



ECOIL TECHNOLOGIES

CHEMICAL PRODUCTS FOR OIL PRODUCTION PROCESSES





ECOIL TECHNOLOGIES DEVELOPS AND IMPLEMENTS CHEMICAL PRODUCTS FOR OIL PRODUCTION PROCESSES



ECOIL TECHNOLOGIES offer more than 150 names of chemical products and technologies. All of them are approved for use in the oil and gas extraction industry and are confirmed by normative and technical documentation.

ECOIL TECHNOLOGIES can supply the necessary quantity of chemical products and equipment in the shortest possible time carry out laboratory and pilot-industrial tests and their application supervision.

Chemical solutions under the ECOIL brand and technology of their application are successfully used in the oil fields of Russia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan. Our reagents are used by various oil companies, including the largest ones: PJSC «NK «Rosneft», PJSC «Gazpromneft», PJSC «LUKOIL», PJSC «Tatneft», JSC «RITEK», PJSC «NK «RussNeft», JSC «Surgutneftegaz», JSC «Zarubezhneft», PJSC «Transneft», LLC «INK», State Production Association Belorusneft.



1. DEVELOPMENT, PRODUCTION & IMPLEMENTATION OF CHEMICAL PRODUCTS FOR CRUDE OIL RECOVERY, TRANSPORTATION & TREATMENT

One of the areas of activity of Ecoil Technologies is to ensure the efficiency of oil production, collection, transport and treating. The use of various groups of additives and reagents ensures a reduction in operating costs and an improvement in operation of the chemical systems of the oil field.

CHEMICAL PRODUCTS FOR OIL PRODUCTION, TRANSPORTATION AND TREATING

Process	Chemicals
Oil treating	<p>Deemulsifiers ECOIL-4410, SNPX-4103, ECOIL-4114, ECOIL-4315, ECOIL-4480, ECOIL-4460, ECOIL-4880, ECOIL-4901, ECOIL-4810 A</p> <p>Active base of the deemulsifier ECOIL series S</p> <p>Concentrate of deemulsifiers ECOIL-7, ECOIL-8, ECOIL-21, SNPH-23</p> <p>Slurry upgrading ECOIL-4802</p>
Improving rheological properties of oil	<p>Reagents with compound actions ECOIL-7909, ECOIL-7963, ECOIL-7912M</p> <p>Depressor additive ECOIL-2005</p>
Control over sulfate-reducing bacterias	<p>Bactericides ECOIL-1050, ECOIL-1517</p>
Removal and prevention of heavy oil deposits and hydrate formations	<p>Wax deposition remover ECOIL-7r-14, ECOIL-7870, ECOIL-7890 (in the form of an aqueous solution)</p> <p>Wax deposit & hydrate formation remover ECOIL-7850</p> <p>Heavy oil deposit inhibitors ECOIL-IPG-11, ECOIL-7941, ECOIL-7920, ECOIL-7909, ECOIL-7963, ECOIL-7912M</p>
Protection of equipment from corrosion	<p>Corrosion inhibitors ECOIL-6030, ECOIL-6418, ECOIL-6035, ECOIL-6825, ECOIL-6438, ECOIL-6201</p> <p>Corrosion inhibitors for gaseous medium ECOIL-6030 G, ECOIL-6201 G, ECOIL-6474 G, ECOIL-6941 G</p>
Scale deposit prevention & removing	<p>Scale deposit inhibitors ECOIL- 5311-T, ECOIL-5312, ECOIL-5313, ECOIL-5316, ECOIL-5317</p> <p>Scale deposit remover ECOIL-53R</p> <p>Reagent with compound actions ECOIL-5314</p>
De-oxygenation	<p>Oxygen absorbent ECOIL-OS-3610</p>
Foam suppression	<p>Foam suppressant ECOIL-3510</p>
For reducing hydraulic resistance & increasing pipeline-transmission capacity	<p>Turbulent viscosity reducing additives ECOIL-DRA of 100, 200, 300, 400 trademarks</p>

PRODUCTS DESCRIPTION

DEMULSIFIERS

They are used in the process of crude oil dewatering and desalting in gathering facilities and at oil treatment plants in a wide range of temperatures; for deep oil desalination at oil refineries; for fuel oil dewatering, processing and utilization of industrial effluents; for destruction of intermediate layers stabilized by mechanical impurities (including iron sulfide) associated with heavy oil deposits.

Brand	Description
For crude oil dewatering & desalting, they are effective in a wide range of temperatures at low specific consumption (oil-soluble, water-dispersible)	
ECOIL-4103	It is effective for dewatering of high-viscosity true emulsions of the Devonian and coal-bearing horizons. It is used to prevent formation of water-oil emulsions in the processes of oil production stimulation. Reagent modifications can be used in composition of process fluids during hydraulic fracturing and acid treatments of the bottom-hole reservoir zone. It is effective in a wide range of temperatures. It is fully compatible with reagents used in acid treatments and hydraulic fracturing. Effectively prevents the formation of water-oil emulsions, promotes the destruction of formed emulsions, while ensuring high purity of separated water.
ECOIL-4315 ECOIL-4460	They have anticorrosive properties, effective for destruction and dewatering of heavy high-viscosity oil-water emulsions, fuel oil & oil sludge dewatering, processing and disposal of industrial effluents and waste. They provide fast separation and purity of reservoir water.
ECOIL-4880 ECOIL-4810A ECOIL-4901	They contribute to the effective destruction of stable intermediate layers, form the clear interface. They have anticorrosive properties and the ability to inhibit heavy oil deposits. They are effective for heavy high-viscosity oil dewatering and desalting. They provide fast separation and purity of reservoir water.
For pre-discharged of water & reducing water-oil emulsion viscosity; they are effective in a wide temperature range at low consumption	
ECOIL-4114	Oil-soluble, water-dispersible. They provide fast separation and purity of reservoir water, can be used in oil gathering facilities and oil treatment plants.
ECOIL-4410	Watersoluble. It provides fast separation and purity of reservoir water. It is effective for oil deep dewatering and desalting at oil refineries

Brand	Description
	Watersoluble. It provides fast separation and purity of reservoir water. It is effective for oil deep dewatering and desalting at oil refineries
For oil sludge processing, destruction of resistant cuff-layer water-oil emulsions, stable intermediate layers stabilized by a large amount of mechanical impurities, including iron sulfide	
ECOIL-4802	Watersoluble. It is produced under several brands depending on properties and composition of stabilizers for solid intermediate layers, stable slop oils, oil sludge. Significantly reduces the content of iron sulfide, due to the destruction of the solid intermediate layer, it contributes to an additional volume of commercial oil recovery.
Concentrate of deemulsifiers	
ECOIL-7 ECOIL-8 ECOIL-21 ECOIL-23	Highly effective concentrates of demulsifiers with an active base content of at least 70% are analogs of imported concentrates produced by "BASF", "Clariant", "Croda", etc. They are used in the production of effective demulsifiers for oil treatment.
Polyurethane compound-based active bases for demulsifiers	
Series of ECOIL-S products	Polyurethane compound-based active bases for demulsifiers. They are used in the production of high-performance demulsifiers for heavy high-viscosity oil-water emulsion dewatering and desalting. They are effective both at low temperatures (under conditions of in-line demulsification) & at the final stage of commercial oil treatment, ensuring a minimum content of residual water and chloride salts in processed oil, as well as high purity of reservoir water.



PRODUCTS DESCRIPTION

CORROSION INHIBITORS

In case of continuous introduction they slow down corrosion processes of oilfield equipment and pipelines significantly. They can be used for corrosion suppression in water circulation cycles of the oil refining & metallurgical industries.

Brand	Description
ECOIL-6030	At low dosages, it provides reliable protection in highly mineralized environments containing H ₂ S, CO ₂ and in the absence of them. Film-forming; it has a high aftereffect. Improves the rheological properties of oils.
ECOIL-6035	It is highly effective in highly mineralized environments of the Devonian horizon, as well as in aggressive oilfield environments containing dissolved gases: CO ₂ , O ₂ , H ₂ S. The protective effect at low costs is more than 90%. It has a high aftereffect.
ECOIL-6825 ECOIL-6418	It has a bactericidal effect and is effective in aggressive environments containing hydrogen sulfide and carbon dioxide.
ECOIL-6201	It is effective in aggressive environments containing hydrogen sulfide and carbon dioxide. At low dosages the protective effect is more than 90%
ECOIL-6438	It shows a high anticorrosive effect in aggressive environment containing hydrogen sulfide, as well as in hydrochloric acid environment used for processing the bottom-hole reservoir zone.

CORROSION INHIBITORS FOR GAS ENVIRONMENTS

It designed for use in the gas industry for corrosion protection of field equipment in process environments containing carbon dioxide and hydrogen sulfide. The corrosion inhibitor has a good solubility in methanol, oil and petroleum products; it doesn't tend to form emulsions and foaming.

Brand	Description
ECOIL-6030 G ECOIL-6201 G ECOIL-6474 G ECOIL-6941 G	For protection against hydrogen sulfide and carbon dioxide corrosion of downhole equipment and pipelines at gas production and oil refining facilities.

BACTERICIDES

Brand	Description
ECOIL-1050 ECOIL-1517	Control over sulfate-reducing bacteria (SRB) in oil and oil-field equipment

OXYGEN ABSORBENT

Brand	Description
ECOIL-OS-3610	It is designed to remove dissolved oxygen in oilfield, fresh and other waters of various mineralization in order to prevent the development of oxygen corrosion of oilfield equipment.



PRODUCTS DESCRIPTION

HEAVY OIL DEPOSIT INHIBITORS

They prevent wax deposits in the oilfield equipment and pipelines during oil recovery, storage and transportation.

Brand	Description
ECOIL-7941 ECOIL-7920 ECOIL-7821	To prevent wax deposits during oil recovery and transportation. Designed for difficult type of oil
ECOIL-IPG-11	To prevent alkane hydrate deposits during oil recovery and transportation
ECOIL-7909 ECOIL-7912 M ECOIL-7963	To prevent wax deposits during recovery of difficult types of oil & reduce viscosity during crude oil transportation
ECOIL-7890	For washing oilfield equipment from deposits with hot water solutions
ECOIL-2005	Depressor. For decreasing the pour point, oil viscosity reducing & improving the rheological characteristics of oil

HEAVY OIL DEPOSIT REMOVERS

Brand	Description
ECOIL-7870 ECOIL-7P-14	Removing heavy oil deposits in oil-field equipment
ECOIL-7850	Removal of alkane hydrate plugs and deposits

SCALE DEPOSIT INHIBITORS AND SOLVENTS

Designed to protect oilfield equipment during oil recovery and treatment from scale deposits, including sulfates, calcium and magnesium carbonates, barium sulfate, and iron compounds.

Brand	Description
ECOIL-5311-T	To prevent calcium carbonate deposits
ECOIL-5312 ECOIL-5316 ECOIL-5325 ECOIL-5350TS ECOIL-5315	To prevent deposits of sulfate and calcium carbonate in highly mineralized commercial waters
ECOIL-5313	To prevent deposits of iron sulfide, iron oxides and hydroxides, barium sulfate, and calcium carbonate
ECOIL-5317	To prevent deposits of barium sulfate and carbonate, strontium, calcium carbonate and calcium sulfate
ECOIL-53R	For dissolving carbonate deposits with an admixture of sulfides and iron oxides on surface of well equipment, pipelines for oil and water treatment and transportation systems, as well as in heat and power equipment
ECOIL-5314	The reagent with compound action. Designed to protect wells and oilfield equipment from deposits of carbonate and calcium sulfate, as well as to protect oilfield equipment from hydrogen sulfide and carbon dioxide corrosion.



PRODUCTS DESCRIPTION

FOAM SUPPRESSANT

Brand	Description
ECOIL-3510	It is intended for use in the oil recovery and refining industry in order to eliminate forming foam and prevent further foaming in the processes of oil & gas production, treatment and processing

TURBULENT VISCOSITY REDUCING ADDITIVES (ATA)

Brand	Description
ECOIL-DRA of 100, 200, 300, 400 brands	Designed to reduce hydraulic resistance in pipelines, pumping oil, condensate, and petroleum products. Application of ATA reduces energy losses in turbulent flows and allows decreasing the pressure drop on the pipeline section with a constant flow rate of liquid or increasing the pumping of hydrocarbons



2. TECHNOLOGIES OF ENHANCED OIL RECOVERY AND OIL PRODUCTION INTENSIFICATION

Ecoil Technologies provides complex solutions for oil recovery stimulation and intensification of oil production, ensuring maximum efficiency and profitability. The technologies are aimed at optimizing the parameters of hydrocarbon production from productive reservoirs, reducing the costs of long-term exploited fields and putting undrained and residual oil reserves in development.



TECHNOLOGIES OF ENHANCED OIL RECOVERY AND OIL PRODUCTION INTENSIFICATION

Process	Chemicals	Effects
Water shut-off	ECOIL-9633 ECOIL-9640 ECOIL-9110	Improving the efficiency of heterogeneous reservoir development
Conformance control	ECOIL-9633 ECOIL-9640	The increase in oil recovery during water-flooding operation
Intensification of oil production in carbonate reservoirs	ECOIL- 9010 (AS)	Effective intensification of the treated formation interval by acid systems (AS)
Intensification of oil recovery in terrigenous reservoirs	ECOIL- 9021 (AS) ECOIL- 9030 (AS) (including non- combustible composition)	Recovery & increasing productivity of wells due to bottom- hole zone treatment
Acid pack	Acid modifier ECOIL-8903 Iron Stabilizer ECOIL-8905	Multifunctional complex additive for acid modification
Repair and insulation works	ECOIL-9800	Isolation of lost-circulation zone and water ingress during drilling and repair of oil and gas wells
Acid corrosion inhibitor	ECOIL-8904	Reducing the corrosive aggressiveness of acid
Modifier - Filter cake remover	ECOIL-8909	Improving the acid treatment efficiency due to destruction of clay bond of the reservoir. An alternative to clay acid treatment
Inverse emulsion-based well- killing fluids	Emulsifier ECOIL-9777	Oil and gas well kill operation, well completion
Technology of directed acid treatment of highly watered reservoirs	ECOIL - 9633 + AS ECOIL-9640 + AS	Directed acid treatment to increase well productivity with a water content of more than 80%
Oil recovery stimulation technology with compound action	ECOIL-95M, PG-UVS ECOIL-96M	Development of undrained oil reserves by increasing the reservoir coverage due to flooding operation and increasing the oil-displacing capacity of water
Technology of physical and chemical impact on the reservoir	Ultrasonic impact + ECOIL-9010	Combined impact on the reservoir by chemical reagents in the ultrasonic field
Quantum markers-reporters	ECOIL-Geosplit	Quantitative and qualitative assessment of horizontal well flow profiles, assessment of the performance of each hydraulic fracturing interval for oil, water and gas

PROCESS DESCRIPTION

WATER SHUT-OFF

WELL TREATMENT TECHNOLOGIES WITH HYDROCARBON COMPOSITION OF TENSION-ACTIVE SUBSTANCES (HC TAS)

- ECOIL-9633 reagent has been developed for low reservoir temperatures (up to 60°C),
- ECOIL-9640 reagent has been developed for high reservoir temperatures (60-105°C)

Producing Wells

Water shut-off technology HC TAS (ECOIL-9633, ECOIL-9640).

The technology is designed to reduce water content in extracted products and increase the oil flow rate in carbonate and terrigenous deposits with high water content in products (60-99%) and different mineralization of waters that water the well.

The method is based on blocking the water-saturated zones of the reservoir with high-viscosity emulsion systems formed during injection of HC TAS. Emulsions that form in washed areas of the reservoir are resistant to water erosion and are destroyed by contact with oil, which ensures high selectivity of the method and does not impair the permeability of oil-saturated layers. In addition, the developed reagents have a hydrophobizing effect and are able to dissolve and disperse heavy oil deposits and reduce oil viscosity.

To increase the effectiveness of HC TAS application, it is recommended to introduce a modifier and/or filler into its composition. The introduction of additives can increase not only the speed of formation of emulsion systems and their stability, but also the viscosity and strength. This increases the blocking properties, reduces the sensitivity to depressions, and reduces the possibility of the emulsion removal from the reservoir.

EXPERIENCE IN APPLICATION

Parameter	ECOIL-9633	ECOIL-9633 with modifier and / or filler
Number of wells treated	over 2 000	over 900
Additional oil recovery (tn/treated well)	1 000	Over 1 200
Average daily increase in oil recovery (tn/day)	2,0-5,0	2-6,5
Success rate	over 70%	over 75%
Cutting volumes of produced water (t/treated well)	over 2000	over 2500
Effect duration	1 year in terrigenous, more than 2 years – in carbonate reservoirs	1,5-2,5 years

In the first months after application of ECOIL-9640 with a modifier and/or filler, most wells showed a decrease in water cut of recoverable products and an increase in oil recovery.

CONFORMANCE CONTROL

Injection wells

Technology of HC TAS impact on the oil reservoir through injection wells. The technology is designed to improve the performance of oil field development in conditions of heterogeneous reservoirs with different mineralization of reservoir and injected water and high water content in well production.

The method is based on the ability of reagents “hydrocarbon solvent - surfactant composition - mineralized water” to form viscous stable gel - like emulsions with an external hydrocarbon phase, which contributes to the redistribution of filtration flows and alignment of the displacement front in injection wells. This ultimately leads to decrease in the water content in production and increase in oil flow rate in producing wells. In addition, the technology has a hydrophobizing effect, it helps to dissolve and disperse heavy oil deposits & reduce the viscosity of oil

EXPERIENCE IN ECOIL-9633 TECHNOLOGY APPLICATION (114 sites): • additional oil production - more than 2100 t/ treated well; • success rate-78%.

Advantages and distinctive features of HC TAS (ECOIL-9633, ECOIL-9640) & HC TAS-based technologies:

- low pour point (below minus 55 ° C);
- does not contribute to clay swelling;
- able to bind large amounts of water;
- facilitates dissolution and dispersion of heavy oil deposits;
- standard oilfield equipment can be used;
- delivered in commercial form, does not require dilution;
- low viscosity (usually 1.5 mm² /sec)
- low interfacial tension at the water boundary (10-2-10-4 mN / m);
- impact selectivity.

PROCESS DESCRIPTION

WATER SHUT-OFF

REAGENT SNPCH-9110-BASED TECHNOLOGY

- ECOIL-9633 reagent has been developed for low reservoir temperatures (up to 60°C)
- ECOIL-9640 reagent has been developed for high reservoir temperatures (60-105°C)

APPLICATION:

The reagent is intended for regulating the reservoir coverage by waterflood and water shut-off operations in producing wells.

PRINCIPLE:

When a reservoir is treated with ECOIL-9110 reagent, the oil recovery coefficient increases due to the redistribution of flows in interlayers as a result of reduction in filtration-volumetric characteristics of permeable intervals and involvement of low-permeable zones into the operation

ADVANTAGES:

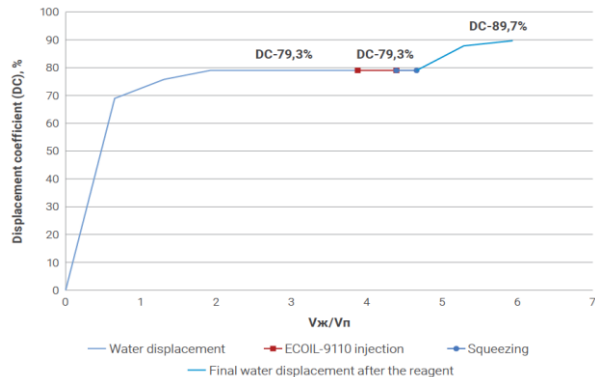
- retention of reservoir properties of productive reservoirs
- putting a well into operation in the shortest possible time, without loss of oil flow rate, with a possible reduction of water content

SEEPAGE STUDIES TO EVALUATE THE EFFECTIVENESS OF ECOIL-9110 REAGENT:

PREDICTION OF PROCESSING

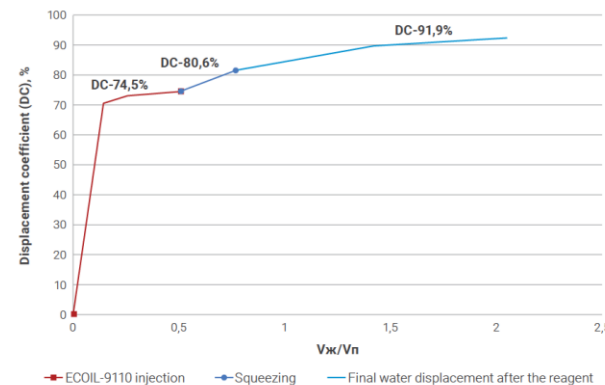
Change in the coefficient of oil displacement in the reservoir model with residual oil content after ECOIL-9110 application.

Model № 1.



Change in the coefficient of oil displacement in the oil-saturated reservoir model after ECOIL-9110 application.

Model № 2.



RESEARCH RESULTS

Model №	Oil volume in the model, ml (% n.o.)	Oil volume displaced by water, ml (% n.o.)	Finally displaced oil volume, ml (% n.o.)	DC before ECOIL-9110 injection, %	DC after ECOIL-9110 injection, %	Finally displaced oil volume, ml (% n.o.)
1	58 (74,9)	46 (59,4)	6 (7,8)	79,3	89,7	10,4
2	62 (79,8)	-	57 (73,4)	79,3*	91,9	12,6

ECOIL-9110 reagent showed effectiveness in enhancing the oil-displacing properties of water in the model, both in the case of primary oil displacement from the reservoir and in the case of residual oil saturation.

PROCESS DESCRIPTION

STIMULATION OF OIL PRODUCTION

CARBONATE RESERVOIRS ECOIL-9010ZH TERRIGENOUS RESERVOIRS ECOIL-9021, ECOIL-9030

The technologies are designed to intensify oil recovery from carbonate and terrigenous reservoirs, prevent the formation of oil emulsions, and effectively clean the bottom-hole zone.

ADVANTAGES:

- thermal stability up to 80°C,
- ability to stabilize Fe³⁺ ions,
- inhibition of salt deposition processes,
- optimization of the raw material base,
- competitive cost.

THE EFFECT IS ACHIEVED BY:

- increasing the radius of active drainage of the bottom-hole zone as a result of partial dissolution of the rock skeleton and clay particle dispersion;
- cleaning of pore channels from mechanical contamination, dispersed clay and heavy oil deposits;
- reduction of capillary forces at the oil-water interface;
- preventing the formation of oil-acid emulsions;
- effective cleaning of the bottom-hole zone from deposits that colmatage the porous medium.

EXPERIENCE IN ECOIL-9010J APPLICATION

Main productive formations	Tournaisian and Bashkirian stages	Bashkirian stage, Vereiskian horizon	Kashirskian-Podolskian horizon
Additional oil production at 1 well/treated	1270	600-1000	860
Success rate, %	93	85	90
Average increase in oil production, tn/day	2,0	2,1	2,3

EXPERIENCE IN ECOIL-9021, ECOIL-9030 APPLICATION

Main productive formations	Kynovian, Bobrikovian Horizons	Melekesskian horizon	Achimovsky suite	Vasyugan, Megion, Wartovsky Suites
Additional oil production at 1 well/treated	1145	600	1360	1300
Success rate, %	100	—	100	82
Average increase in oil production, tn/day	2,1	1,6	1,6-6,0	2,0-20,0 (av. 6,0)



PROCESS DESCRIPTION

STIMULATION OF OIL PRODUCTION

ACID PACK ECOIL-8903

Multifunctional complex additive for modifying (refining) inhibited hydrochloric acid or a mixture of hydrochloric and hydrofluoric acids.

The additive, which is a balanced composition, includes: an inhibitor with a rock matrix, a reciprocal solvent, a complexing agent, a mixture of surfactants that provides the composition with demulsifying properties and promotes heavy oil deposit washing.

ADVANTAGES:

- slowing down the reaction rate of hydrochloric acid with the carbonate rock of the reservoir;
- uniform penetration into high-and low-permeable zones of the rock, thereby increasing the radius of active drainage and involving the entire reservoir thickness in development;
- preventing emulsion & deposit formation, when acid and reservoir fluids come into contact;
- inhibition of deposition of sediment in the reservoir after the reaction of acid with the rock;
- reduction of interfacial tension at the acid-oil interface to 0.01-0.07 mN/m.
- minimal costs for preparing the acid composition.

EXPERIENCE IN APPLICATION:

- number of wells treated – 400;
- additional oil production – 300 tons of oil per 1 well/treated;
- average increase in oil recovery per 1 well - more than 2.0 t /day.;
- the average duration of the effect is more than 10 months;
- successful treatment of production wells - more than 85%.

IRON ION STABILIZER ECOIL-8905

ECOIL-8905 is designed to stabilize iron ions in the technological processes of bottom-hole zone acid treatment.

ECOIL-8905 reduces trivalent iron ions to divalent ones. The rate of reagent consumption in the acid composition is 0.8-1.0% vol. (5000 ppm Fe³⁺), 0.5 - 0.7% vol. (2500 ppm Fe³⁺)

ADVANTAGES:

- low pour point (below minus 50°C);
- prevention of deposition of sediment and formation of true emulsions with reservoir fluids;
- retention of reservoir properties in productive reservoirs;
- can be used in combination with other components of acid composition and in hydrochloric acid of various concentration;
- standard oilfield equipment is used.

REPAIR AND INSULATION WORKS

REAGENT SNPCH-9800

APPLICATION:

The compound is designed to eliminate behind-the-casing flows in lost-circulation zones & water seepage during drilling and repair of oil and gas wells.

PRINCIPLE:

Mobile low-viscosity two-component composition.

ECOIL-9800 composition-based polymerized compound is elastic & has a high adhesive ability with regard to metal and rock.

The curing time is adjustable from 4 to 48 hours.

ADVANTAGES:

- technological in use;
- environmental safety;
- consumption per well is 1-5 tons.
- volume of the polymer stone produced is equal to volume of the grouting solution (non-shrink);
- grouting stone produced is resistant to aggressive reservoir environment & acids-alkaline solutions.

APPLICATION EXPERIENCE:

- number of treated wells - 50
- success rate-75%

PROCESS DESCRIPTION

STIMULATION OF OIL PRODUCTION

ACID CORROSION INHIBITOR ECOIL-8904

PURPOSE:

ECOIL-8904 is used in acidic compositions to reduce their corrosive aggressiveness against metal surface.

DESCRIPTION:

Corrosion inhibitor ECOIL-8904 is applicable in acid compositions with high HCl content and at reservoir temperatures up to 150°C.

Specific corrosion rate of St35 steel at 120°C in 20% HCl at inhibitor ECOIL-8904 concentration of 15 g/dm³ is ~ 4.5 g/m²*h.

ADVANTAGES:

- applicable at reservoir temperatures up to 150°C;
- low pour point (below minus 50 °C);
- applicable in combination with other components of acid composition and in hydrochloric acid of various concentrations.

MODIFIER – FILTER CAKE REMOVER ECOIL-8909

APPLICATION:

Modifier ECOIL-8909 + acid composition (AC).

The products of interaction of the modifier with hydrochloric acid contribute to the dissolution and removal of natural and man-made colmatants of the porous medium, & surfactants included in the composition increase rock wettability, slow down the reaction rate and prevent the formation of insoluble compounds.

DESCRIPTION:

The technology is aimed at structural deformations of clays by the action of the complex “Modifier ECOIL-8909 + KK”.

The process is accompanied by changes in the mechanical properties of clays: their sorption capacity is lost and their hydrophobic properties change.

This technology application prevents the sedimentation of hard-to-dissolve compounds in a porous medium that occur during clay-acid treatments.

Structure of montmorillonite under the action of composition ECOIL-8909 + KK (electron microscopy, 6000x)

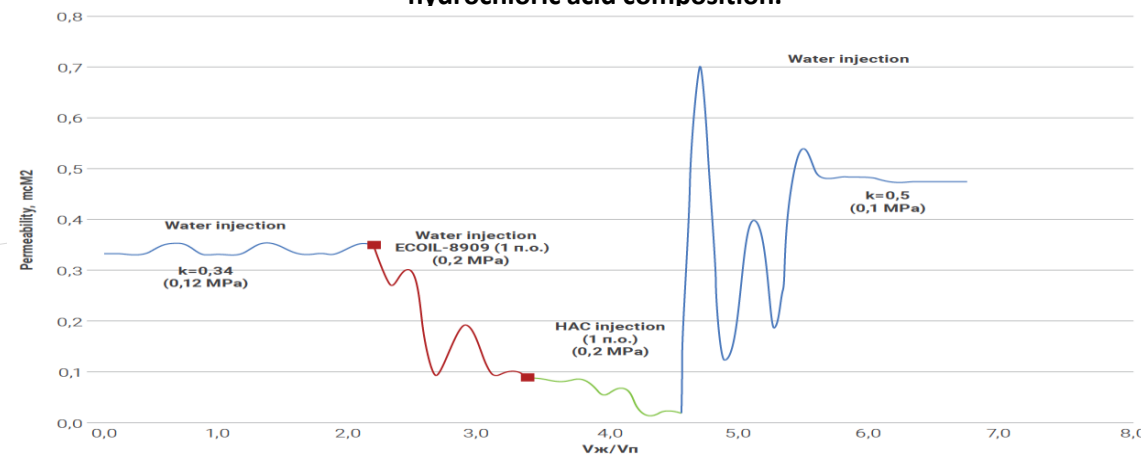


Initial sample

being treated by ECOIL-8909 + KK

Studies on filtration to evaluate the effectiveness of ECOIL-8909 reagent

Change in reservoir model permeability after treatment with solution of ECOIL-8909 in 12% hydrochloric acid composition.



The combined effect on facially inhomogeneous reservoirs by ECOIL-8909 modifier with a hydrochloric- acid composition increases the solubility coefficient of the rock and salts that colmatage the porous medium, and increases the water permeability in the model by 1.5 times.

PROCESS DESCRIPTION

EMULSIFIER ECOIL-9777

Designed to produce invert emulsions used:

- for oil and gas well kill;
- in the development of oil fields (in technologies for water shut-off & alignment of profile log);
- before the acid bottom-hole treatment for temporary isolation of highly productive water-yielding

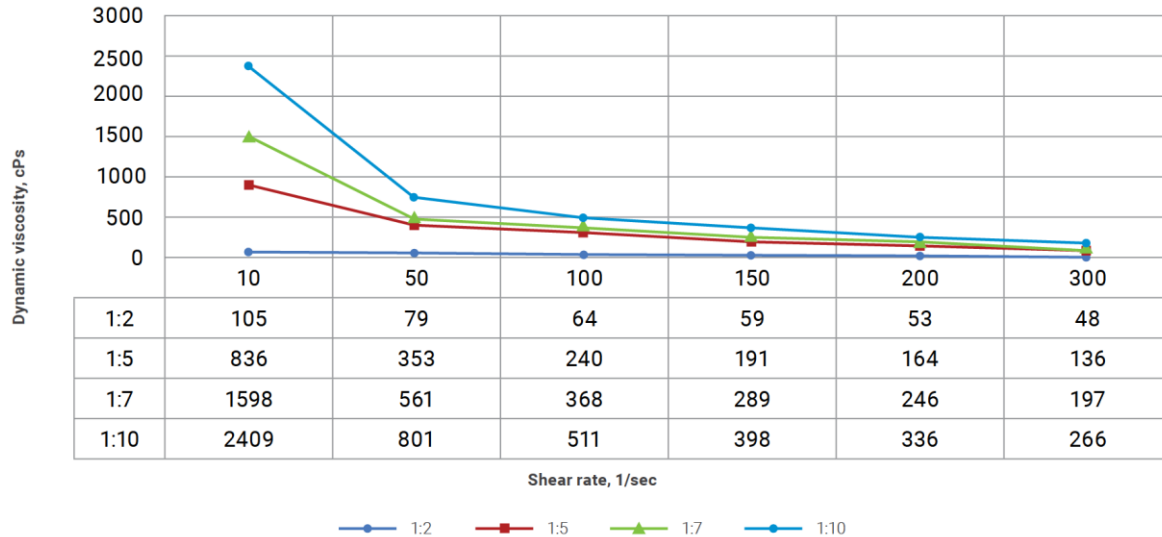
The emulsion-based well killing fluid is an invert emulsion:

- dispersion medium-hydrocarbon solution of Emulsifier ECOIL-9777;
- dispersed phase – water mineralized with various salts;
- viscosity and density of well killing fluids is regulated by phase ratio & water mineralization degree.

ADVANTAGES:

- retention of reservoir properties of the productive reservoir;
- putting a well into operation in the shortest possible time, without loss of oil flow rate with possible reduced water content in products;
- control of well killing fluid density in a wide range from 1.0 to 1.6 g/cm³;
- thermal stability up to 90°C.

Dependence of dynamic viscosity on the amount of dispersed phase in the emulsion Initial data: emulsifier ECOIL-9777, water - CaCl₂ (density 1.358 g/ml)



ECOIL-9777 WITH MODIFYING ADDITIVE (MA)

RESULTS OF SEEPAGE STUDIES on changes in the water permeability in the reservoir model after treatment with ECOIL-9777-based emulsion with 0.7% MA

No	Component	Model length	Permeability by water (initial), mcM2	Injected reagent volume, ml	Permeability by the emulsion, mcM2	Water permeability (final), mm ² /pressure, MPa	Summary
1	Emulsion	50	3,78	85	0,07	0,015/0,8	Breaching of the emulsion at a pressure of 0.8 MPa. Removed from the model in the form of low-viscosity flocculates
2	Emulsion with MA	50	3,37	85	0,38	0,015/1,6	Breaching of the emulsion at a pressure of 2.0 MPa. The emulsion is stable

The introduction of MA into emulsifier SPNH-9777 contributes to the formation of a visco-elastic emulsion with water that is resistant to reservoir drawdown & has a high penetrating ability.

TECHNOLOGY OF DIRECTED ACID TREATMENT OF HIGHLY WATERED RESERVOIRS (DATHWR)

The technology is designed to improve the efficiency of acid treatments in conditions of heterogeneous carbonate or terrigenous reservoirs with different mineralization of produced water at high water content of products (more than 80%).

The method is based on increasing the efficiency of acid treatments by blocking areas with increased permeability. Blocking of permeable zones is carried out using viscous gel-like emulsion systems of the reverse type, which are formed when HC TAS contacts with mineralized waters that water the well. The acid injected afterward is directed not to areas with high permeability, but to oil-saturated, low-permeable zones that were not previously affected.

APPLICATION EXPERIENCE (46 treated wells):

- increase in oil flow rate by 1.5-5 times;
- additional oil production-more than 800 t/treated well;
- reduction of produced water volume - more than 1000 t/treated well;
- average duration of the effect is more than 1 year;
- success rate of the method is more than 70%.

PROCESS DESCRIPTION

STIMULATION OF OIL PRODUCTION

WHEN FLOODING BY INJECTION OF POLYMER-CLAY AND HYDROCARBON OIL-WASHING SYSTEM (PG-UVS TECHNOLOGY)

PURPOSE OF THE TECHNOLOGY

increase in the reservoir coverage by waterflood operation with the following increase in the displacement capacity of the injected water is achieved by sequential injection of the polymer-clay system and the hydrocarbon oil-washing composition

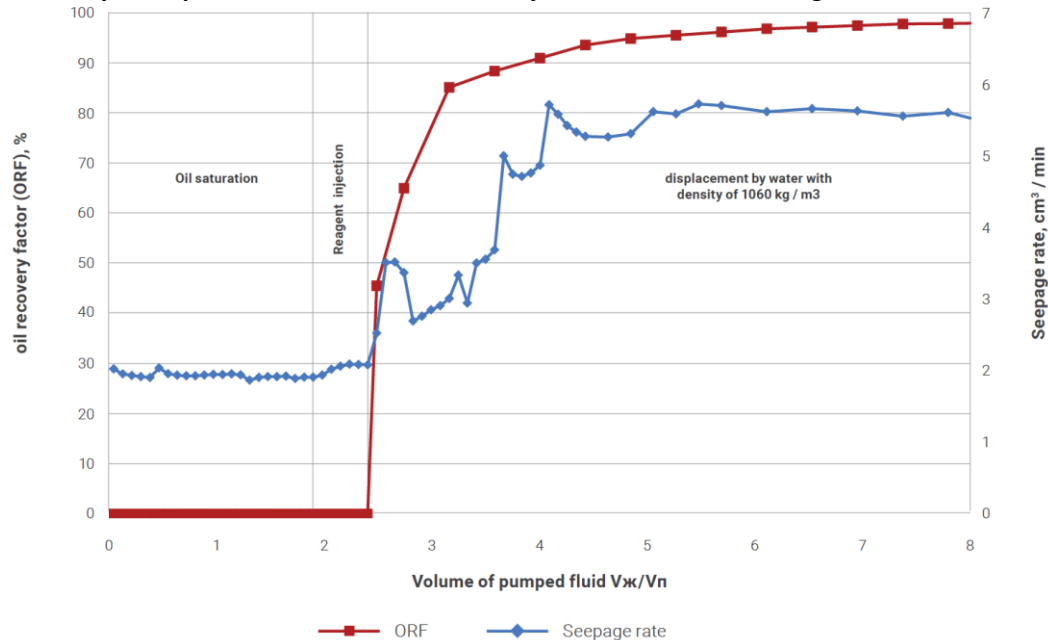
TARGET CHARACTERISTICS

terrigenous reservoirs watered by injected water of any mineralization & characterized by heterogeneity in permeability & with no confluence between oil-saturated and water-saturated intervals, being opened by the injection well

OPERATIONAL CONDITIONS OF THE FACILITY

- secondary reservoir drilling before and after application is not performed;
- presence of pressure communication between the injection well and production well;
- amount of water content from 50% to 98 %;
- liquid flow rate is not less than 50 m3/day.

Primary oil displacement in the model after injection of ECOIL-9633 reagent m S1



ALIGNMENT OF PROFILE LOG

MODERNIZATION OF TECHNOLOGIES FOR COMPLEX IMPACT ON THE RESERVOIR ECOIL-96M TECHNOLOGY

In order to improve existing technologies, a new technology is currently being developed, which is characterized in that the micellar composition of ECOIL-96 with high oil-washing properties is used as a surfactant composition, and the water-insulating reagent ECOIL-8900 is used as a polymer-dispersed system.

THE CONCEPT OF THE TECHNOLOGY

As a rule, the applied technologies use bentonite clay powder and polymer. Currently, a cost-effective composition has been selected, which is an activated finely dispersed mineral system.

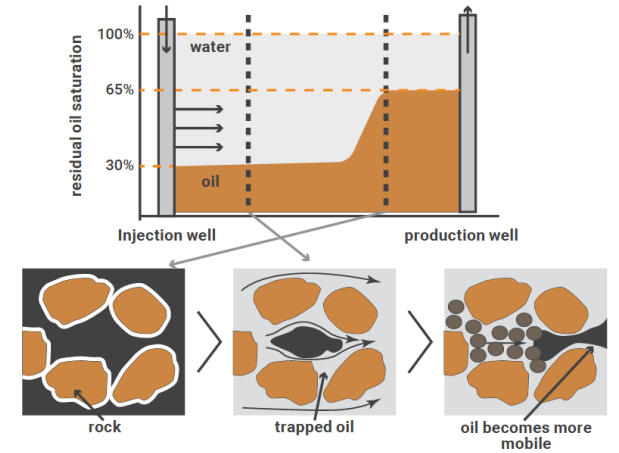
When water interacts with mineral systems activated as a result of grinding, gases such as O₂, H₂, CO₂, CH₄ are released, which penetrate into low - permeable zones in the reservoir, displacing oil from them, and thereby increase the filtration of liquid in the reservoir.

Due to flocculation of grinded mineral systems in highly permeable water - saturated interlayers, the resistance of the injected water increases, which, penetrating into low-permeable oil-saturated interlayers together with gases, displaces oil from them. The micellar composition of ECOIL-96 reduces the surface tension at the "oil-water" and "oil-rock" interface, increasing oil mobility.

All components for the implementation of the technology are selected for the conditions of a particular field. All the components used in the composition of reagents (surfactants and fillers) are made from domestic raw materials.

EXPERIENCE IN APPLICATION

Technology	Total number of treated sites	Additional oil production, thousand tons
ECOIL-95M	49	196,3
PG-UVS	53	190



PROCESS DESCRIPTION

PHYSICAL AND CHEMICAL METHODS FOR OIL RECOVERY STIMULATION

TREATMENT WITH ACIDIC COMPOSITION ECOIL-9010J TOGETHER WITH ULTRASOUND

The technology is based on a combination of chemical and physical methods to stimulate oil recovery. Application of chemical reagents and physical fields can achieve a synergistic effect: significantly increase the processing efficiency. The innovative method involves injecting an acid composition into the reservoir (ECOIL-9010J, ECOIL-9021 (9030) or hydrochloric acid modified with additive ECOIL- 8903A) and processing with acoustic waves.

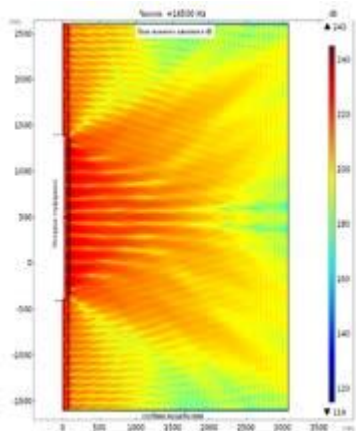
Combined application allows you to:

- Increase the penetration of acid composition into the reservoir by several times;
- Activate the chemical reaction in the acoustic zone in a controlled manner

Depending on the characteristics of wells being treated, it is possible to use acoustic waves of the ultrasonic range, as well as acoustic shock waves.

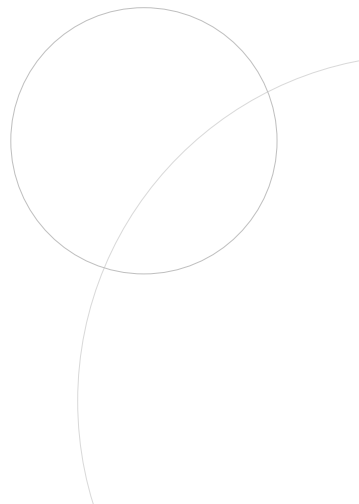
The results of laboratory studies:

1. Acid composition. Increase in permeability to oil in the formation model by 1.9 times.
2. Acid composition together with ultrasonic exposure. Increase in the permeability to oil by 3.3 times.
3. Acid and ultrasonic exposure contributes to the de- colmatage of the porous medium and increases the oil permeability by 2 times compared to the treatment with an acid composition. After US exposure the permeability of high-viscosity oil (172 -255 cPs) increased by 1.3 -1.8 times
4. Reduced oil viscosity by 20-30% after ultrasonic exposure.



Model of ultrasound exposure:

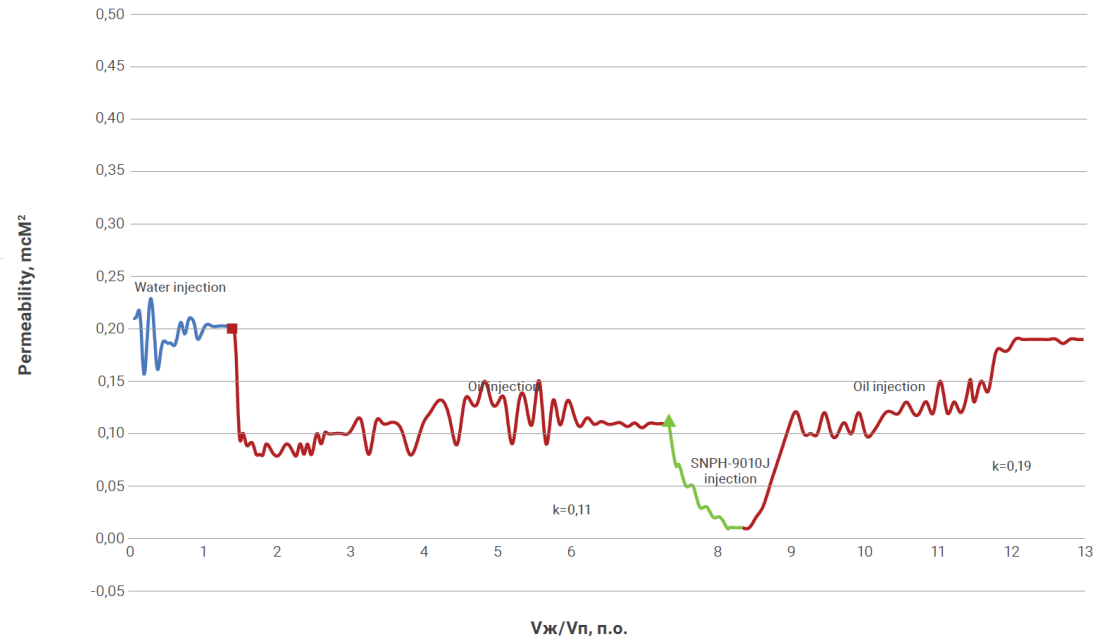
- casing column - 146 mm,
- wall - 7 mm,
- cement - 23 mm,
- perforation - 5 mm,
- medium - porous



SEEPAGE STUDIES ON DETERMINATION OF CHANGES IN THE PERMEABILITY OF THE RESERVOIR MODEL RESERVOIR FLUIDS

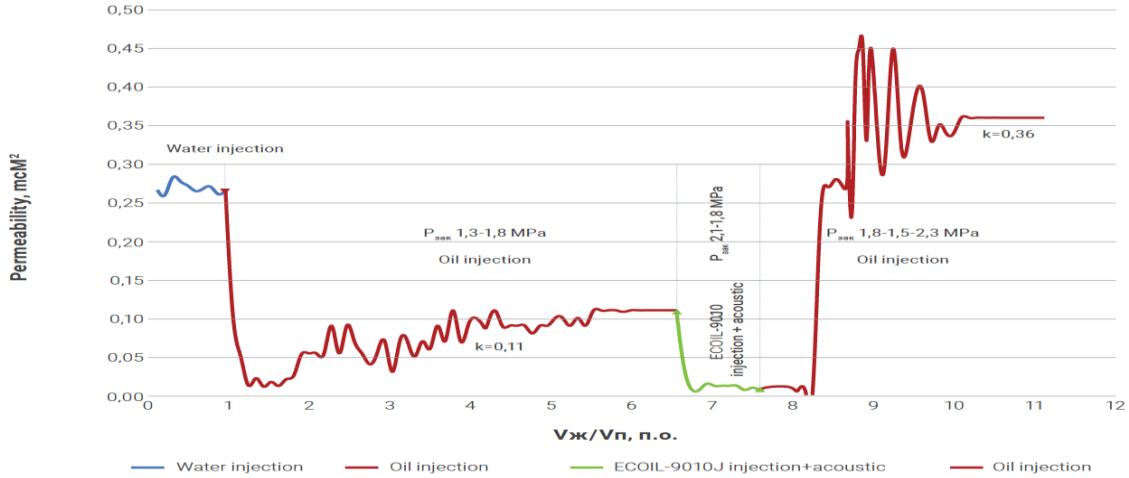
Parameter	Value
Oil viscosity, cPs	15,01
Oil density, kg/m ³	888
Produced water viscosity, cPs	1,08
Produced water density, kg/m ³	1150

Model 1. Change in the permeability to oil in the sand packed tube after ECOIL-9010J injection

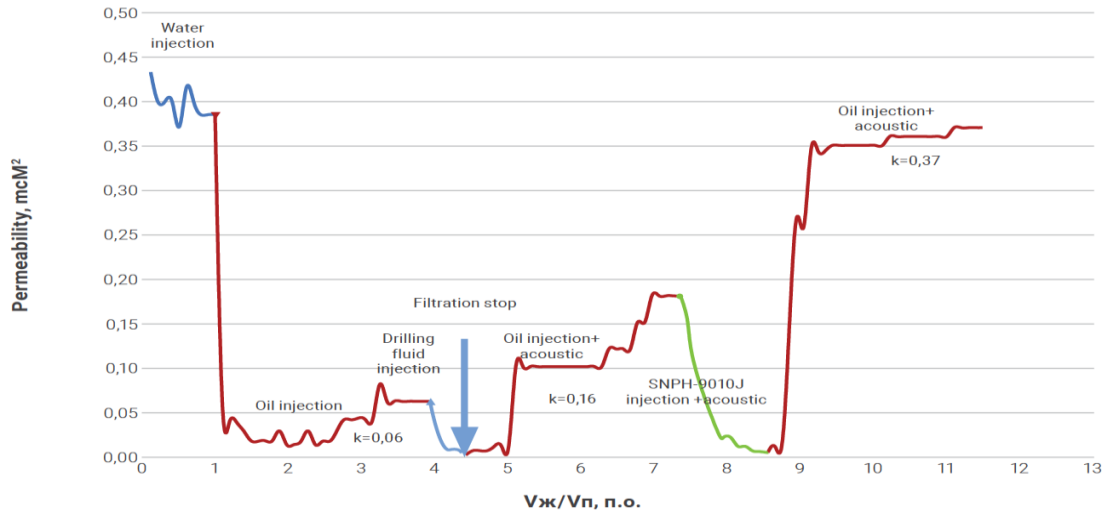


PROCESS DESCRIPTION

Model 2. Change in the permeability to oil in the sand packed tube after treatment with ECOIL-9010J together with acoustic generator



Model 3. Unblocking a colmataged reservoir under acoustic exposure



CLAY STABILIZER ECOIL-SG

APPLICATION:
Additive to drilling fluid and hydraulic fracturing fluids.

PRINCIPLE:
Designed to prevent swelling and migration of clay particles when working to intensify the oil (gas) flow from wells at temperatures up to 90 °C. The organic composition of the product is compatible with all types of biopolymers used in drilling fluids, and does not affect its rheological and filtration properties.

- ADVANTAGES:**
- Effective at high reservoir temperatures;
 - Low-toxic;
 - Does not affect the wettability of the reservoir;
 - The required product concentration for low-clay rocks is from 2 to 5 liters per 1 m³ of the ready mix mud. For high-clay rocks, a concentration of 5 to 15 liters is recommended.

TRACER MARKERS ECOIL-GEOSPLIT

The marker diagnostics and monitoring system allows you to evaluate a flow profile of a horizontal well (after multi-stage hydraulic fracturing) and analyze the performance of each stage for water, oil and gas. Based on the data obtained, wells are managed and their operation is optimized. The principle of the method is to continuously obtain a flow of information about the productivity of producing wells using markers-reporters® from quantum dots using specialized software that interprets analysis data of borehole fluid samples. Unlike traditional methods of horizontal well exploration, this technology does not require special means for device delivery, does not involve risks of equipment seizure and ambiguous interpretation of data.

3. MAINTENANCE SERVICE

PROVISION OF SERVICES FOR RESERVOIR ULTRASONIC TREATMENT TOGETHER WITH ACID COMPOSITIONS



PROCESS DESCRIPTION

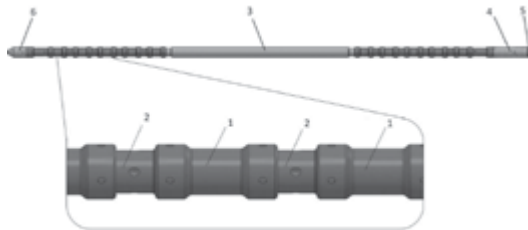
MAINTENANCE SERVICE

PROVISION OF SERVICES FOR RESERVOIR ULTRASONIC TREATMENT TOGETHER WITH ACID COMPOSITIONS

Complex ECOIL-US for physical and chemical impact on the reservoir is designed for ultrasonic exposure on the productive reservoirs of oil fields. The set of equipment consists of ultrasonic ECOIL- GU generator designed to power ECOIL-SP1 downhole device connected via a geophysical cable. Joint treatment of the productive part of the reservoir with the acid composition & ultrasound gives a synergistic effect, which is expressed in an increase in the active filtration zone due to the involvement of low- permeable and colmataged rock interlayers in the work

ADVANTAGES:

- Increasing the treated area and involvement new interlayers into the development process;
- Increasing the reservoir permeability to oil;
- De-colmatage of the porous medium in the bottom-hole zone;
- Increase of acid injection rate;
- Reduction of work time during the development of low-permeable, colmataged productive reservoirs.



Design of ECOIL-SP1 downhole device

1. Tie bar;
2. Booster;
3. Resonator;
4. Tail piece;
5. End plug;
6. Header.

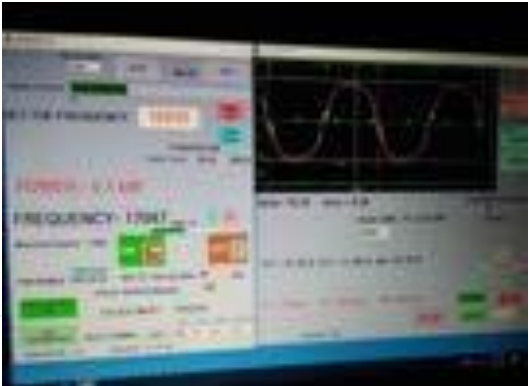
Power voltage, V	500 ± 100
Resonance frequency, khz	16,5 ± 0,5
Overall dimensions, mm	Ø51 x 2600
Weight, kg, not more	15
Ambient temperature, °C max	100
Fluid pressure during operation, MPa	up to 16



Ultrasound downhole device



Installation on a geophysical cable



Interval well treatment by ultrasonic exposure with simultaneous injection of ECOIL-9010ZH



Run of the ultrasound device into a hole

PROCESS DESCRIPTION

MAINTENANCE SERVICE

SHOCK-WAVE EFFECT ON THE BOTTOM-HOLE ZONE OF A PRODUCTIVE FORMATION

The main goal of the technology is to bring low-permeable isolated zones of a productive reservoir that do not respond well to the impact of the reservoir pressure maintenance system into production by acting on them with elastic waves that attenuate in highly permeable sections of the reservoir, but propagate over a considerable distance and with sufficient intensity to excite low - permeable sections of the reservoir. Under the influence of elastic vibrations in a reservoir with a liquid-filled pore volume, pressure increases in pores, which leads to the destruction of the membranes between the pores and the reservoir of additional capillaries, and the difference in the speed of propagation of elastic high - frequency waves through the skeletal rock and pore liquid leads to the destruction of the spatial grid created by the oil colloid - dispersed system. Since the impact of elastic waves only leads to the separation of the system particles from the capillary walls due to vibrations, but does not move them in space, the subsequent powerful shock effect of high energy leads to the removal of colmatant from the formation into the well. It is possible to use shock-wave action both separately and together with chemical treatment of the bottom- hole reservoir zone. The equipment will be operated using a geophysical lift equipped with a geophysical cable.

Characteristics of the down hole tool

Single impulse energy capability, J, not less	400
Single impulse energy duration, ms	5-10
Interpulse time, sec	2
Power source: three-phase voltage	380 B, 50/60 Hz
Power consumption, kWt, not more	5
Operation conditions (ground equipment)	
temperature, °C	from + 5 to +30
relative humidity, %, not more	90 (+25 °C)
Operation conditions (down hole tool)	
temperature, °C	from + 5 to +75
Hydrostatical pressure, MPa	from 0,5 to 20



TRACER ANALYSIS

The tracer analysis for studying productive deposits is one of the most informative in the process of flooding. This method allows getting reliable information in real time, assessing the filtration and reservoir characteristics of reservoir rocks. Types of tracers:

Fluorescent. This type of indicator is environmentally and sanitary-hygienic safe; it's multi-colored, which allows simultaneous launch of 5-7 or more different colors in injection wells.

Ionic. Tracers of this type are highly soluble in reservoir and injected water (amines), have no analogues in nature, are biologically inactive (environmentally friendly), and do not interact chemically with oil.

Organic. These tracers are soluble in both oil and water. Quantitative determination is conducted by chromatographic methods.

The technology is designed for:

- study of the geological structure of the field site, deposits;
- determining the direction of filtration flows of injected liquids and water sources;
- evaluation of the implemented reservoir pressure maintenance system;

These studies will help in the selection of methods for oil recovery stimulation in the studied area of the field, deposits

ECOIL-GEOSPLIT

The technology is a marker monitoring of horizontal well inflow profiles using quantum markers-reporters®. Marking a horizontal well can be performed in several ways – using marked polymer-coated proppant injected during multi-stage hydraulic fracturing, as well as using downhole marker cassettes that are inserted as part of lower completion or into an existing well. The technology allows quantitative & qualitative assessment of horizontal well inflow profiles, as well as analysis of the operation of each stage (interval) of hydraulic fracturing for oil, water and gas. Received data is used to optimize various technical solutions for well completion at the early stages of field development. The research results allow determining the optimal length of the horizontal section and the number of stages for multi-stage hydraulic fracturing and are also used to control the operation of wells in real time.





Thank you!



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