

MULTISTAGE PHYSICO-CHEMICAL METHOD



Company overview



East Scientific Technological Center

Ukraine based company, established in 2000

- ✓ Patent holder for technology
- ✓ Manufacture and supply chemicals
- ✓ Perform well stimulation operations in Ukraine



UK registered company, established in 2006

- ✓ Official represented of ESTC
- ✓ Perform overseas activities for well stimulation with **MPC Technology**



Challenges

Contamination

Reservoir properties

**Fluid properties
(viscous, density, etc.)**

Natural depletion

Approaches

Chemical stimulation

Hydraulic Fracturing

Heating, solvent

**Flooding, in-situ
combustion**



Well stimulation

ACID Treatment

- Comparatively cheap
- Not long lasting effect

Hydraulic Fracturing

- The most efficient among existing
- Average output increase by 2-6 times
- Require high demanding logistic
- Not suitable if water bearing layers exist

Heating

- Need infrastructure
- Low efficient

MultiStage Physico-Chemical Method

- Output increase up to 6 times
- Applicable with high water cut
- Cost effective compared to HF

Benefits

Chemical treatment

- ✓ breaking down chemical bonding between rock and hydrocarbon
- ✓ pay-zone cleaning from mud and contamination of heavy oil components

Mechanical Impact

- ✓ creating a new micro fractures and channels
- ✓ enlarging of existing filtration channels and pores

Thermal stimulation

- ✓ short term in-situ cracking-pyrolysis of heavy HC fractions
- ✓ temporary temperature increase (up to 500°C) in near bore zone





Advantages

**Operations schedule
similar to conventional
acid treatment**

Eco friendly materials

**MPC
Technology**

**All operation 2-3 days
(including well
activation)**

Long lasting effect



Health, Safety & Environment

- ✓ Worldwide track records prove no negative environmental effects;
- ✓ No damages or accidents;
- ✓ All Chemicals are non-hazardous, eco-friendly and can be **applied with bare hands**.
- ✓ Certificates obtained (**Ukraine, Russia, Turkmenistan, China & the UAE**)





Track record

≈50k BOEPD

500 wells

6 countries



Kazakhstan – more than **30 wells** successfully treated.



Russia: 30 oil wells. Averaged output increased **3.7 times.** Additional petroleum output 2,200 bpd



China: 25 wells, Average output increased **3 times.** Cumulative production increase 6,000 - 7,000 bpd.



India: 10 oil wells successfully activated after drilling and put into production after long time being abandoned.



Turkmenistan: more than 350 oil wells. Averaged output increased **1,65 times.** Additional petroleum output 13500 bpd .



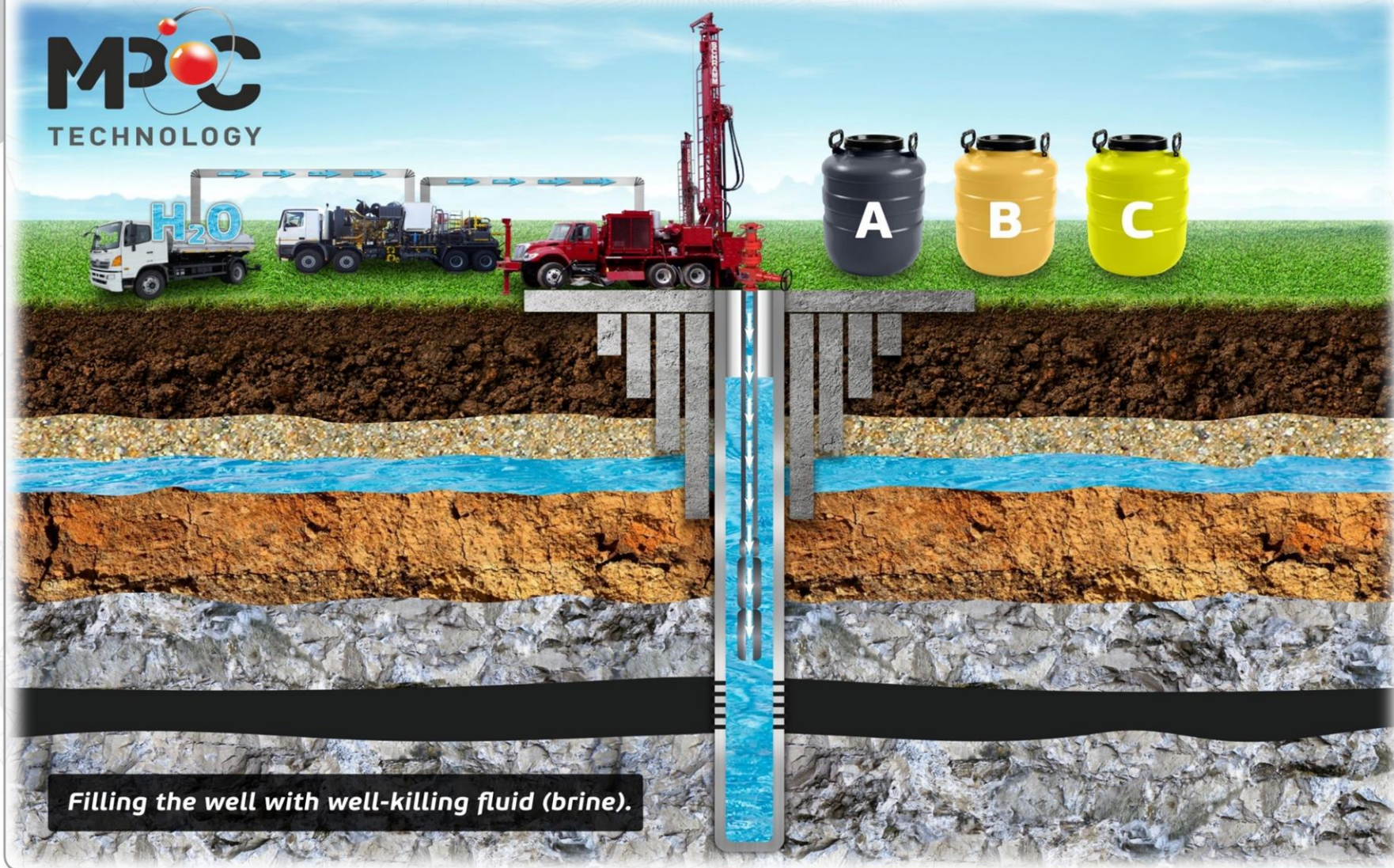
Ukraine: 13 oil wells. Averaged output increased **3.9 times.** Additional petroleum output 1,120 bpd; 8 gas wells. Averaged output increased 7 times. Additional natural gas output 20,000 m3/day (706,000 cfpd)



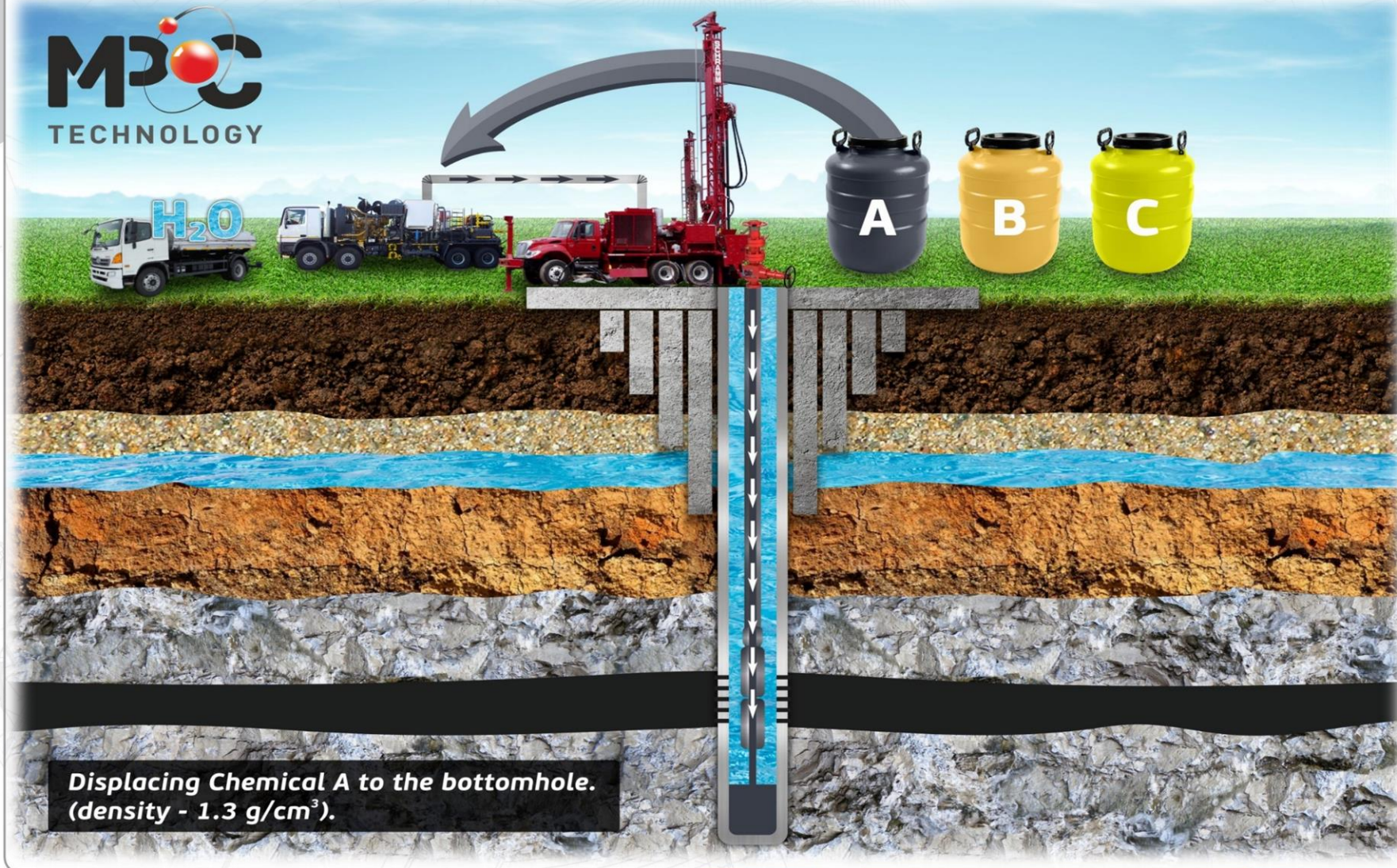
Track record



Operating procedure

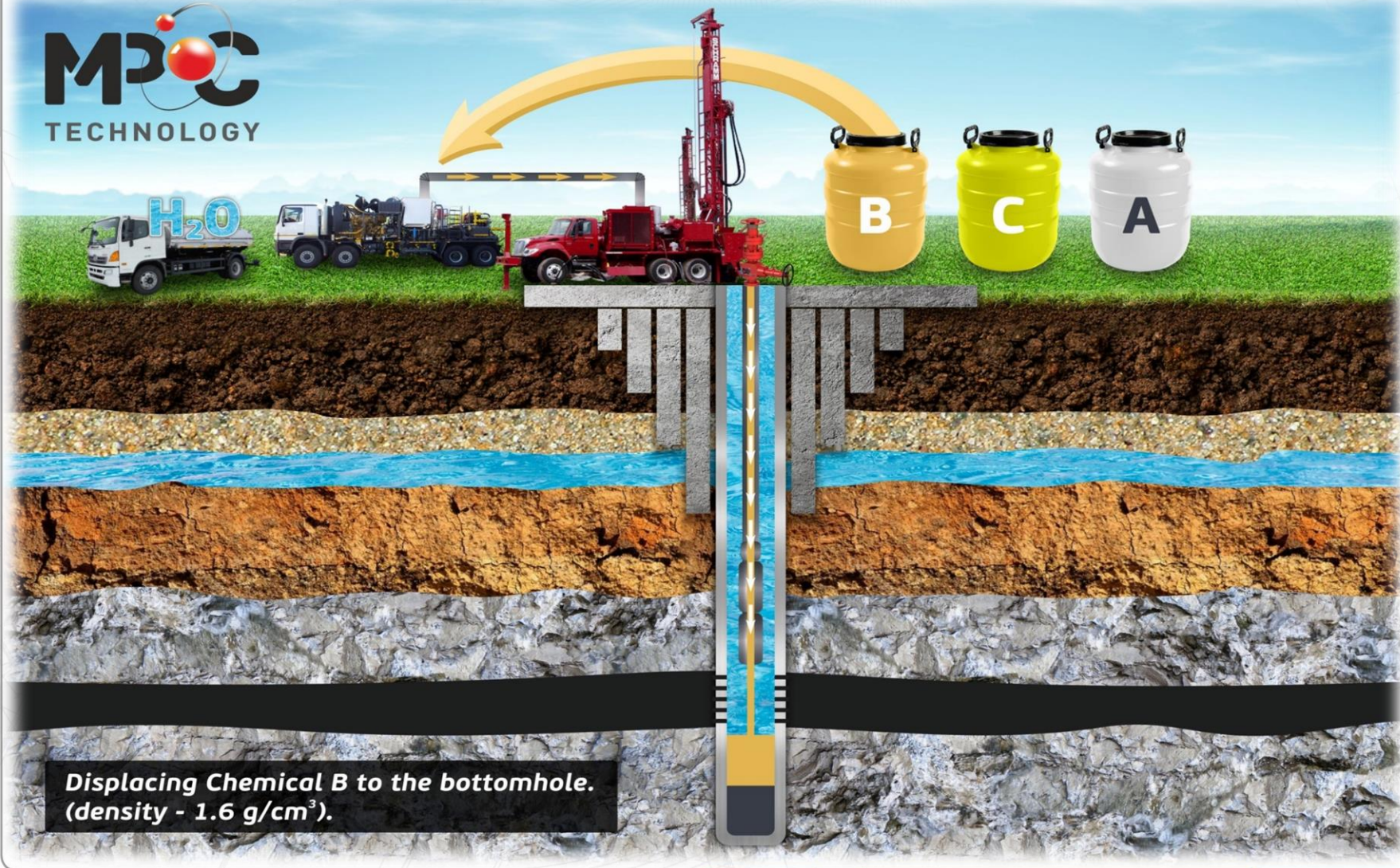


Operating procedure



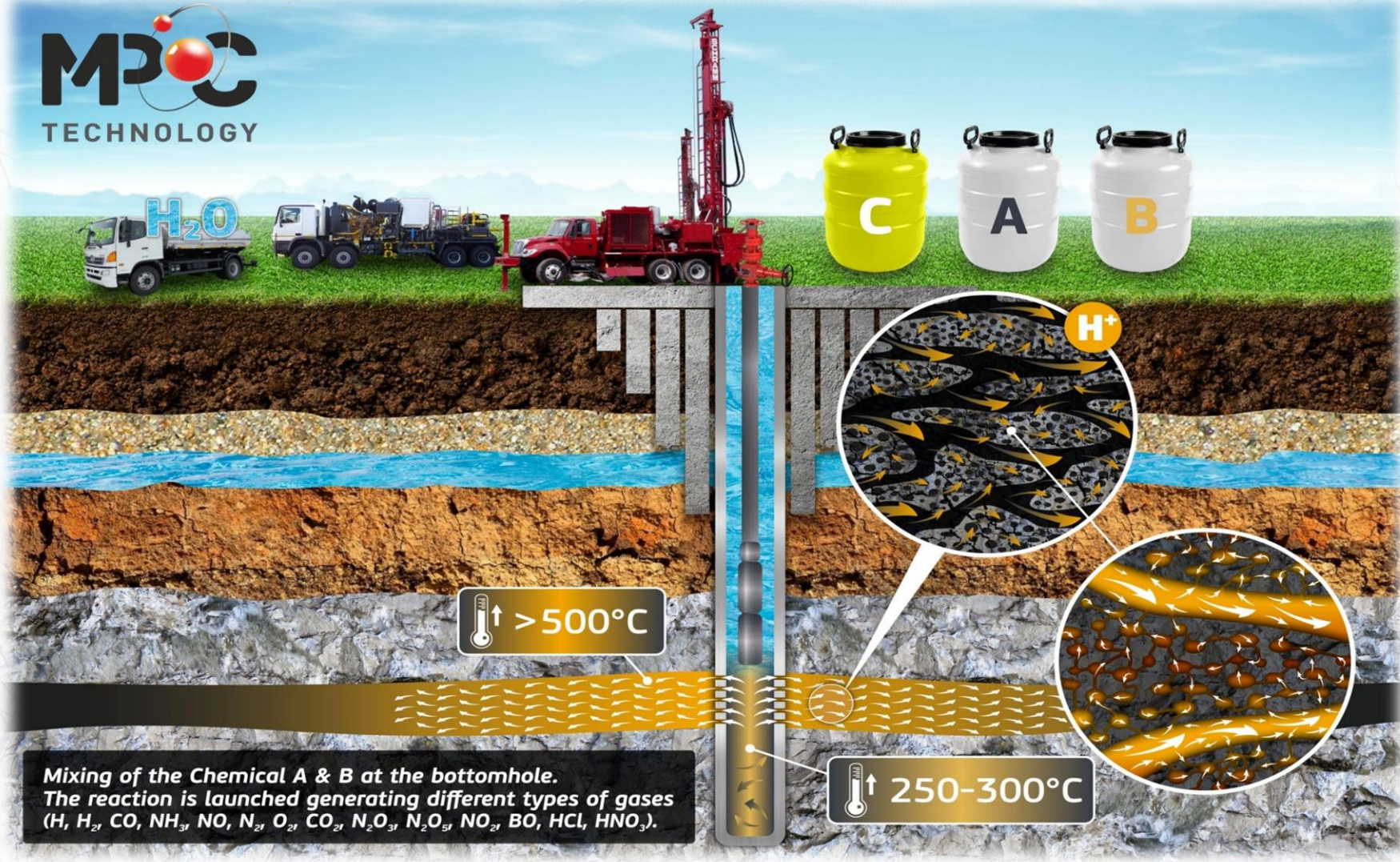
Operating procedure

МРС
TECHNOLOGY

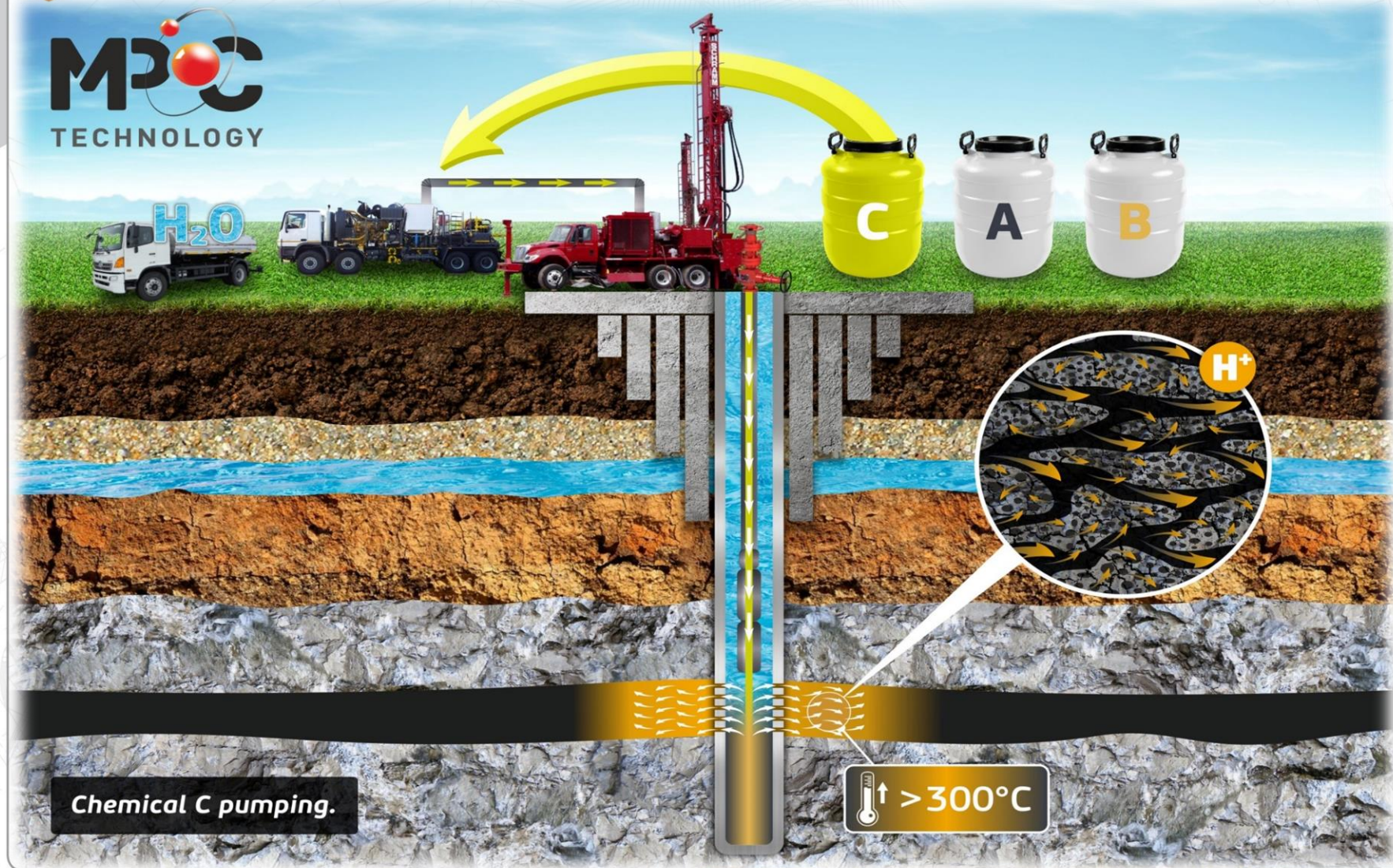


Operating procedure

МНО
TECHNOLOGY



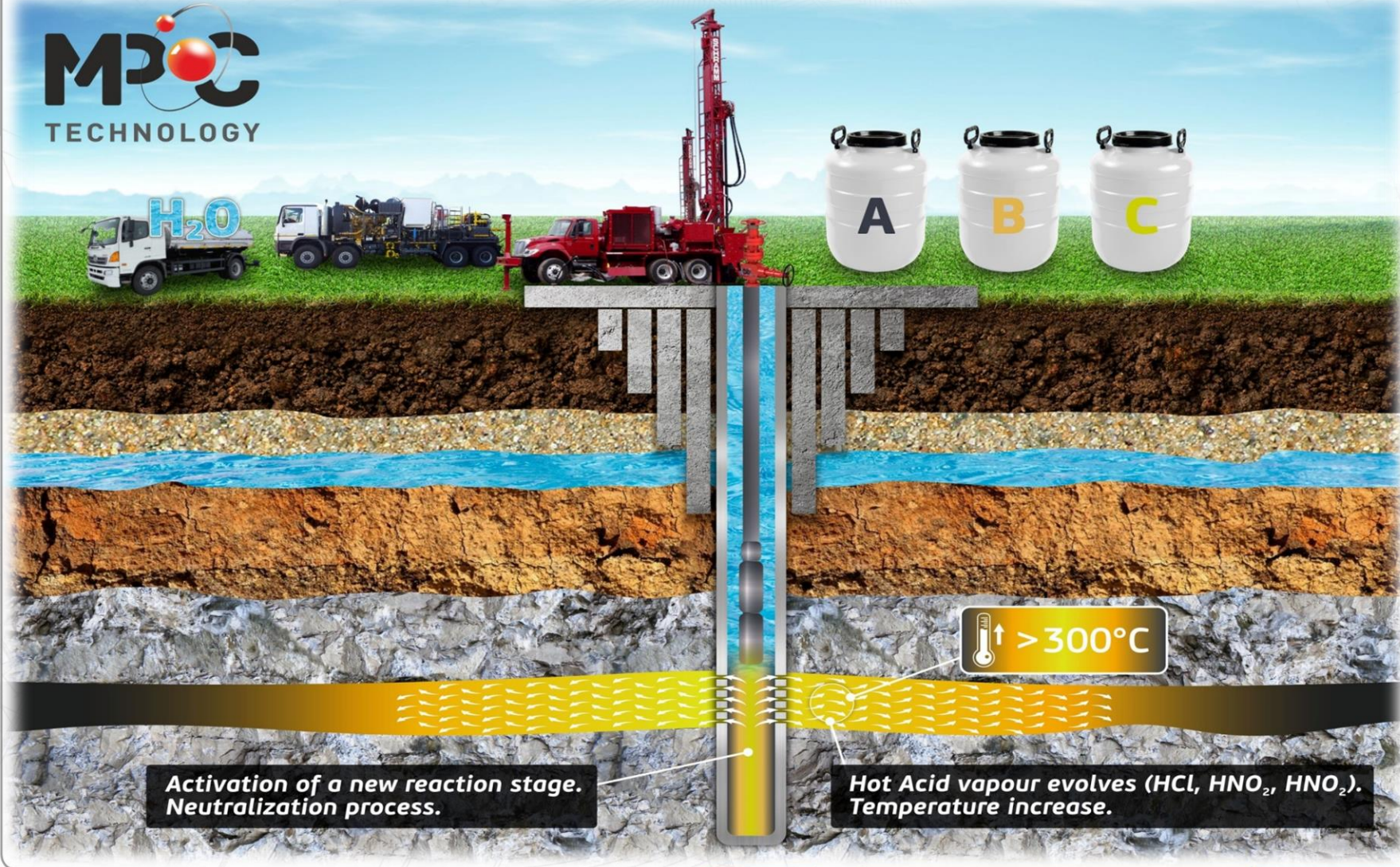
Operating procedure





Operating procedure

МРС
TECHNOLOGY

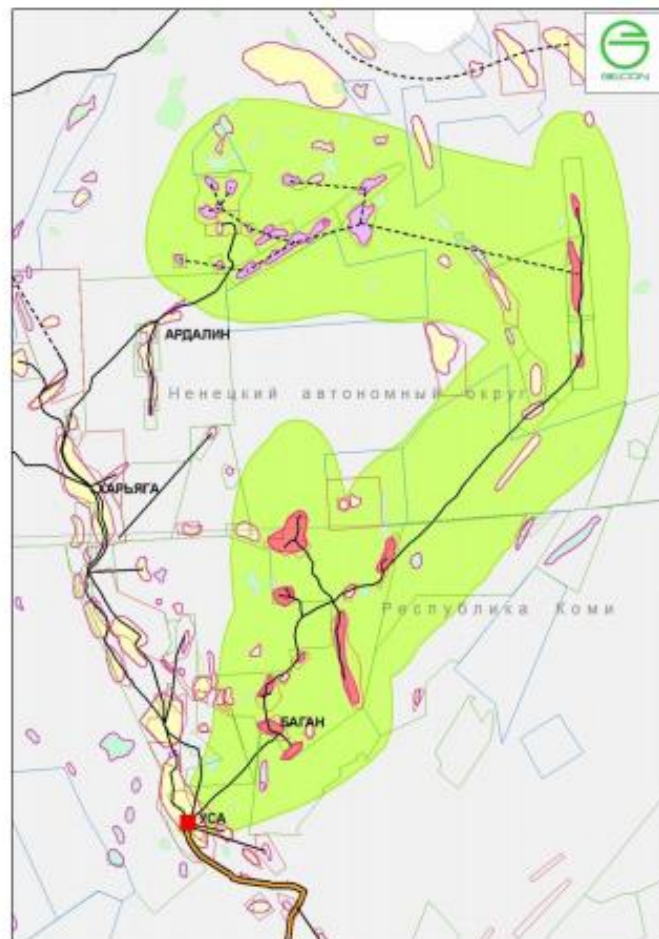




Track record (Russian Federation)

Ardalin oil field

- ✓ Polar Lights' JV area contains four fields – **Ardalin**, Oshkotin, Kolva, and Dyusushev – known collectively as the **Ardalin complex**.
- ✓ Ardalin is the largest one with OOIP around 287 million of barrels.
- ✓ Ardalin block has an area of about 378,000 sq. miles in the Timan Pechora basin. Site is in Nenets District, north to the Arctic Circle.
- ✓ The productive horizons on the field are located in the top of Devon and represented by tight limestone and dolomite. The Ardalin field has porous-fractured and vuggy reservoir type with high anisotropy of reservoir properties.





Track record

Well C-2 MPC Stimulation Results

Reservoir Data:

Net Pay - 7 m

Porosity - 11-12%

Permeability - 25 md

Formation pressure – 4636 psi

Res. Temperature $\approx 86^{\circ}\text{C}$

Formation type - carbonate

Production rate: **157 BOPD & 88.8 BWPD**
(ESP)

After MPC: **314 BOPD & 86 BWPD**
(ESP)

“Polar Lights Company”
Well #C-2

Fluid properties:

API gravity 31 API.

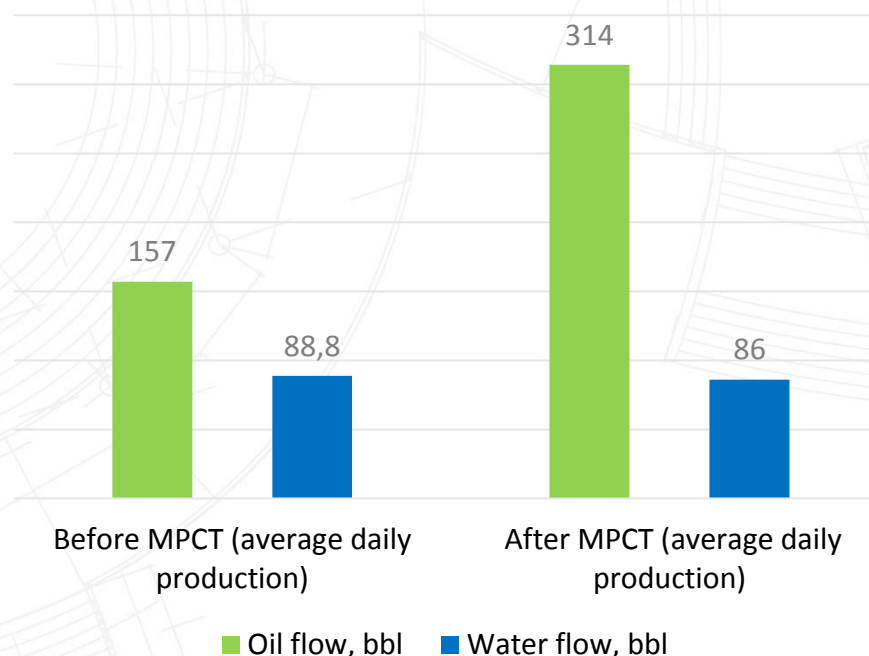
Wax – 8.94%

Asphaltenes – 1.74%

Resin – 6.68%

Pour point - 18°C

Kinematic Viscosity – $3.12 \text{ mm}^2/\text{s}$





Track record

Well D-7 MPC Stimulation Results

Reservoir Data:

Net Pay - 5.6 m

Porosity - 11-12%

Permeability – 8.5 md

Formation pressure – N/A

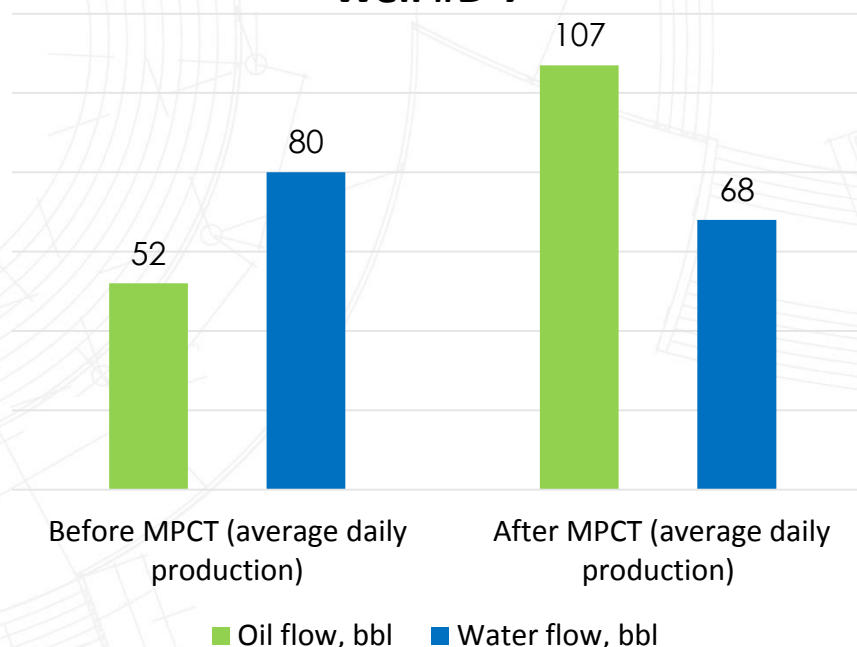
Res. Temperature $\approx 80^{\circ}\text{C}$

Formation type - carbonate

Production rate: **52 BOPD & 80 BWPD**
(SRP)

After MPC: **107BOPD & 68 BWPD**
(SRP)

“Polar Lights Company” Well #D-7



Fluid properties:

API gravity 31 API.

Wax – 12.55%

Asphaltenes – 1.77%

Resin – 6.28%

Pour point - 18°C

Kinematic Viscosity – $3.09 \text{ mm}^2/\text{s}$



Track record (India)

SunPetro Company, Baola & Modhera Fields, Gujarat, India

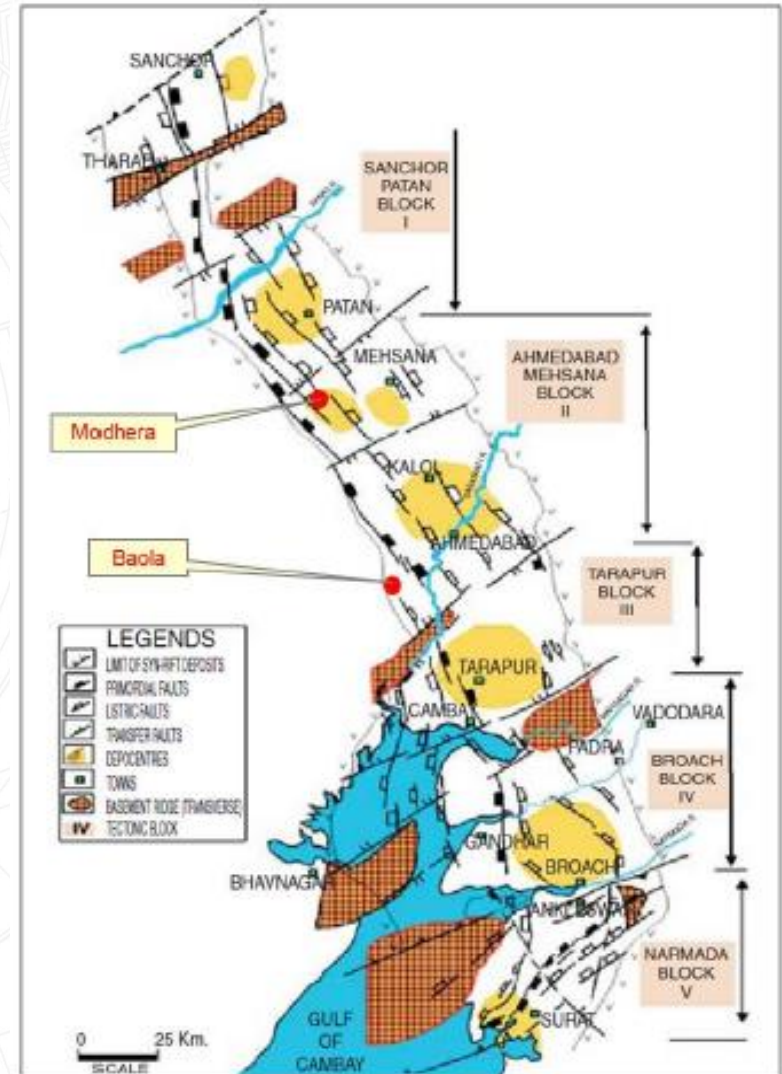
Baola & Modhera fields, operated by Sunpetro Company are located in the **Cambay Basin**.

The Cambay Basin is a narrow half graben trending NNW-SSE and NE –SW (in the southern part ENE-WSW)

surrounded by Saurashtra Uplift in the west, Aravalli-Delhi Fold Belt in northeast, and Deccan Craton in the southeast.

The basin is divided into discrete tectonic blocks based on major lineament trends.

This fields are among other Heavy oil field located in the western part of Cambay Basin in Mehsana-Ahmedabad block.

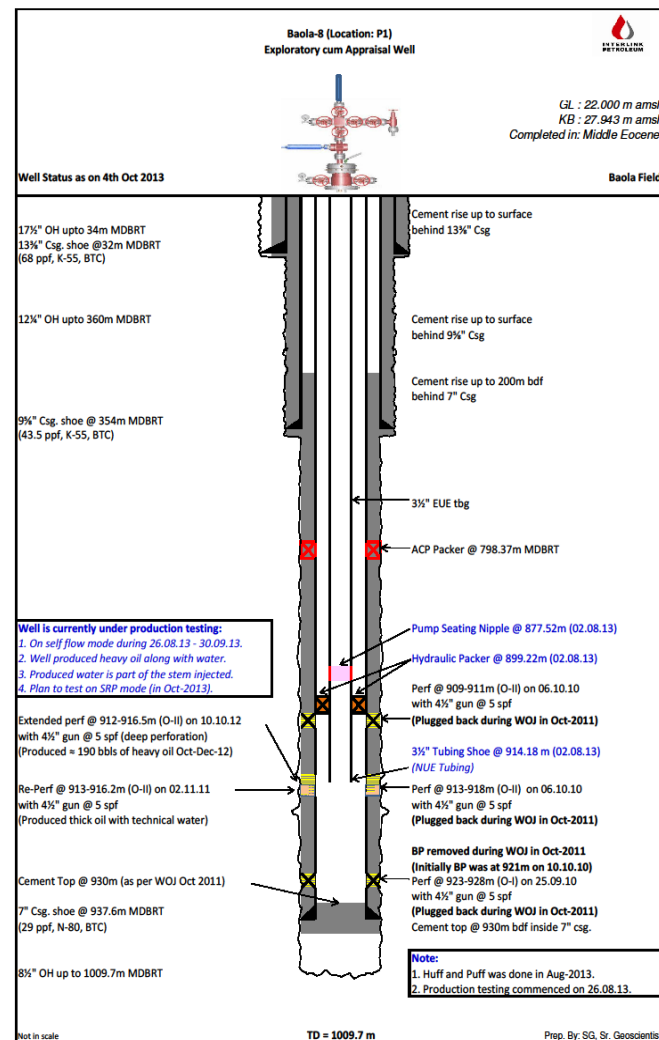




Track record (India)

Baola #8:

- ✓ Baola-8 well was drilled with TD 1009MD and encountered the target Middle Eocene Kalol Formation @ depth 875. Several hydrocarbon bearing oolite layers were tested in interval 880-928 MD.
- ✓ Initial test results 50 BOPD & 208 BWPD by lifting (2010)
- ✓ Water isolating jobs with cement plug installation on depth 923-928 MD was done.
- ✓ After re-perforation well activation by lifting was unsuccessful
- ✓ Tubing string heating was applied by using hot brine, result: 1.8 BOPD & 162 BWPD (WC 90-98%)
- ✓ Numerous stimulation jobs using various technologies carried out during 2011-2015 didn't give material results.





Track record (India)

Baola #8 MPC Stimulation Results

Reservoir Data:

Net Pay - 5.7 m

Porosity - 14-16%

Permeability – N/A

Formation pressure –N/A

Res. Temperature ≈65°C

Fluid properties:

API gravity 18 API.

Wax – 36%

Asphaltenes – 6.5%

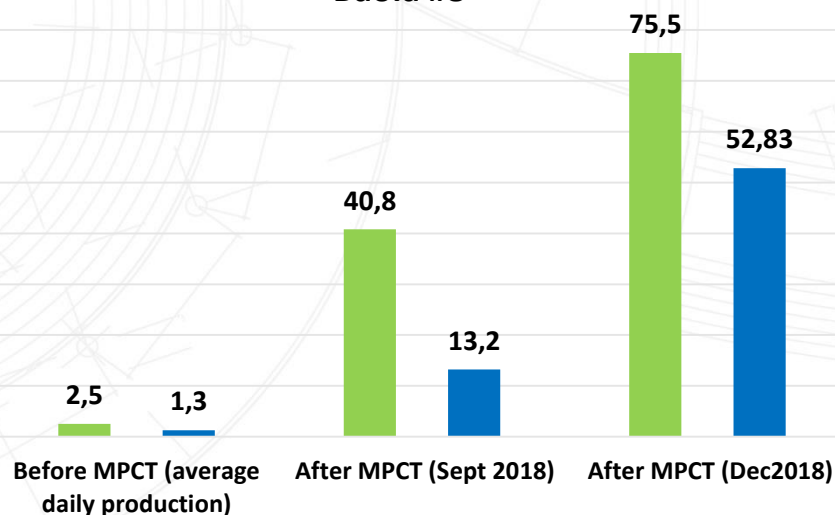
Pour point - 33°C

Viscosity - 135 cSt

Production test (2012): **2.5 BOPD & 1.3 BWPD**
(steam injection for 50 days)

After MPC: **75.5 BOPD (PCP)**
52.83 BWPD

“Sunpetro Company”
Baola #8



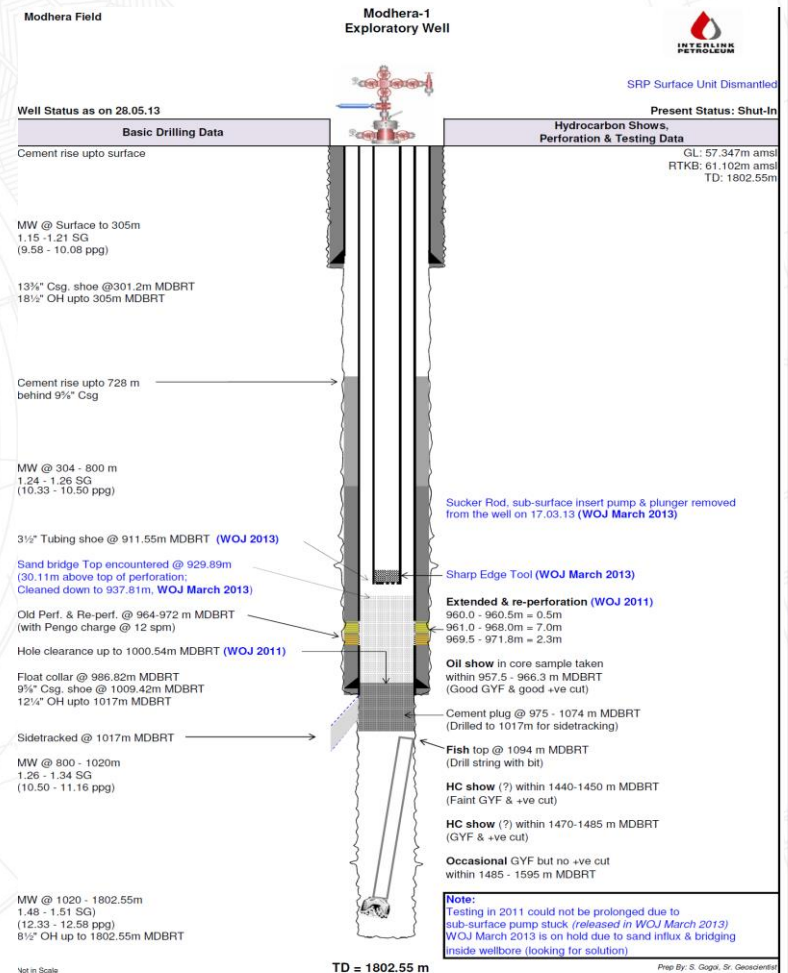
■ Oil flow, bbl ■ Water flow, bbl



Track record (India)

Modhera #1:

- ✓ Modhera-1 and sidetrack: In 1982 Modhera-1 was drilled to target the Kalol sequence. Drilling progress was stopped after stuck pipe at 1822m, and again at 1798m following a sidetrack from 1917m. Drilling was terminated at 1798m and 9 5/8" casing set at 1010m. The secondary deeper Cambay shale and Olpad targets were not achieved Middle Eocene, Kalol Formation @ depth 945 MD. Hydrocarbon bearing oolite layers were tested in interval 960-982 MD.
- ✓ No sustained production has come from Modhera wells.
- ✓ Initial testing on Modhera-1 brought lumps of heavy (10° API) oil to surface. Pumping trials stopped after failure of the downhole pump. Only minor gas influx has occurred in Modhera-2 from the Cambay intra-shale sand packages.





Track record (India)

Modhera #1 MPC Stimulation Results

Reservoir Data:

Net Pay - 7.6 m

Porosity - 14-15%

Permeability – N/A

Formation pressure –N/A

Res. Temperature $\approx 65^{\circ}\text{C}$

Production test (2012): **55bbl/d with oil lumps**
(PCP)

After MPC: **44 BOPD & 40.9 BWPD**
(PCP)

Fluid properties:

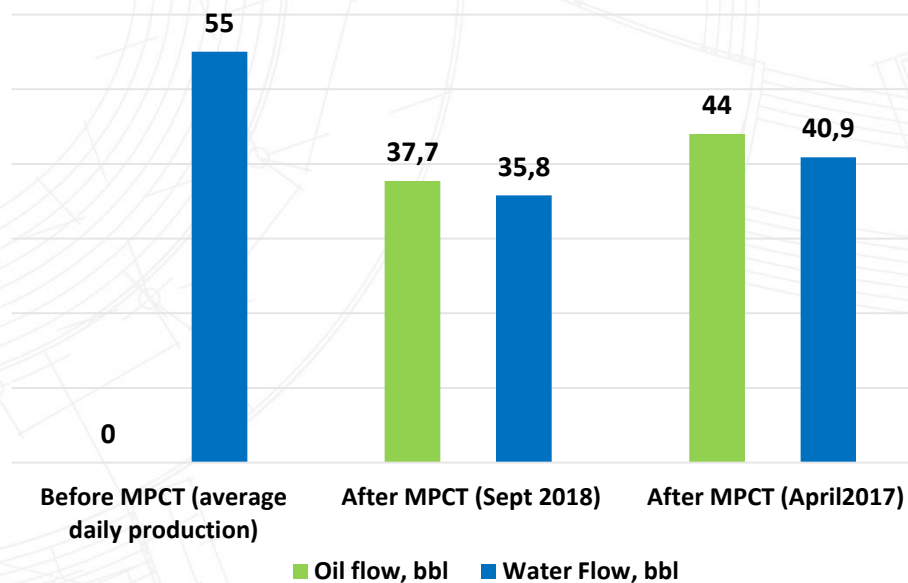
API gravity 11.5API.

Wax – 1.6%

Asphaltenes – 13.9%

Pour point - 27°C

“Sunpetro Company”
Modhera #1





Track record (Kazakhstan)

KazMunayGaz, Karamandybas, Kazakhsta

Karamandybas is a large oil, gas and condensate field in South Mangistau region of Kazakhstan, on the Mangyshlak peninsula. It belongs to the South Mangystau oil and gas Basin. Karamandybas field was discovered in mid of 60s to the west of Uzen Field, with the No. 3 well in 1987, which encountered pay in stacked Middle Jurassic deltaic sandstones. Geologically, the Karamandybas is a gentle compressional anticline similar to surrounding fields on the Uzen-Zhetabay Terrace.

The production was started in 1973. The average reservoir depth is 1.9 - 2.5 km. The initial wells rate was around 200 BOPD. The oil density is of 0.85 - 0.86 g/cm³. The Karamadybas oil is heavily gas under-saturated and very, resinous $\approx 15.5\%$, wax $\approx 25\%$, Sulphur 0.2-0.28 %. The content of asphaltenes $\approx 6\%$.





Track record (Kazakhstan)

Karamandybas#359 MPC Stimulation Results

Well Data:

The well has been in operation for
over 25 years

Net Pay - 8 m

Porosity - 19%

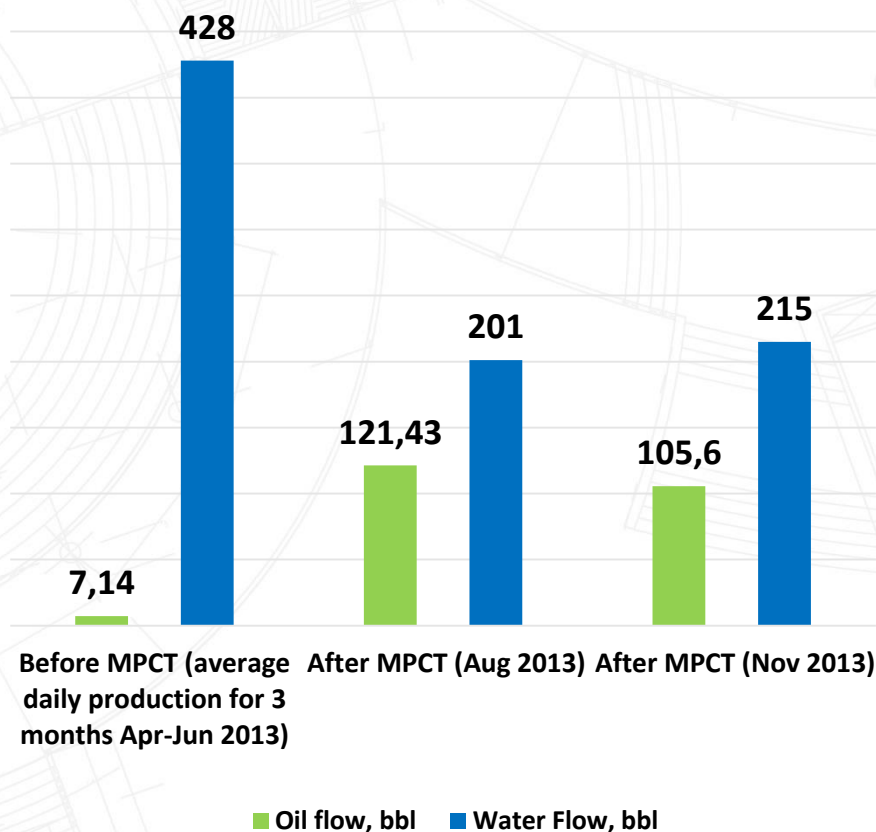
Asphalt/resinous/paraffin $\approx 23.6\%$

API - 33.1

Production: **7.14 BOPD & 428 BWPD**
(PCP)

After MPC: **105 BOPD & 215 BWPD**
(PCP)

“Ozenmunaygaz” Karamandybas #359





Track record (Kazakhstan)

Zhetybay #3332 MPC Stimulation Results

Well Data:

The well has been in operation for over 35 years

Perforation: 2357-2370.5 MD

Net Pay - 9 m

Porosity - 24%

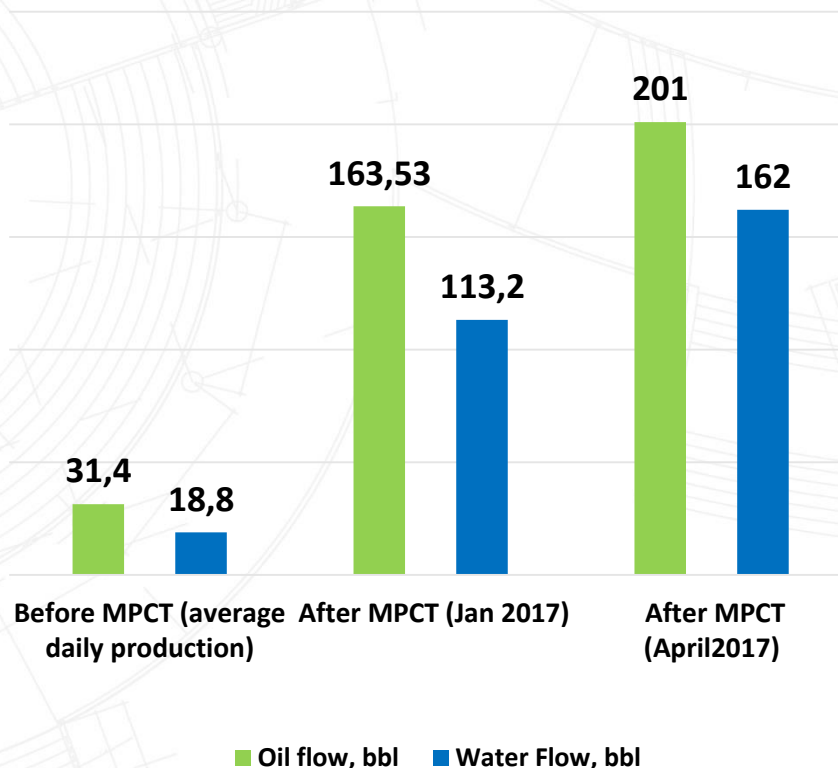
Asphalt/resinous/paraffin ≈25%

API - 30

Production: **31.4 BOPD & 18.8 BWPD**
(PCP)

After MPC: **201 BOPD & 162 BWPD**
(PCP)

“KazMunayGaz” Zhetybai #3332

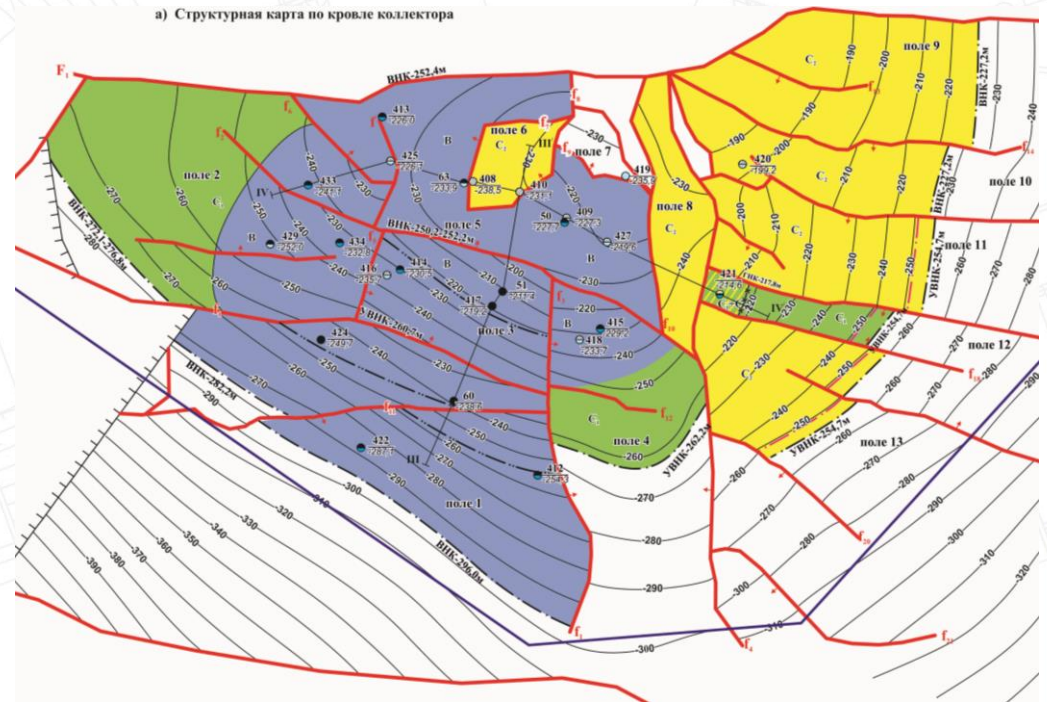


Track record (Kazakhstan)

**JV Ada oil(KNOC) ,
Bashynkol, Kazakhsta**

Bashynkol is an oil field in Aktobe region of Kazakhstan. It belongs to the edge of Peri-Caspian depression. Beshynkol field oil-bearing sandstones deposited at shallow depth in ranges 200-500 m. The field has active aquifer.

The production was started in 1958. The average reservoir depth is 200-500 m. The initial wells rate was around 200 BOPD. The oil density is of 0.87 - 0.91 g/cm³. The Bashynkol oil has content of resinous $\approx 12.3\%$, waxe $\approx 0.25\%$, and paraffin 1%.





Track record (Kazakhstan)

Bashynkol #206 MPC Stimulation Results

Well Data:

The well was in operation for
5 years

Perforation: 195-224 MD

Net Pay - 23 m

Porosity - 14%

API≈23

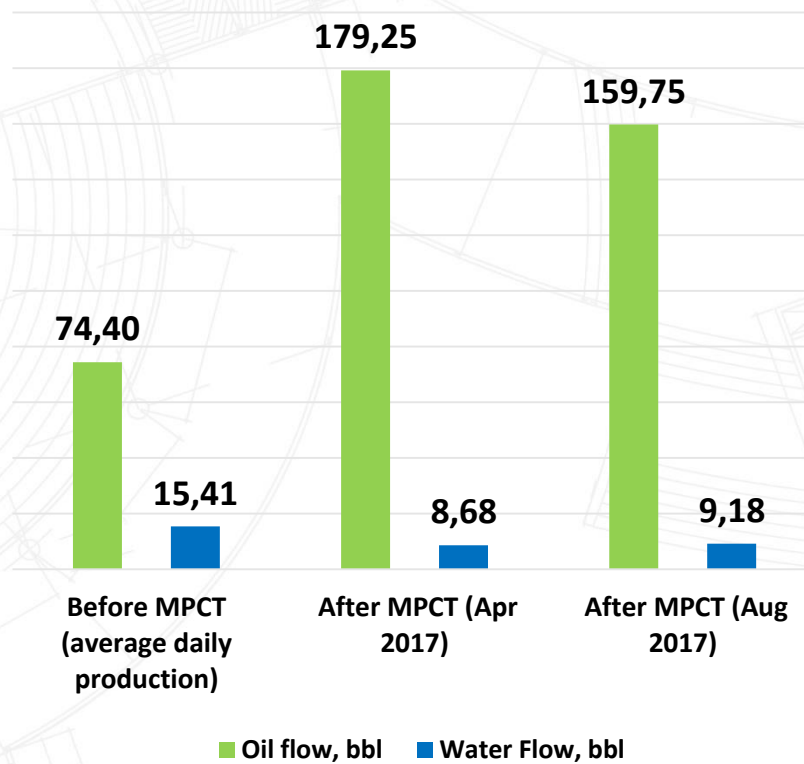
Resinous - 20%

Formation pressure –290 psi

Production: **74.4 BOPD & 15.4 BWPD**
(PCP)

After MPC: **159.75 BOPD & 9.18 BWPD**
(PCP)

“ADA Oil (KNOC)” Bashynkol #206





THANK YOU!

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