

A background image of a Swiss lake scene. In the foreground, a white swan swims in the water. In the middle ground, there are several boats docked at a wooden pier. In the background, a large church with a tall, pointed spire stands on a hill overlooking the lake. The entire scene is overlaid with a semi-transparent blue gradient.

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INNOVATIVE TECHNOLOGY OPERATED IMPACT



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"During the stimulation of oil production, the broad spectrum of ultrasonic used on the oil pool provides an improvement in the most important and vulnerable, oil pool, oil well, subsystem. It means that the effect on the bottom-hole zone can actually increase deliverability of wells resulting in an additional oil output. Ultrasonic will integrate the un-involved, outlying zones into the production process".

V. Sabanchin

Head of Increasing Oil Recovery Department,
Lukoil-KomiLtd.



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Wax depositions and gelation can render a pipeline unusable

- Wax deposits in production tubing and pumping equipment are expensive problems for producers.
- They cause a significant decrease in oil production rates.
- These cause costs 18 billion dollars every year.





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Mechanisms leading to wax deposition

- Crude oil contains long chain paraffinic and asphaltic molecules.
- As oil flows up the production string solution, gas is liberated because of drop of pressure.
- Loss of gas and lowering of temperature below the cloud point temperature (CPT) causes wax and asphaltenes to precipitate.
- This causes an oil viscosity increase, forming organic depositions and chocking off flow lines

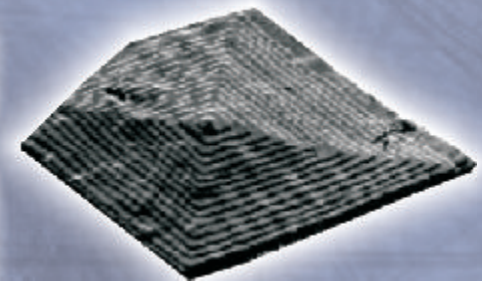
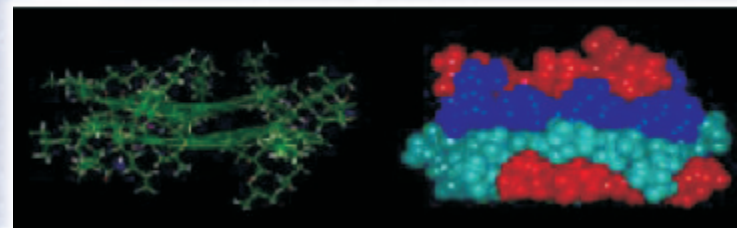


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Wax deposition depends on
wax content, viscosity, flow rate

- Wax depositions are complex mixtures of heavy solid alkenes, asphaltenes, sand grains, precipitated salts, rust, entrapped water.

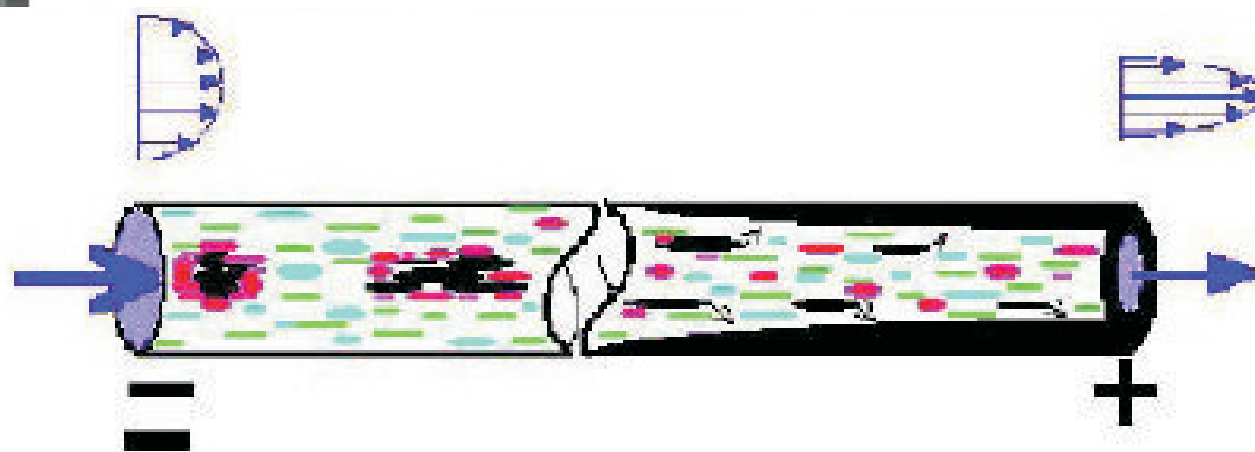




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Wax deposition depends on wax content, viscosity, flow rate

- The paraffin deposits start off as a thin film and deposits grow in the form of crystalline solids, which slowly chokes off the production.
- Deposition rates depend on paraffin content, fluid viscosity, flow rates, gas/oil ratio and heat transfer coefficient.

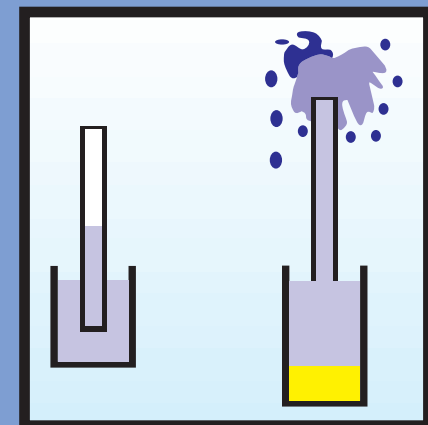




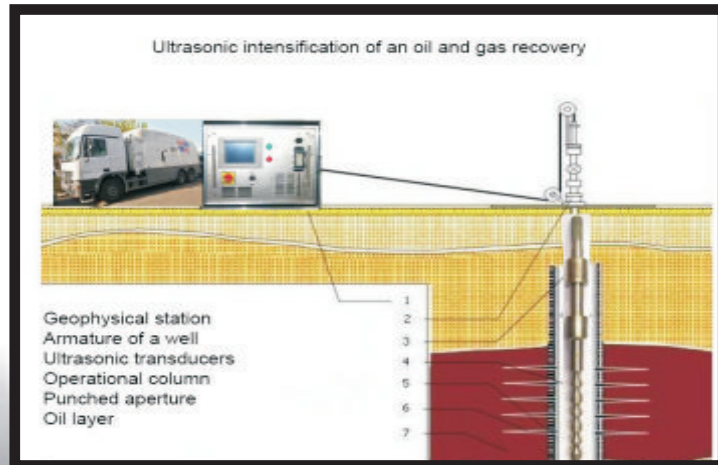
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Acoustic Capillarity

- Facilitates capillary penetration and destruction of retarding electrostatic layer in capillaries.
- Optimizes diffusion through membranes (and brushing membranes to keep them clean).
- Reduction of surface tension in capillaries and micro-porous structures
- Reduction of liquid viscosity
- Mechanically agitating and decolmating or de-blinding porous layers
- Reduction of fluidic friction and friction on pipeline walls.
- Homogenizing and reducing agglomerations
- Increase flow line production from wells and support rate of flow on stable level



Acoustic effect on capillaries



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Acoustic Effects on Bottom-Hole Zone

Acoustic effects (AE) on the bottom-hole zone improves the quality of fluid loss properties in oil pools according to:

- Remediation of Stripper Well.
- Paraffin, wax, mud, asphaltene and filter problem
- Salt deposit destruction in wall pores due to sound Vibrations.
- Gas locks remove capillaries during acoustic degassing of liquid Acoustic effects are created by pulse generator and ultrasonic converters and are lowered into the well to a depth of 5000m, the processing speed is 0,5-1 m/h, power consumption up to 15kw.

Summary:

- Up to 3 times increase in production rate
- Positive effect increase of about 85% predicted
- Obtained effects last between 3 to 24 months



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Technological Basics

- Geoacoustic complexes are used to stimulate production in oil and gas wells by an acoustic method using powerful ultrasonics to the bottom-hole zone of oil reservoirs.
- The complexes are produced using a pulse generator and an ultrasonic converter. The resonator is connected to the well via a Electro mechanical cable held by a cased-hole hoist.
- To get the resultant power, ultrasonic pulses are applied with frequency of 18 -20kHz and an output of 5000 to 15000W.
- Each geoacoustic system interfaces generator and converter so that it can submerge the maximum impulse power to a depth of 5000m.
- The radiator sizes 44 (1,73.) or 75 mm (3,0.) diameter are suitable for use at existing boreholes by lowering it into the production tube.





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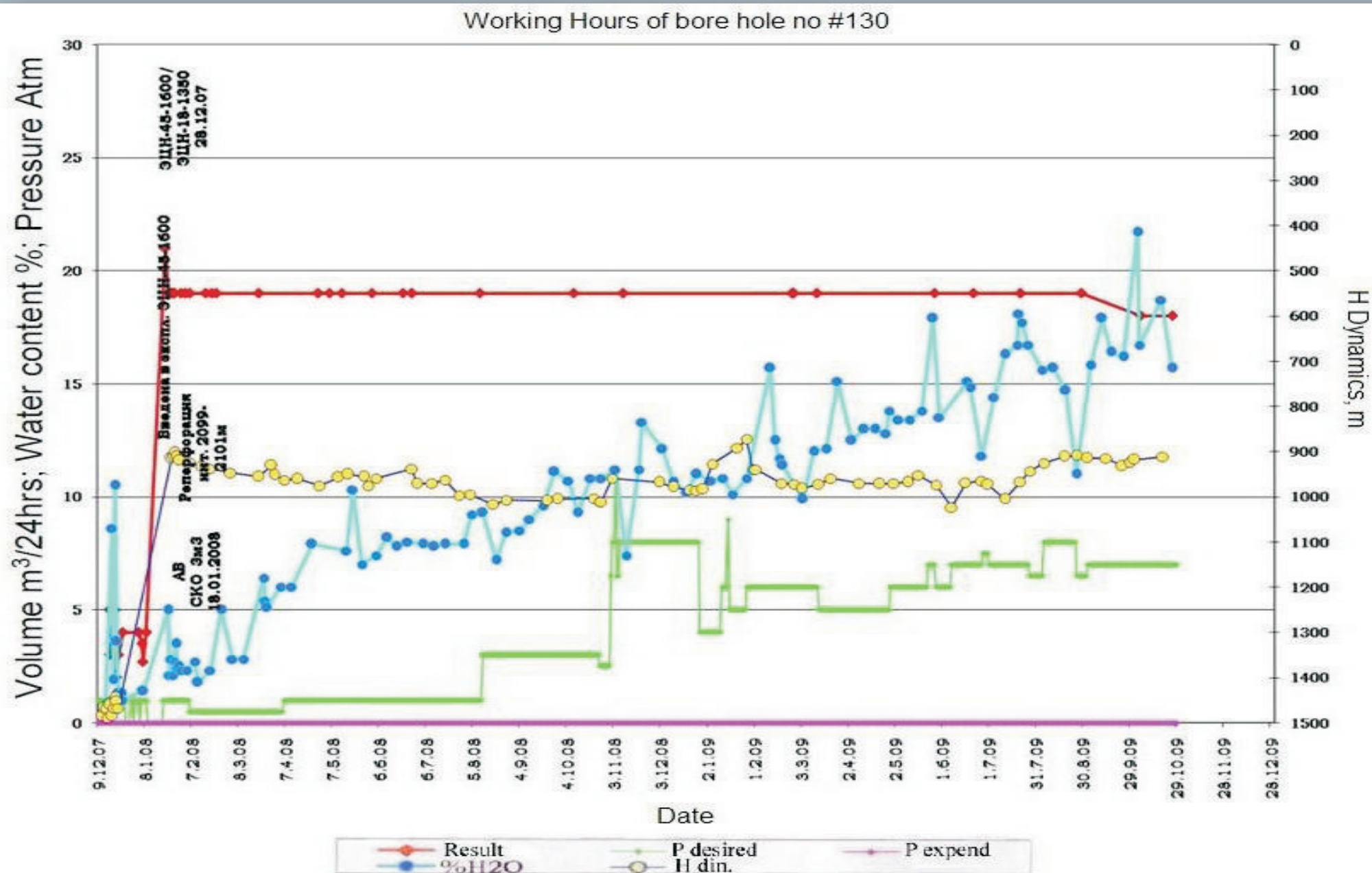
Guide for Ultrasonic Cleaning

- The reservoir should show declining production. Indications should exist that the near-borehole zone is plugged by deposits. No improvement can be expected when a highly producing formation is treated.
- The reservoir should not exhibit a significant decrease of internal pressure : No hydraulic fracturing in the past for oil / gas stimulation.
- The reservoir characteristics should include:
 - A) Porosity of not less than 5%
 - B) Significant gas content (more than 10 m³ gas/m³ total fluid).
 - C) Viscosity not more than 10 mPas / 10 cP
- The optimal frequency and intensity range for effective wellbore cleaning are 5 -50 kHz and 1-15 kW/m² respectively. Continuous treatment generally should last for several hours.





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For instance, In case of well mass acoustical treatment (without analyzing reasons of oil production rate decrease), carried out in oil field being at commercial development stage under intensive flooding regime, the rise of production rate gained as 51% of treated wells (with total number of 200) with average rise of 20%.

Within retrospective analysis, subject to field, geo acoustical, hydrodynamic and technological factors, with the acoustic stimulation efficiency assessment of 30 wells, a positive effect has been received in 85% of wells with oil production rate increase ranging from 20 to 500% and more.



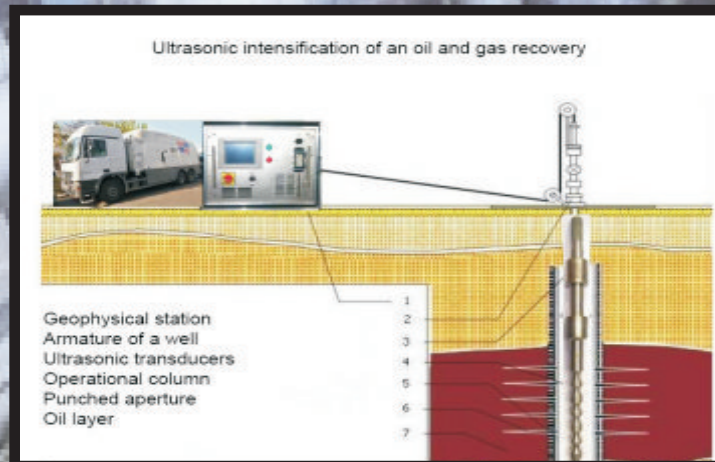


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Pre-requisites for Acoustic Treatment of the Oil and Gas Wells

For carrying out work with ultrasound on
a Well, following equipments should be
made available by the user:

1. The mobile geophysical machine
equipped by a cable, the elevating
mechanism, the standard geophysical
equipment.
2. Electromechanical Cable 3-conductor
with each wire 1.5mm².
3. The length of a cable should be not be
less than 3000 meters.
4. Power requirement ---380 volts /50 Hz
(10-15 A)





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