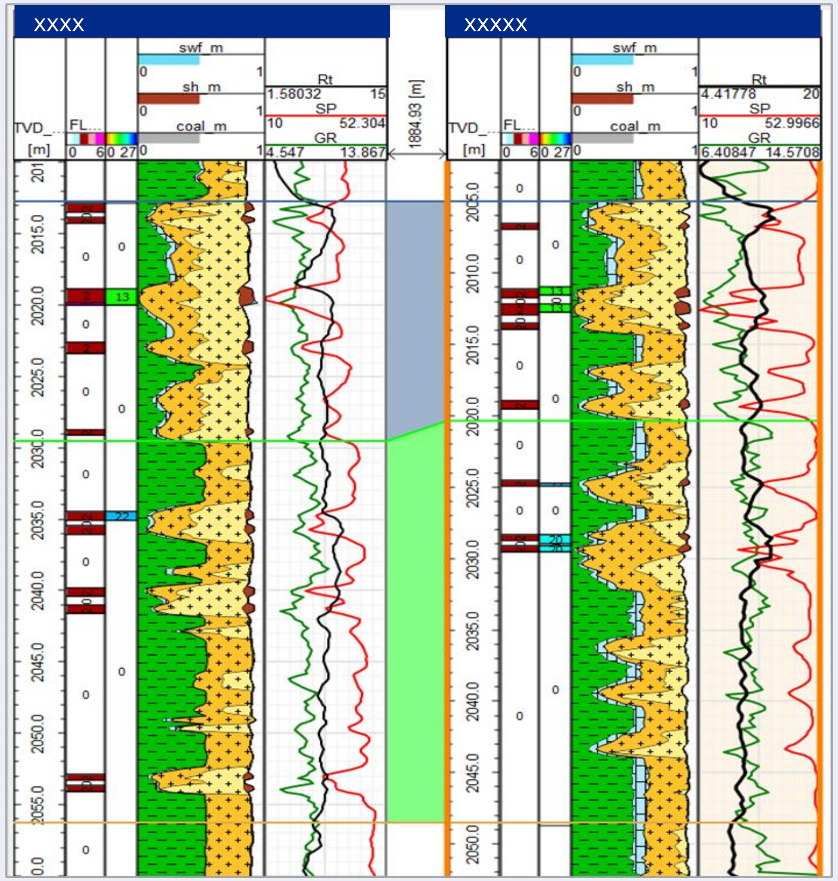
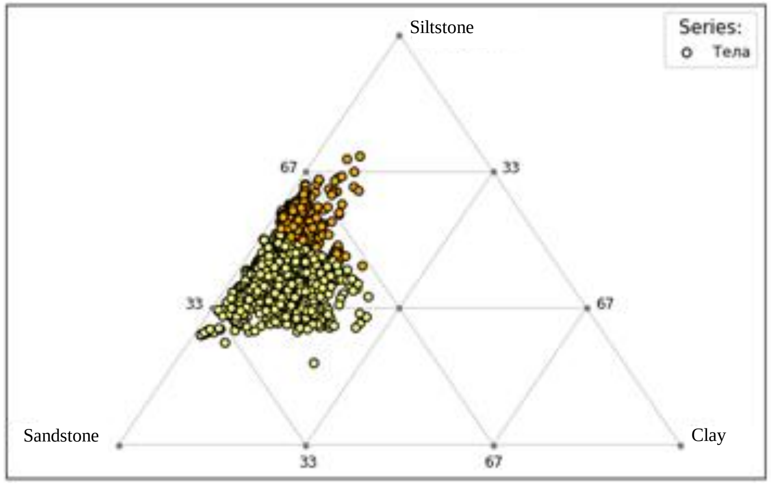
Prospective interval for drilling of horizontal wellbore on the example of well pad No XX



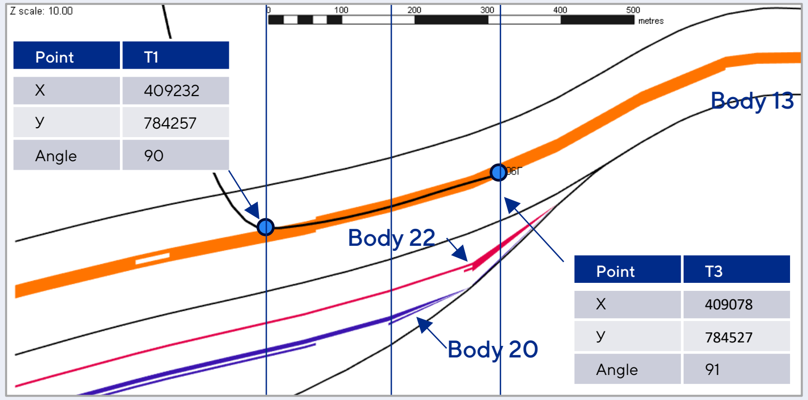


Body 13 Class 2



Prospective interval for drilling of horizontal wellbore on the example of well pad No XX

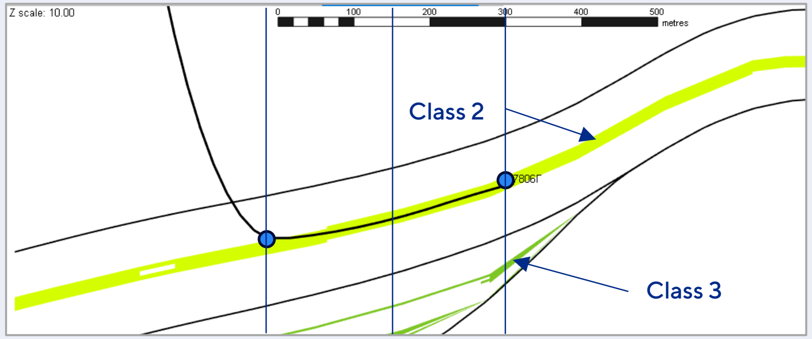
Properties prediction based on the well model XXX

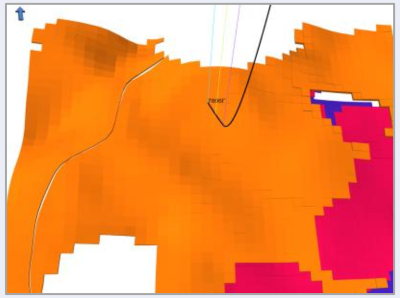


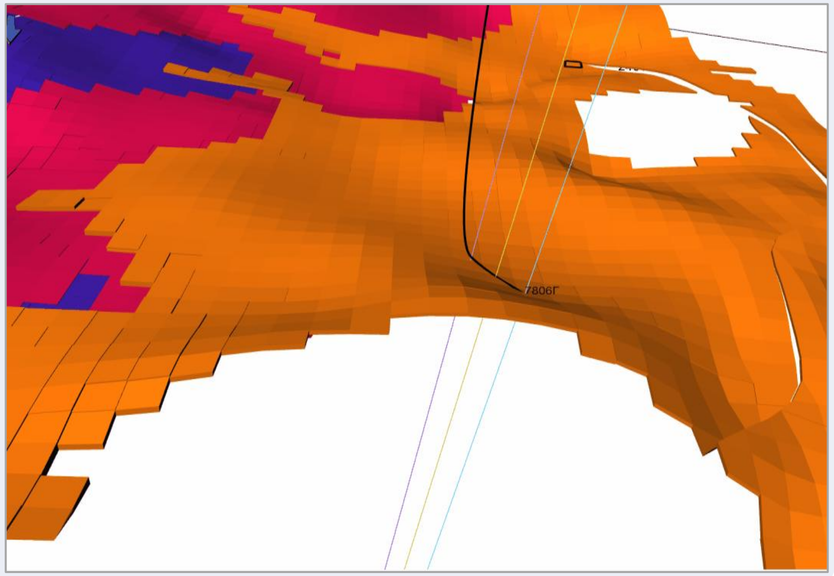
Point	T1
X	409232
У	784257
Angle	90

Point	T3
X	409078
У	784527
Angle	91

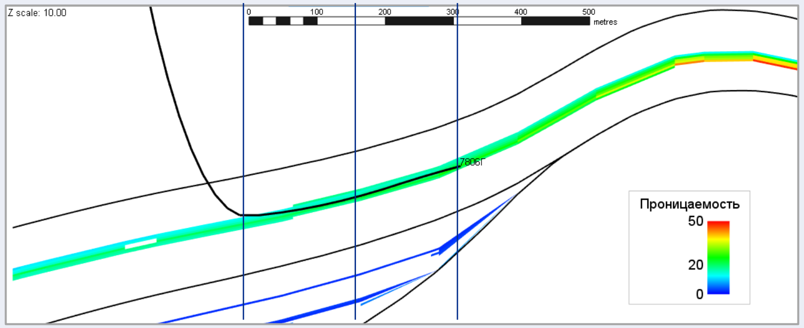
v1 v2 v3



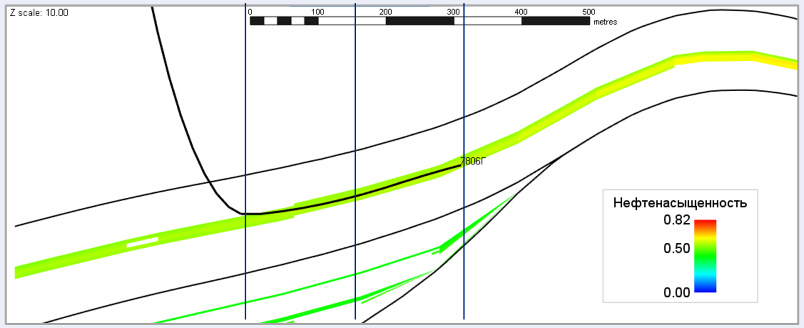




Properties prediction based on the well model



v1 v2 v3



Comparison of calculated well performance indicators

according to the model of well pad No XX with actual data after drilling

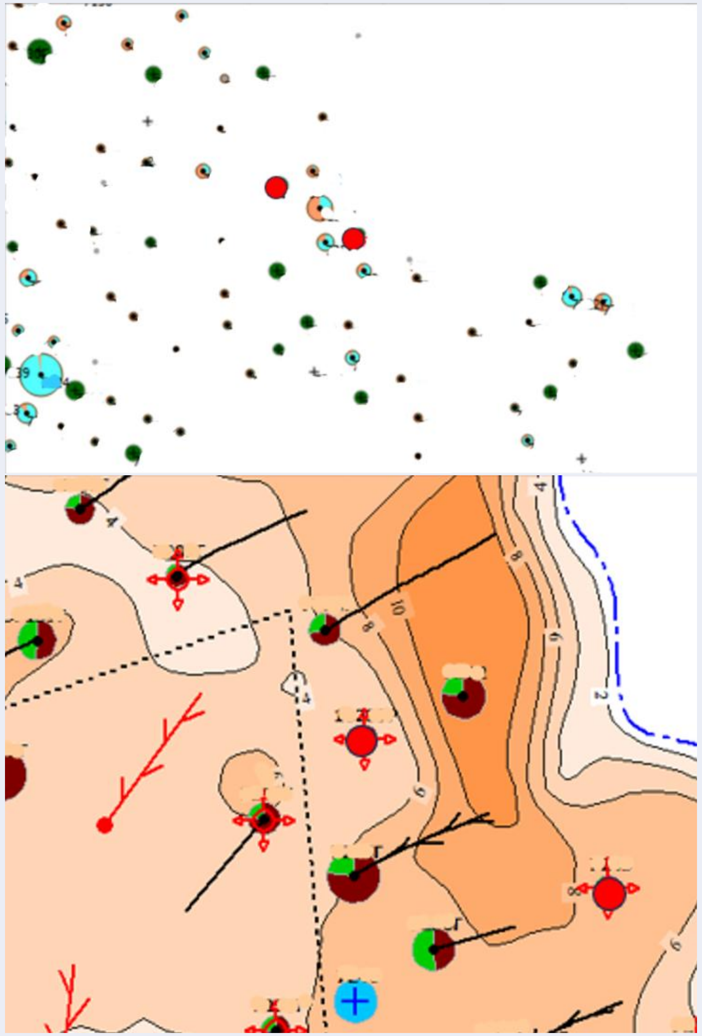
Calculated vs actual difference is 6% for fluid production rate, 15% for oil production rate

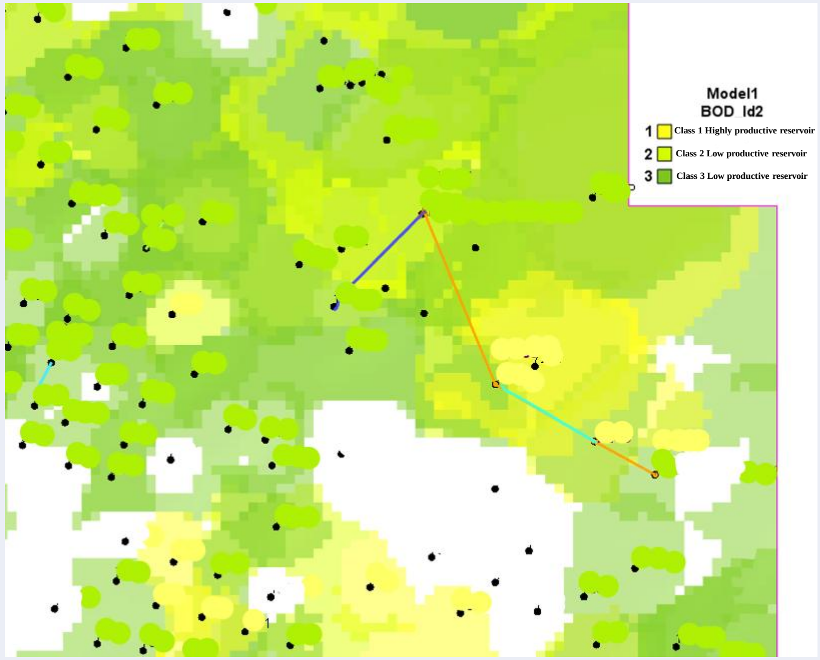
Well	Type	The length of horizontal interval, m	N Hydraulic fracturing	Oil thickness, m	Permeability factor mD	Productivity Index (PI)	Qf - calculated fluid production, m3/d	Qo - calculated oil production, t/d	WCcalc - calculated watercut, %	Qf - actual fluid production (2 months of work), m3/d	Qo - actual oil production (2 months of work), t/d	WCact - actual watercut, %
XX	Directional well	-	1	6.40	12.0	0.213	17	12	17	29	22	8
XXXГ	Multilateral well	600	7	611.2 327.2 611.2	19.40 21.90 19.40	0.561	42	31	14	41	29	15
XXXXГ	Multilateral well	500	7	514.0 248.6 490.6	12.70 19.00 11.60	0.506	48	36	12	37	25	20
XXX	Directional well	-	1	3.40	8.10	0.126	12	7	30	20	13	18
XГ	Multilateral well	600	7	625.8 415.6 638.2	19.0 18.70 17.50	0.423	42	23	43	52	36	17
XXГ	Horizontal well	300	5	315.00	17.50	0.358	34	20	33	34	23	18
XXXXXГ	Multilateral well	600	7	470.2 295.8 504.4	20.70 18.70 16.30	0.503	45	26	45	38	27	26
XxxГ	Horizontal well	300	5	262.0	13.10	0.353	30	16	41	44	29	20
XXXXXX	Directional well	-	1	5.40	5.90	0.256	23	12	36	17	12	16
For well pad on average:							33	20	30	35	24	18
Overall Total:							293	183		312	216	

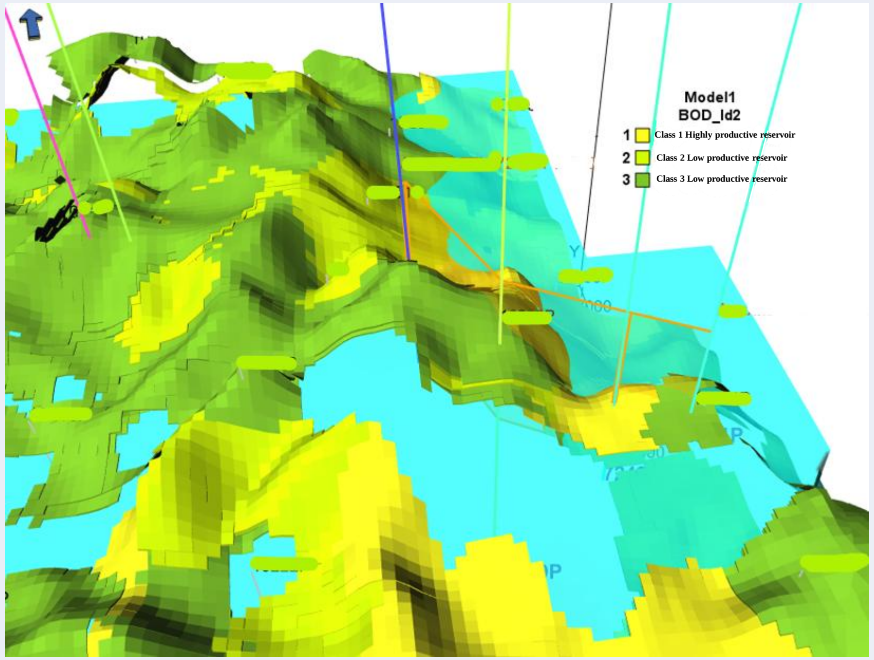
Elaboration of activities for the injection well stock

No	Well	well pad	Mode prior the well intervention (as of 1.10.2023)				Basic production rate	Planned activity (Well Intervention)	Expected mode				Incoming gain, t/d	Remark	Remark (R&D Institute)
			Qf - Fluid production, m3/d	Qo - Oil production, t/d	Watercut, % by mass	CPF intake volume, m3/d	Qo - Oil production, t/d		Qf - Fluid production, m3/d	Qo - Oil production, t/d	Watercut, % by mass	CPF intake volume, m3/d			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Activities at injection well stock															
1	xxxP	xx				65.0		Conversion to water injector				60-80		Conversion to injector in the case of production rate decline to less than 5 t/d For wells 7223Г, 7232, 7235Г and 7290Г	**Done**. Est. injectivity 60 m3/d
2	Xxxx	Xx				62.0		Conversion to water injector				60-80		Conversion to injector in the case of production rate decline to less than 5 t/d For wells 7235Г, 7256Г and 7257Г	**Done**. Est. injectivity 60 m3/d
3	Xxxx	X				11.4		Workover at injector				50-80		Bottomhole flushing, BHT, injectivity increasing (HF if required). For wells 7911, 7881, 7896Л	**Done**. Q 90 m3/d, current diameter of choke is 5mm
4	Xxxx	Xx				20.3		Workover at injector				50-70		Additional perforation of missing intervals, 80 t of frac fluid to increase injectivity.	**Done**. Qintake 50 m3/d, current diameter of choke is 2mm.
5	Xxxx	Xx				21.1		Workover at injector				50-70		Bottomhole flushing, BHT, injectivity increasing (HF if required). For wells 7803, 7854, 7838, 7822).	**Approved**. Included into the annual plan for 2024
6	Xxxx	Xx	6.0	2.1	58.8			Conversion to water injector				60-80		Conversion to water injector in the case of ESP failure (oil production rate decline to less than 1 t/d). For wells 7836, 7856, 7865	**Approved** for 2025. Production rate decline to less than 1 t/d
7	Xxxx	Xx						Workover at injector				50-70		HF to increase injectivity.	**Approved**. Included into the annual plan for 2024
8	Xxxx	X				91.7		Workover at injector				60-80		Cement squeeze job to recover behind-the-casing cross flows, inefficient injection. Poor injection ratio for wells 7986Г and 7982Г.	**Approved**. Included into the annual plan for 2024
9	Xxxx	X						Workover at injector				50		HF to increase injectivity.	**Approved** for 2025. The well No 7672 was converted to injector (Dec'23), effect to be evaluated, based on the result to review the need to enhance the water injection (by starting injection well No 7831)
10	xxx	Xx				33.7		Workover at injector				50-70		Frac on T2	**Not approved**. It is possible to replace the choke to increase the injectivity (current diameter is 3mm). Injectivity in the well No7922 is limited in order to reduce watercut of wells No 5923, 7940

Wells conversion to injectors

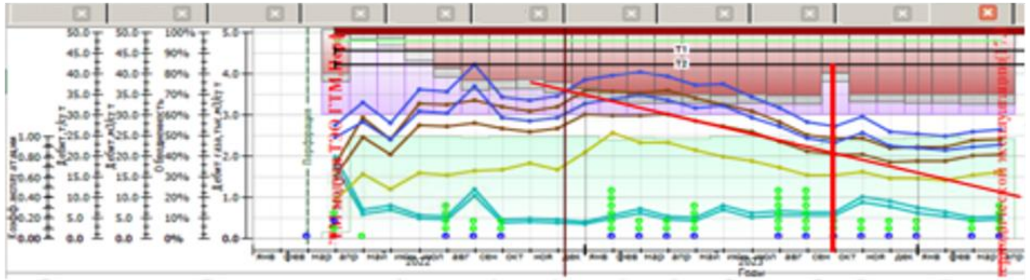






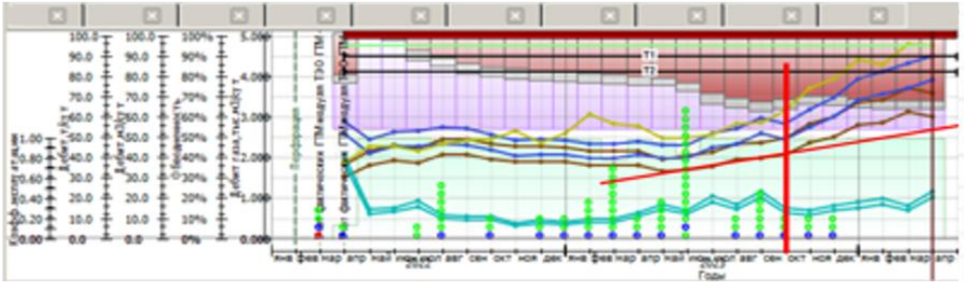
Wells conversion to injectors

xxx



+1 077t

xxx



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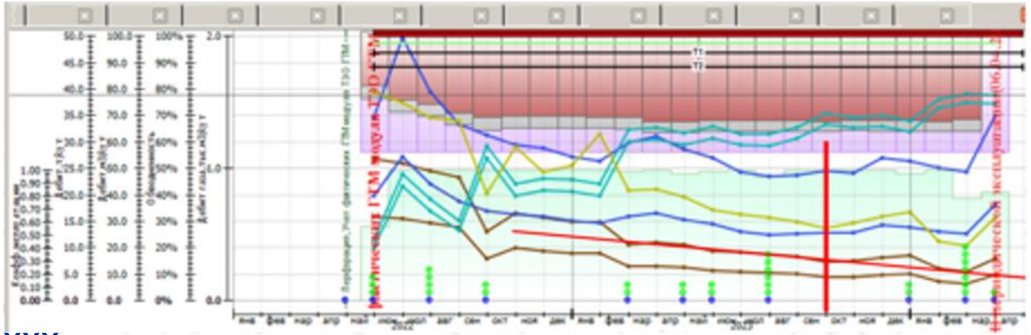
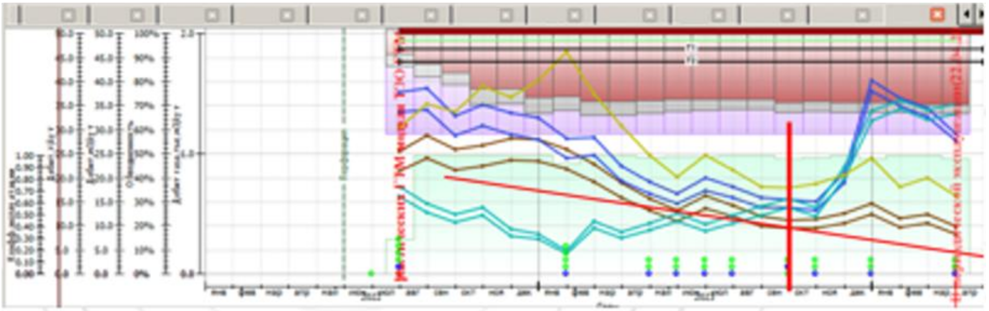
xxx



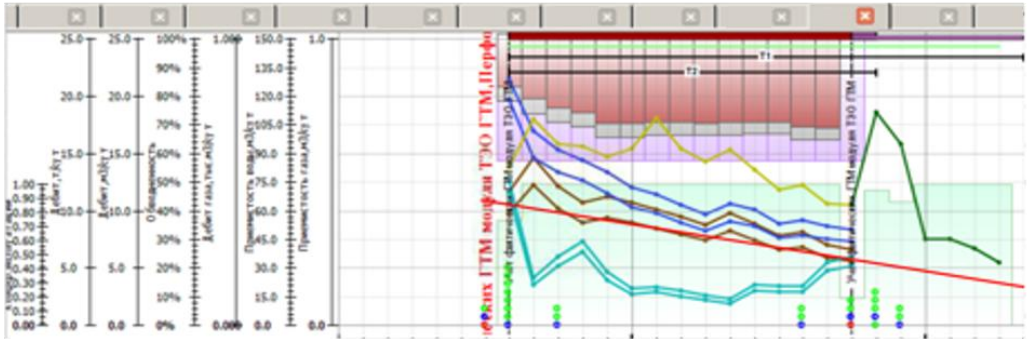
+306t

xxx



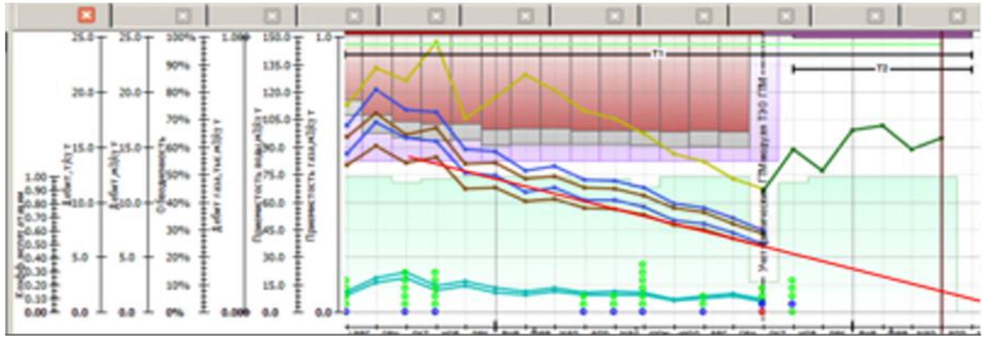
+856t

xxx



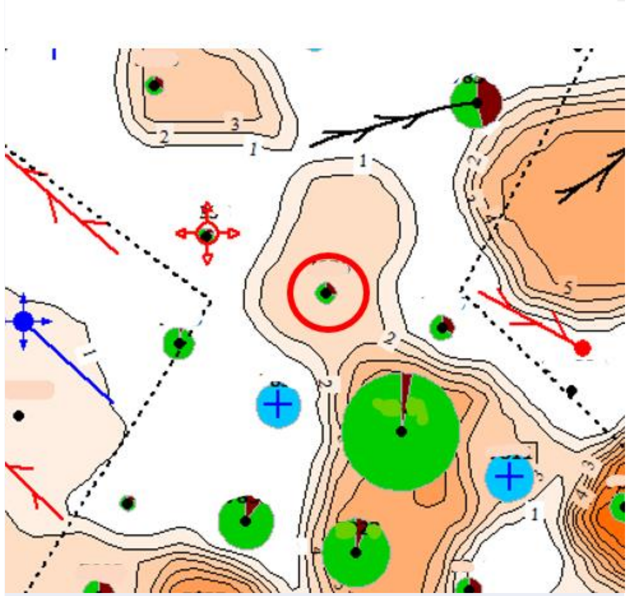
-913t

xxx

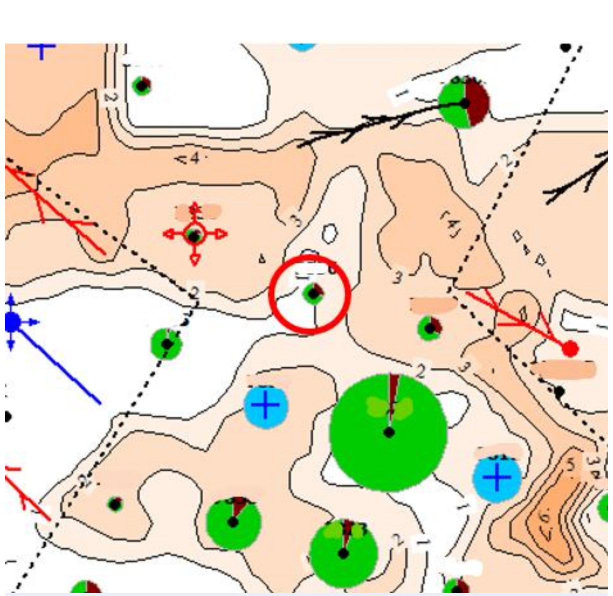


-680t

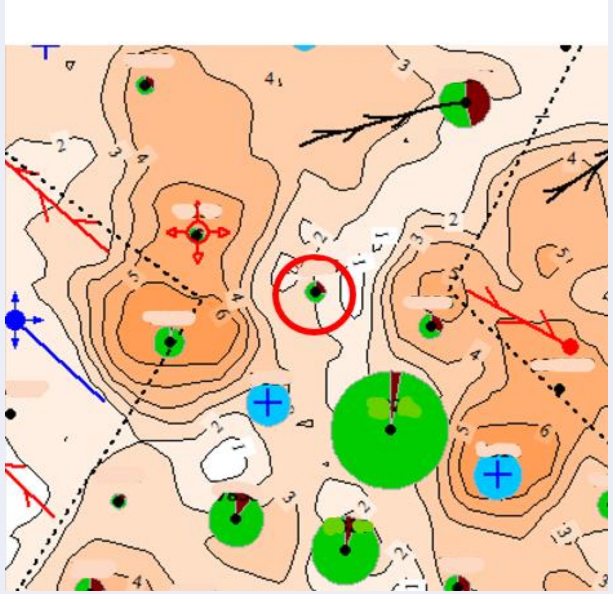
Analysis of frac efficiency on the well No XXXX



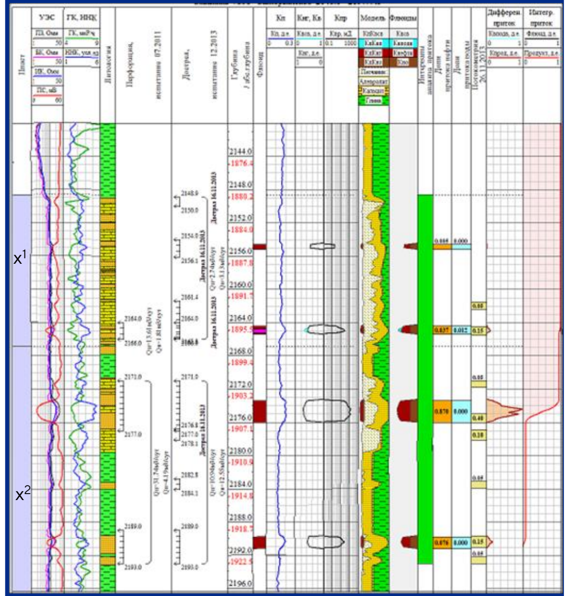
Net pay map (class 1)
and current recovery



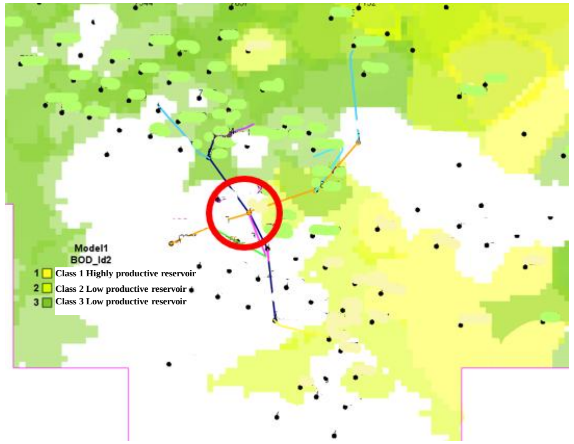
Net pay map (class 2)
and current recovery

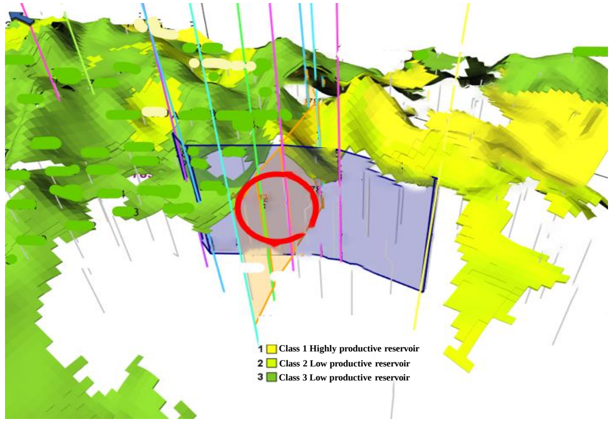


Net pay map (class 3)
and current recovery



Analysis of frac efficiency on the well No XXXX





№	Скважина	куст	Режим до ГТМ (на 1.10.2023г)			Базовый дебит нефти	Планируемое мероприятие (ГТМ)	Ожидаемый режим			Входной прирост, т/сут	Дата запуска	Режим за март						
			Qж, м3/сут	Qн, т/сут	Обв., % (мас.)	Qн, т/сут		Qж, м3/сут	Qн, т/сут	Обв., % (вес.)			Qж, м3/сут	Qн, т/сут	Обв., % (вес.)	Прирост, т/сут	Отработано сут	Доп.добыча план	Доп.добыча факт
Интенсификация притока																			
		19	9,7	1,5	81,4	1,0	ГРП. Факт - ПМ 2167м, ГРП 80т	30	6	75	5	21.03.2024	26	5,80	73,4	4,28	11	55	47,08
		8	2,4	1,9	6,7	2,0	ГРП. Факт - ПМ 2098м, ГРП 90т	10	6	30	4	28.03.2024	12	6,2	38,5	4,32	4	15,8	17,28
												Итого						70,8	64,4
												Всего							

куст	Режим за апрель							Режим за май						
	Qж, м3/сут	Qн, т/сут	Обв., % (вес.)	Прирост, т/сут	Отработано сут	Доп.добыча план	Доп.добыча факт	Qж, м3/сут	Qн, т/сут	Обв., % (вес.)	Прирост, т/сут	Отработано сут	Доп.добыча план	Доп.добыча факт
19	24,6	9	56,4	7,5	30	150	224,4	20,6	7,9	54,5	6,4	31	155	197,78
8	11,9	9,2	8,2	7,3	30	118,5	219,6	8,2	6,6	5,2	4,7	31	122	146,32
Итого						268,5	444,0						277,5	344,1
Всего						339,3	508,4						616,8	852,5

Well XXXX. Major inflow was indicated from the X2 formation. Watercut increase is related to X2 formation producing from a highly permeable interlayer.

The frac is intended to get residual oil from X1 formation being the poorly developed. Prior the frac it is necessary to inject 50-100m3 of shale baffle to prevent fracture propagation into the lower X2 formation. Back filling up to 2167 m and the frac will follow.

The frac was 100% effective. 77% of the activities are approved

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Patents and certificates

РОССИЙСКАЯ ФЕДЕРАЦИЯ

СВИДЕТЕЛЬСТВО

об официальной регистрации программы для ЭВМ

№ 2005610863

"Система автоматизированной визуальной интерпретации результатов геофизических исследований скважин" ("Gintel")

Правообладатель(ли): Афанасьев Виталий Сергеевич (RU), Афанасьев Сергей Витальевич (RU), Афанасьев Александр Витальевич (RU)

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Заявка № 2005610676

Дата поступления 7 апреля 2005 г.

Зарегистрировано в Реестре программ для ЭВМ 11 апреля 2005 г.

Руководитель Федеральной службы по интеллектуальной собственности, патентам и товарным знакам

Б.П. Симонов

РОССИЙСКАЯ ФЕДЕРАЦИЯ

СВИДЕТЕЛЬСТВО

о государственной регистрации программы для ЭВМ

№ 2008614505

«Программный модуль ТАБС»

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Заявка № 2008614210

Дата поступления 16 сентября 2008 г.

Зарегистрировано в Реестре программ для ЭВМ 19 сентября 2008 г.

Руководитель Федеральной службы по интеллектуальной собственности, патентам и товарным знакам

Б.П. Симонов

РОССИЙСКАЯ ФЕДЕРАЦИЯ

ПАТЕНТ

НА ИЗОБРЕТЕНИЕ

№ 2219337

СПОСОБ ОПРЕДЕЛЕНИЯ ГЕОЛОГИЧЕСКИХ СВОЙСТВ ТЕРРИГЕННОЙ ПОРОДЫ В ОКОЛО СКВАЖИННОМ ПРОСТРАНСТВЕ ПО ДАННЫМ ГЕОФИЗИЧЕСКИХ ИССЛЕДОВАНИЙ РАЗРЕЗОВ СКВАЖИН

Патентообладатель(ли): Афанасьев Виталий Сергеевич, Афанасьев Сергей Витальевич, Афанасьев Александр Витальевич

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г. Москва, 20 декабря 2003 г.

Генеральный директор

А.Д. Корчагин

РОССИЙСКАЯ ФЕДЕРАЦИЯ

СВИДЕТЕЛЬСТВО

о государственной регистрации программы для ЭВМ

№ 2008614504

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Заявка № 2008614209

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Руководитель Федеральной службы по интеллектуальной собственности, патентам и товарным знакам

Б.П. Симонов

TABC Methodology

Automated restoration of rock properties in a terrigenous profile according to well logging data in Gintel software

- ✓ Approved by the Technical Advisory of the State Reserves Commission under the Ministry of Natural Resources of the Russian Federation
- ✓ Included in the Technology and Software Library of the State Reserves Commission under the Ministry of Natural Resources of the Russian Federation

Russian unique ESKS technologies in Gintel supersede foreign counterparts!

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Conclusions

01

Complete geological data

In-depth interpretation of well logging data provides comprehensive geological data on the reservoir structure, geomechanical parameters, fluid saturation and formation filtration properties, evaluation of the potential water cut of the produced oil.

02

High-precision reservoir modeling

An extensive database relied on re-interpretation of conventional well logging ensures high-precision modelling of the formation geological structure along with distribution of saturation and actual oil reserves.

03

High efficiency

Practical application of this methodology using AI at operating fields demonstrates its high efficiency. Meanwhile digitalization and neural networks are being continuously enhanced and expanded.

The use of the technology significantly reduces non-productive costs and increases the overall efficiency of well interventions.
Drilling, sidetracking, hydraulic fracturing, perforation, conversion to injectors, commingling and other activities are designed based on the studies and modelling, along with proposed calculation of the predicted fluid/oil production rate, water cut by the penetrated intervals.

04

Mitigation of geological risks

Mitigation of geological risks involves decreasing the ambiguity level in decision-making during planning and implementation of field development, as well as in activities aimed at maintaining production levels and reserves recovery.

05

Scientifically proven method

The completed work is a full-fledged scientific study and can be recommended to the specialists of oil-and-gas production departments because of its practical applications, results and developments.

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Thank you for your attention!