

INNOVATIVE TECHNOLOGY OPERATING IMPACT



ULTRASONIC STIMULATION OF OIL PRODUCTION AND ENHANCEMENT OF OIL RECOVERY

PROGRESS ULTRASONICS GROUP LLC
SWITZERLAND

PROGRESS ULTRASONICS



Progress Ultrasonics Group LLC is engaged in the development and production of high-tech ultrasonic equipment. The company is located in the Canton of Neuchâtel, Switzerland. The company's core business is the production and sale of various ultrasonic systems, including those for the stimulation of oil-and-gas condensate production.

The company has broad experience in the use of ultrasonic technologies. It has its own acoustic design bureau, production capacity for ultrasonic generators and converters, and high-precision mechanical operation facilities.

In 2003, in cooperation with Ultrasonic World LLC, Switzerland, the company developed and produced a series of powerful ultrasonic systems for oil-production stimulation.

In subsequent years, the company made great advances in the production of powerful ultrasonic generators and converters based on piezoelectric transducers. The ultrasonic transducers designed and manufactured by the company are able to operate efficiently at great depths and high temperatures.

The operating capability, versatility, efficiency and performance of our ultrasonic systems has been proven by extensive tests at oil fields in Canada, Azerbaijan, Kazakhstan and Russia. The effect of ultrasonic technology on productive stratum were studied in 2005-2009 while carrying out research and production work at the Chibyusk, North Israelsk, Sotchemyusk and Voyvozhsk oil fields, as well as in Romania at low-yield wells in Vata, Tazlau and Baltani. Virtually all cases of well stimulation in Russia have proven successful, with an overall average efficiency gain of no less than 200% (double flow rate).

The company actively participates in various international exhibitions, symposiums and presentations, where it showcases its equipment and technology. (Damascus, SYROIL-2008; Moscow, Oil & Gas-2008; Rome, EAGE-2008; Madrid, WPC-2008; Abu Dhabi, ADIPEC-2008; Singapore, 17th International Oil & Gas Exhibition & Conference 2008; Moscow, "Problems and Prospects of Technologies for Oil Production Stimulation-2009")



OUR STRATEGY



Our strategy and market positioning consists of the manufacturing and sale of hi-tech, competitive and high-quality products to provide geophysical and service companies with ultrasonic systems designed for bed stimulation out of the well.

Our objective is to make the technology of acoustic stimulation a “standard” geophysical (service) technology accessible to the majority of geophysical companies both large and small.

Over the long-term, the transition from individual well stimulation to systemic targeted effect (on a group of wells within a single block, etc.) is essential, including mainly combined, and looking forward – to the methodology of active geophysical monitoring.

This technology makes it possible to achieve the efficient restoration of filtering characteristics in productive formations without oil-reservoir damage and with minimal time and material inputs.

An analysis of acoustic-stimulation case history indicates that all capable facilities – wells and consequent technologies – can be conditionally divided into three categories:

Corrective or Preventive (designed for the productivity adjustment of long-idle wells demonstrating “good” – though underperforming – production rates)

Stimulating (designed for wells with a significantly-reduced production rate compared to their previous production rate)

Reviving (designed for virtually-idle wells).

The percentage of stimulating technologies accounts for the lion’s share of total statistics. The share and experience of the other two is extremely insignificant, while their success ratio is lower.

The field effect becomes statistically significant when the maximum number of specific wells are treated. Therefore, the time has come for a shift from individual well stimulation to systemic target effect (especially taking into account the possible reaction of neighboring wells on acoustic stimulation), which can ensure a high probability of target oil-production incremental gains over a short period of time, as well as an increase in ultimate oil recovery.

PROGRESS ULTRASONICS GROUP LLC
www.ProgressUltrasonicsGroup.com

OUR THEORITICAL POSITION

Our theory is based on the following experimentally-confirmed propositions.

1. The geological environment (producing oil bed) is a composite, multiphase, non-uniform and nonlinear media that reveals (at different scales) properties of activity and self-organization (synergy): energy non-equilibrium, ability to transform to accumulate irregularities and reemit acoustic and other energy in the inherent dominant (or resonant) frequency interval.
2. Interaction of this environment with the acoustic (including ultrasound) field, depending on its specific mechanical-chemical properties and states, including fluid phases and properties, on energy and other field parameters (frequency, vibration amplitude, specific power, etc.), a wide variety of various pragmatic effects, usually nonlinear, is observed, whose physicochemical mechanisms are not fully understood, while many of them can be satisfactorily explained at the level of experimentally-verified working hypotheses.
3. These effects and their mechanisms, revealed jointly or separately, while some of them produce others under different conditions, and finally, as a direct consequence, provide for a well-production rate (oil rate or injectivity) increase with an average success ratio of not less than 85%, and reserve recovery increase.
4. Thus, the acoustic field is not the main energy source of the extraction process, but merely a “hair-trigger” or mechanism exciting the environment’s own energy, essentially through reservoir-pressure action. Acoustic field energy acts as an operating mechanism of incommensurably-powerful hydraulic and other energy types. The acoustic field is not a pump (piston), and it “commands” the redistribution (level) of hydrostatic pressure over the entire target volume. Only this can explain the long-term effects of “post-operation” acoustic stimulation.
5. Maximum filtration resistance is found in the wellbore area of the formation as it is the most altered during drilling and operation; however, this represents hydrodynamic drainage, which to a large extent determines well-production rate (oil rate). The most important characteristic of any influence, including acoustic, is the effective radius of the zone of influence. The typical physical wellbore environment parameters, working frequencies (about 20 kHz) and specific power of our transmitters demonstrates that this zone is approximately 23 m from the wellbore wall. This is the zone from which well stimulation aimed at production stimulation and enhanced oil recovery should be started, since it is quite obvious that without restoring penetration in the wellbore zone, all methods used for the stimulation of remote formation zones will be ineffective.

PROGRESS ULTRASONICS GROUP LLC
www.ProgressUltrasonicsGroup.com

APPLICATION OF ULTRASONICS IN OIL AND GAS ENGINEERING

Equipment for production and injection well-stimulation with the aim of increasing productivity (intake capacity) and oil recovery.



Equipment for the treatment of filters, oil-well tubing, pumps and other equipment in order to prevent (prevention, maintenance & removal) asphaltene, resin and paraffin deposition.



Equipment for treatment of sections of the infield, main pipelines and reservoirs etc. in order to change the rheological properties of oil and petroleum products (viscosity reduction etc.).



Equipment for treatment of oil and petroleum products in the course of processing with the aim of increasing processing depth and quality.

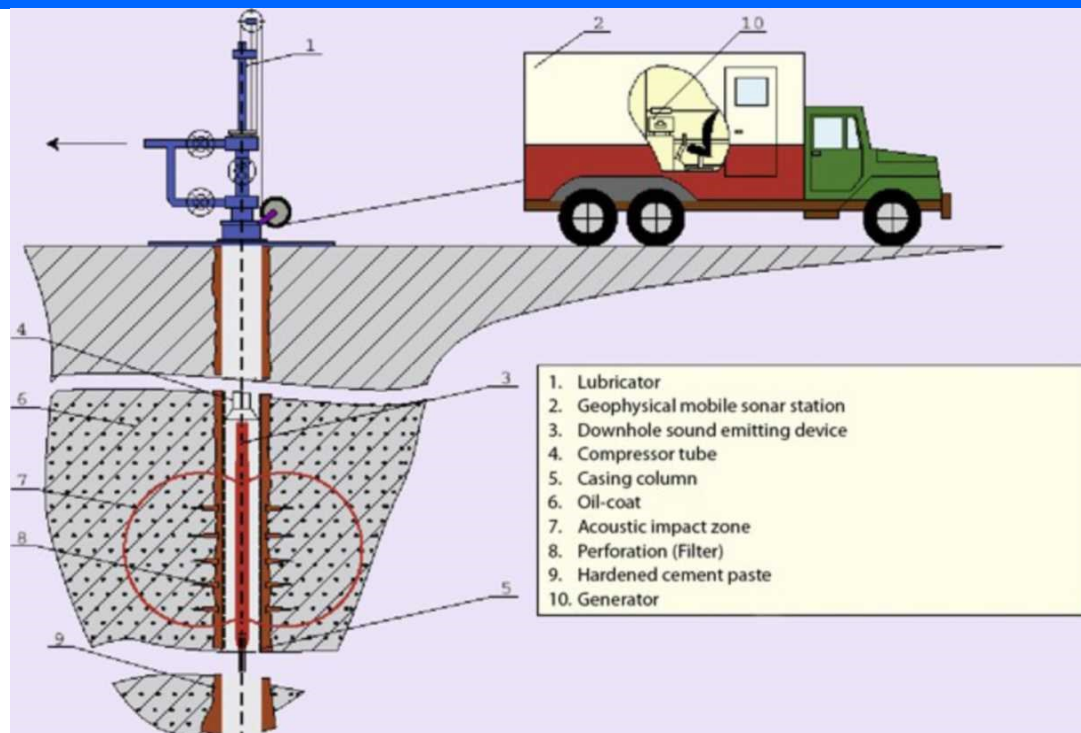


Equipment for welded joints to relieve residual stresses and extending the life of welded structures (tankers, pipes, oil platforms, etc.).



PROGRESS ULTRASONICS GROUP LLC
www.ProgressUltrasonicsGroup.com

ULTRASONIC TECHNOLOGY FOR STIMULATION OF OIL PRODUCTION



Our ultrasonic system for the intensification of oil production consists of a high-powered ultrasonic generator and ultrasonic converters, powered through a standard 3-core logging cable.

All equipment based on acoustic stimulation technology is interfaced with standard equipment for geophysical parties and can be easily assimilated by geophysical personnel.

Acoustic stimulation technology consists of reservoir bed stimulation (in the oil well, filter or perforation interval) with a high-intensity ultrasound field aimed at the rejuvenation of filtering characteristics. Selective stimulation is carried out by the point-to-point method (with 0.5-1.0 m resolution) based on the “inflow stimulation profile” principle.

Well and equipment preparation is virtually the same as that for standard geophysical surveys.

The integrity of production casing and cement stone cover is maintained. Stimulation is technically and physiologically safe and environmentally harmless.

ULTRASONIC EQUIPMENT FOR STIMULATION OF OIL PRODUCTION

Model Progress-2500



Characteristics of the system:

Supply voltage: 220 V
Power: 2,500 W
Frequency: 16,000-50,000 Hz
Signal Type: sine-modulated, pulse
Auto-tuning in a wide range of frequencies.
Size of the generator: 500x750x120 mm.
Weight generator: 15 kg
Length of geophysical cable: up to 3,000 m.
Power emitters: from 500 to 2,500 W
Diameter of emitters: 44, 76, 101 mm
The length of the emitters: from 1,500 to 2,240 mm

The system operates in manual and automatic mode. Comes equipped with an LCD display and computer to enter operating parameters and provide for visual inspection of the generator. The generator is available in a standard 19" case with anti-vibration protection.

The generator is equipped with an USB-2 connector for programming and remote control options.

All connectors and controls are located on the front panel of the generator. The generator is protected from the breakage line, short circuiting on the idling line.

The generator is equipped with stabilization of the input voltage. The generator stabilizes the output parameters of current, voltage and frequency.

The system is equipped with function-programmable cyclograms to operate in different conditions.

The system supports management protocol work – automatic archiving of computer-memory protocol work after the completion of processing-cycle formation.

The generator is compatible with various types of geophysical cables, and ultrasonic emitters.

Emitters are designed to work under pressure up to 500 bar and temperatures up to +125 °C.

PROGRESS ULTRASONICS GROUP LLC
www.ProgressUltrasonicsGroup.com

ULTRASONIC EQUIPMENT FOR STIMULATION OF OIL PRODUCTION

Model Progress-12000



Characteristics of the system:

Supply voltage: 400x3 V
Pulse power: 15,000 W
Frequency: 10,000-50,000 Hz
Signal Type: sine-modulated, pulse
Auto-tuning in a wide range of frequencies.
Size of the generator: 699x933x616 mm.
Weight generator: 60 kg
Length of geophysical cable up to 5,000 m.
Power emitters from 500 to 5,000 W
Diameter of emitters 44, 76, 101 mm
The length of the emitters from 1,500 to 2,240 mm

The system operates in manual and automatic mode. Equipped with an LCD display and a computer to enter the operating parameters and provide for visual inspection of the generator. The generator is available in a standard 19" vibration-resistant case.

The generator is equipped with a USB-2 connector for programming and remote control options. All connectors and controls are located on the front panel of the generator.

The generator is protected from the breakage line, short-circuiting on the idling line.

The generator is equipped with the stabilization of input voltage. The generator stabilizes the output parameters of current, voltage and frequency.

The system is equipped with function-programmable cyclograms to work in different conditions.

The system provides for management protocol works. Automatic archiving of computer-memory protocol work after the completion of processing cycle formation.

The generator is compatible with various types of geophysical cables and ultrasonic emitters.

Emitters are designed to work under pressure of up to 500 bar and temperatures of up to +125°C.

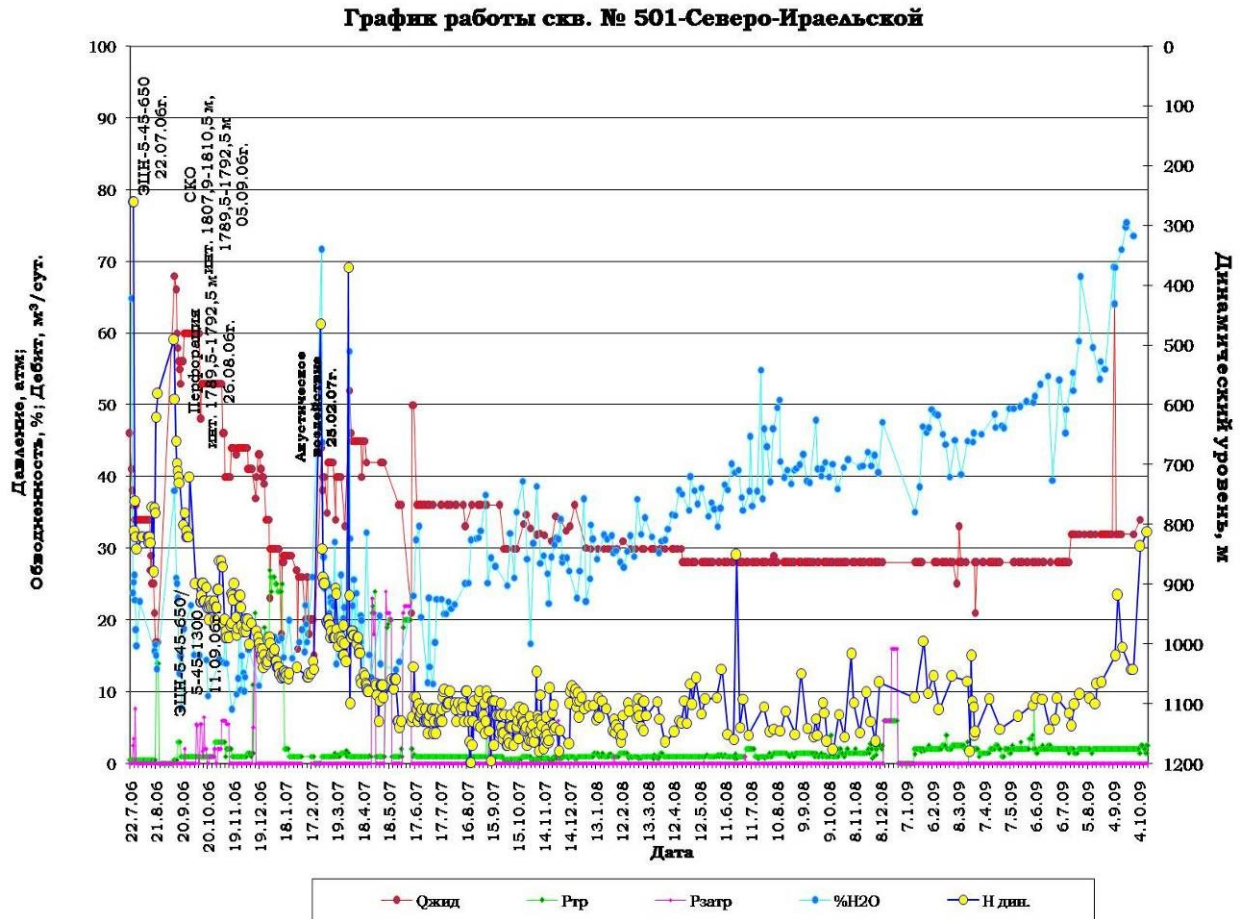
PROGRESS ULTRASONICS GROUP LLC
www.ProgressUltrasonicsGroup.com

COMPETITIVE ADVANTAGES OF ULTRASONIC TREATMENT OVER TRADITIONAL METHODS

Technology Options	Brief description
Reagent	No need for expensive chemicals (acids, solvents, surfactants, etc.)
Removability	Contactless, “close-” and “long-range”
Selectivity	Selectivity effects on the different phases of a multi-phase medium and selective extraction of useful components.
Manageability	Operational controllability of time and intensity of impact, speed processes, etc. on the basis of feedback.
Indestructibility	Indestructible structure and environmental “renewability” of the impact of (initial) parameters
Manufacturability	Machine-less, low number of operations, possibility of automation, etc.
Ease	Flexibility, mobility and fine tuning of technology
Precision	Possibility of stimulation at the sub-molecular level.
Combinability	Possibility of simultaneous (parallel) effects on different phases, inter alia, as combined with real practices.
Environment	“Flawless” (reversibility of “after-effects”) for the geological environment, minor destructive impact on the environment, convenience of production.
Cost	Lower cost and labor-intensive compared with all other methods and technologies

PROGRESS ULTRASONICS GROUP LLC
www.ProgressUltrasonicsGroup.com

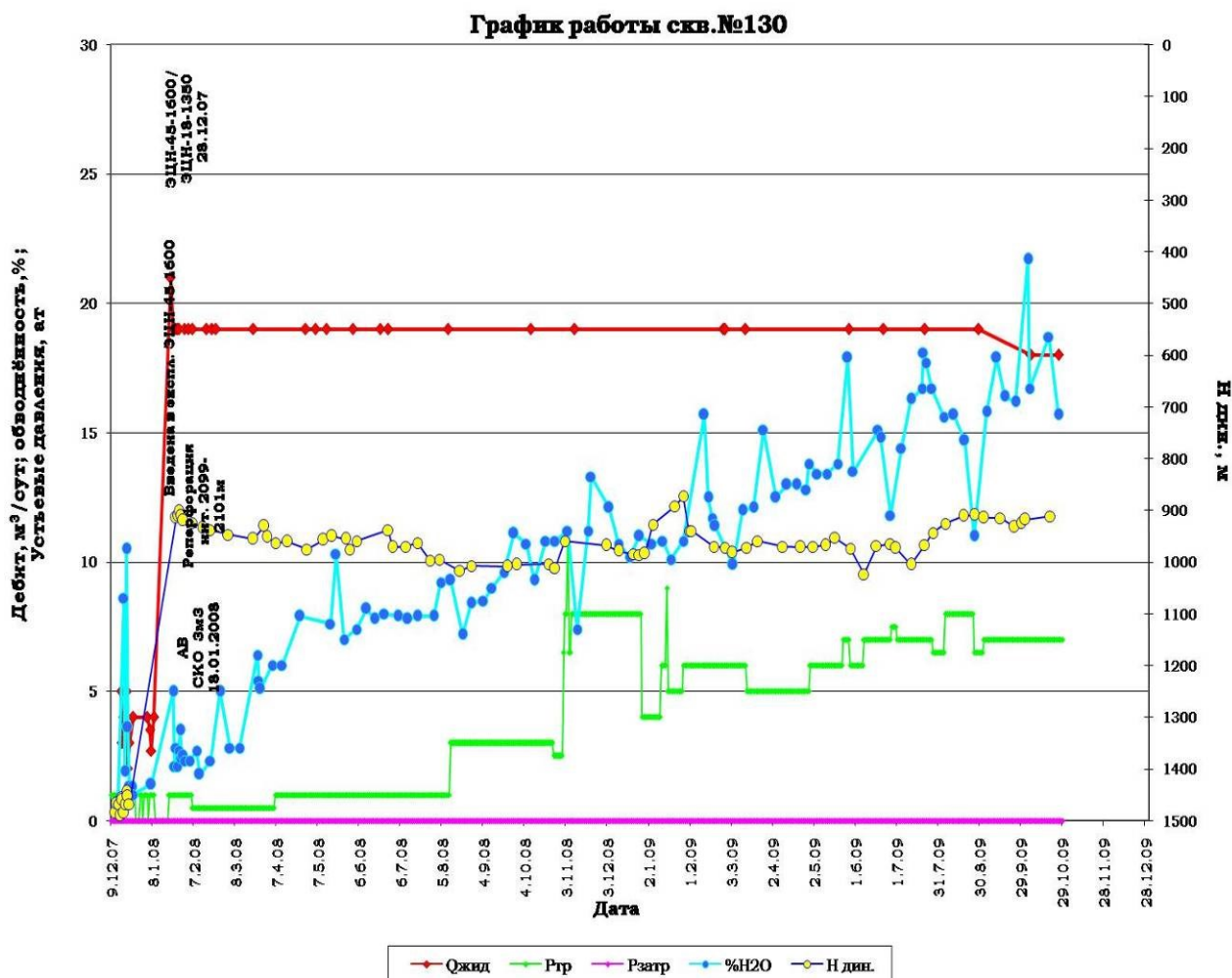
TECHNOLOGY RESULTS



Comments:

This well, one of the first, was acoustically treated on 25/02/2007 for Pechoraneft CJSC and is a “record-breaker” in terms of the length of post-stimulation effect that continues to this day, now approaching three years (36 months). That said, the stable effect was attained with carbonate reservoir rock, and stimulation expenses were justified five days after stimulation (due to the sale of additionally-produced oil). Prior to acoustic stimulation, the well stood out for its sharp oil-rate decrease, despite the entire complex of geological and technological measures.

TECHNOLOGY RESULTS

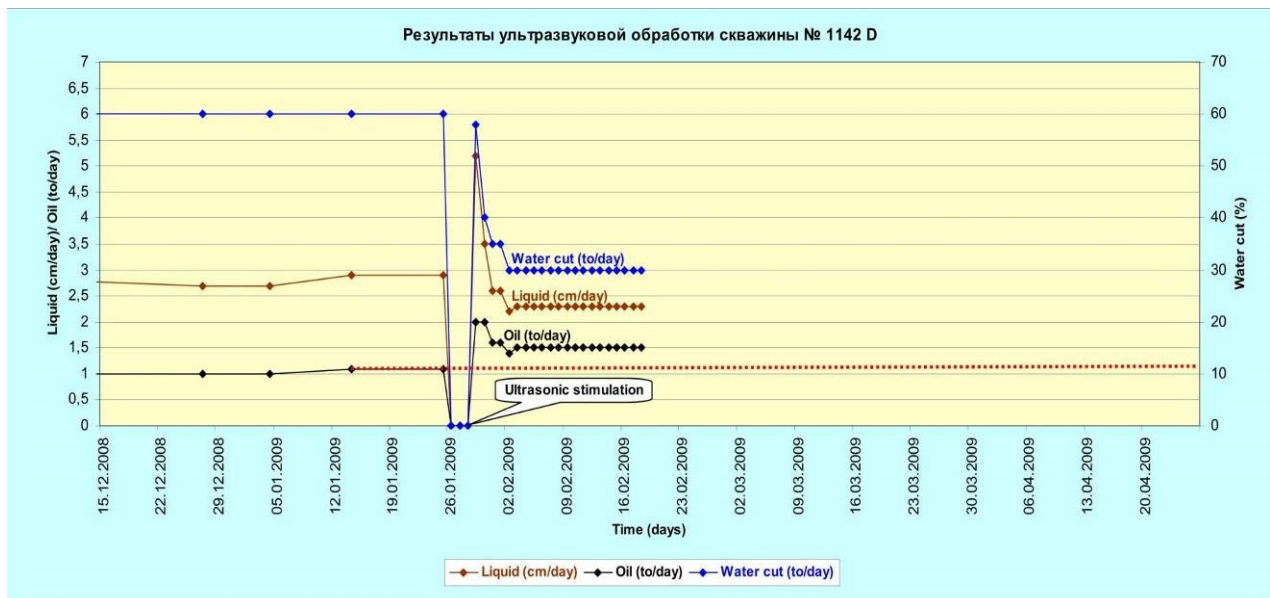


Comments:

This well is a “record-breaker” in a series of ultrasonic treatments for Pechoraneftgaz JSC with the aim of increasing discharge rate – by a factor of 4.5 (450%!). This hole is distinguished by the high stability of work (with a specific percentage increase in water content over time) in terms of continuing performance improvements over the course of more than two years.

PROGRESS ULTRASONICS GROUP LLC
www.ProgressUltrasonicsGroup.com

TECHNOLOGY RESULTS



Well proposed for Ultrasonic stimulation 1142_D,

Casing production (inch) - 8 5/8 + 7; Perforation interval (m) - 761 – 757; Temperature and pressure (°C/ bar)- 35 / 62;

Oil density (g/cc) - 0,9; Oil viscosity (cp) - 320-430; Composition of oil (%) Paraffin/Asphaltene/Resin - not available,

Water cut (%) - 45%, Reservoir permeability (mD) – 300; Reservoir porosity (%) – 29; Type of reservoir - sand, sand (unconsolidated);

The system of exploitation - pumping system; Jobs of stimulation – no; Last job done – no;

Initial production Liquid(m³)/ water cut(%)/ oil (m³) 4,3 /59 /1,6,

Actual production Liquid(m³)/ water cut(%)/ oil (m³) 2,9 /60/1,1;

Obs Downhole equipment -sand filter 2-7/8inch

Comments:

The findings of well 1142D standard-series tests in Romania on marginal fields, characterized by the fact that after ultrasonic treatment, the total flow rate of liquid is almost the same, while oil discharge increased by half (1.5 percent) at a fully-halved water cut from 60 to 30 percent (2 times).

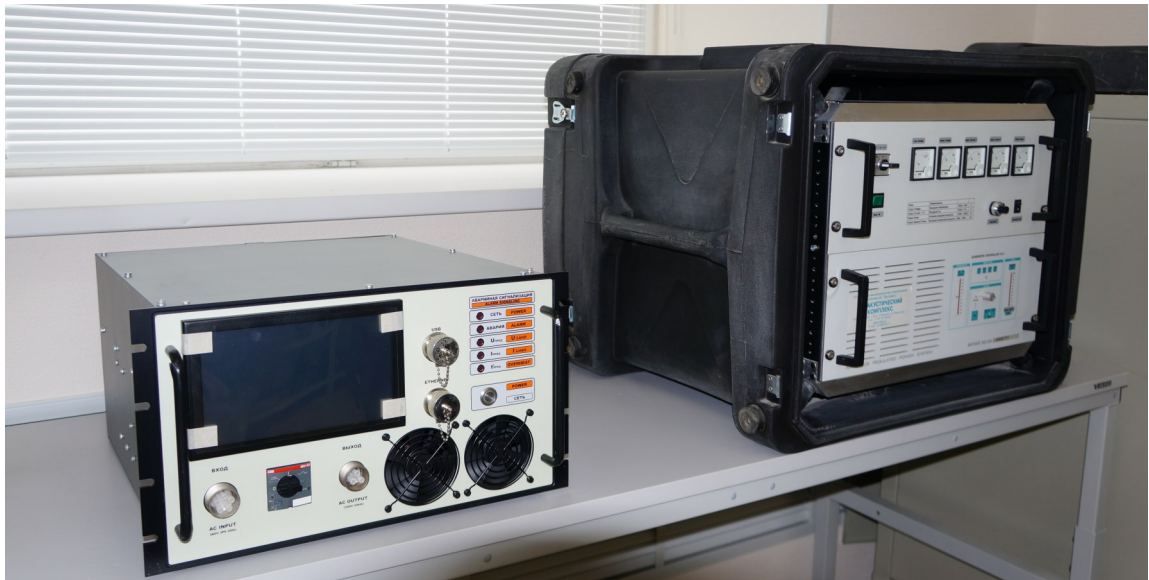
ASSESSING THE EFFECTIVENESS OF ULTRASONIC TREATMENT

The physically-based concept of the effectiveness of acoustic impact lies in increasing the flow of liquid (well capacity), regardless of its (liquid) character, indicating an improvement in the filtration properties of layer zones and “given” the capacity of the reservoir.

Given the lack of information and especially, its utter insufficiency in terms of the basic characteristics of the reservoir (inflow profile, etc.), especially under conditions of high-water content, the customer frequently suggests the substitution of the presumption of efficiency criteria for the increased flow of commodity (oil, condensate) inflow increase (productivity). Therefore, economic impact will largely determine the completeness and reliability of information concerning the target, confirming the well-known thesis that information-savings are irrelevant.

The most objective criteria of the effectiveness of the technology used at a particular stage may well serve as a term of recoupment (by selling additional quantities of the product obtained after acoustic exposure), which, unfortunately, can only be calculated after the implementation process, which is very difficult to predict.

Based on the reality of our practice (depending on oil prices and other market factors), the payback period can range from a few days to several months, with a total duration of monthly productivity-increase effect (usually not less than 6) of up to several years (1-2 times more), often while reducing the water content of products at several points.



PROGRESS ULTRASONICS GROUP LLC
www.ProgressUltrasonicsGroup.com

OUR PRIME COMPETITIVE ADVANTAGES

We're excited that today, acoustic well-stimulation (ultrasonic modification) is a modern, hi-tech, reagent-free, geophysical method harnessing the controlled and selective stimulation and formation of the wellbore zone aimed at the intensification of inflow (injectivity) and oil recovery, which can be used under different geological and technological conditions and result in an enduring (up to 2 years or more) multiple effect that is at once non-destructive with regard to well-formation and ecologically-harmless, as combined with other known intensification methods of oil-recovery increase.

1. Scientifically-sound and systematic approach to the selection of the acoustic-stimulation of targets (deposits, reservoirs, wells), allowing for the formulation and setting of specific geological and technological tasks for the acoustic stimulation of each well (groups of wells), ensuring their effective solution.
2. Unique (with regard to the power, size, matching of the whole) (generator-cable-transmitter system, depth and other parameters), characteristics of the hardware and technology for the acoustic treatment technology itself, allowing for the immediate stimulation of wells down to 5,000 meters, including the use of tubing, i.e. virtually without the suspension of production operations.
3. Informational and financial optimization of the technology is accompanied by geophysical studies, which allow for the performance of selective (targeted) and controlled, regarding different parameters, acoustic treatment based on “inflow profile” – the stimulation profile principle, and the rapid assessment of quantitative results according to performance (return) treatments.
4. A wide range of options for cooperation from consulting and the purchase of geo-acoustic complexes for rent (leasing) and methodological-technological support should allow for the optimal decision.
5. The unique opportunity to implement technologies of combined stimulation (at different frequencies in the range from infrasonic (1-100 Hz) to Ultrasonic (20 kHz) vibrations, as well as in combination with other methods, including “Reagent” methods (HCL Treatment etc.), which considerably expand the application of acoustic stimulation and increase its efficiency.

PROGRESS ULTRASONICS GROUP LLC
www.ProgressUltrasonicsGroup.com

MUTUAL BENEFICIAL PARTNERSHIP

Progress Ultrasonics Group LLC is the world leader in the development and manufacture of ultrasonic systems for the intensification of oil production.

It would not be an overstatement to say that today's acoustic stimulation of wells (in ultrasonic modification) involves an advanced, high-tech, reagent-less, geophysical method of controlled and selective stimulation and bottom-hole formation zone for the intensification of tributaries (throttle response) and enhanced oil recovery, applicable across a wide range of geological technological conditions of commercial facilities, with long-lasting (up to two years or more) and significant (often multiple) effects, virtually “bezdefekten” for reservoir and wells, environmentally clean, and easy to combine with other known methods of stimulation and enhanced oil recovery.



Without affecting the oil-bearing reservoir, the technology allows for restoration of the filtration properties of the productive layers, with minimal time and material costs.

PROGRESS ULTRASONICS GROUP LLC
www.ProgressUltrasonicsGroup.com

OPTION AND CONDITION COOPERATION

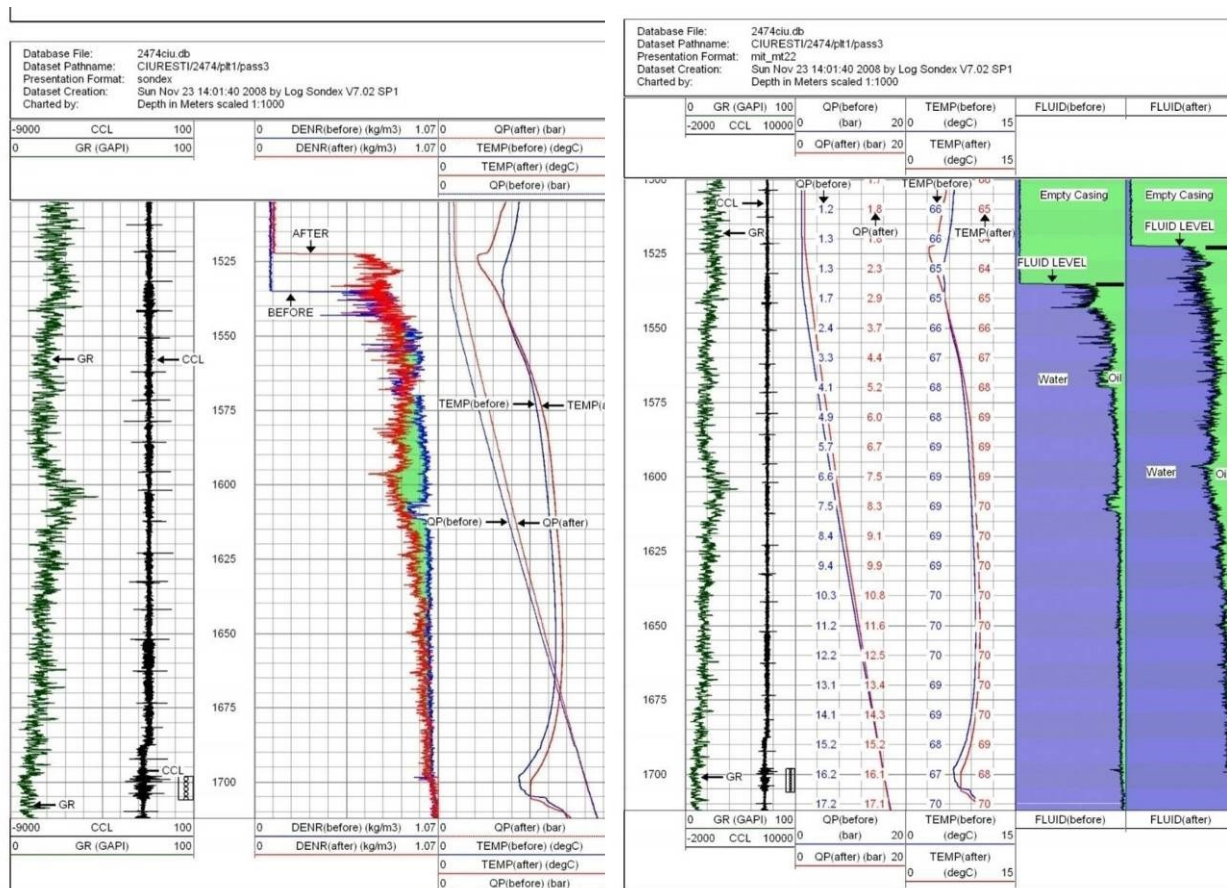
1. Trial testing for 1-3 wells (at cost and on terms of equal risk):
 - a) By our means.
 - b) By the geophysical partners of the customer (with preliminary training and supervision).
2. Purchase of hardware and processing facility with maintenance guarantee (contract price, with a discount when buying multiple sets).
3. Rent (leasing) hardware-processing facility on contractual terms.
4. Training of the Geophysical partner's buyer personnel.
5. Consulting support for acoustic stimulation.
6. Purchasing + Training.
7. Purchasing + Training + Consulting.
8. Rent + training + consulting services, and so on.
9. Development, manufacturing, testing and production of separate components (assembly units) or hardware-technological complex according to the customer's specifications.
10. Carrying-out and financing of joint R&D works.



PROGRESS ULTRASONICS GROUP LLC
www.ProgressUltrasonicsGroup.com

TECHNOLOGICAL SUPPORT FOR GEOPHYSICAL STUDIES

Results of GIS in the borehole. Number 2747 CIURESTI



Comments:

Optimization of the technology is extremely important from the financial point of view, as the cost of these studies (associated with well depth and performance “before” and “after” treatment) is usually higher than the cost of ultrasonic treatment. The results of research carried out by Weatherford Company (USA), during our treatment work in Romania, demonstrates that the technology is sufficient for the operational assessment of the efficiency of ultrasonic stimulation and decision-making. We are moving towards the optimization of a set of methods, technical aids and technologies for different conditions, as well as their automation in combined technology with our well ultrasonic transmitters.

PROGRESS ULTRASONICS GROUP LLC
www.ProgressUltrasonicsGroup.com

COMBINED TECHNOLOGIES ULTRASONIC STIMULATION

Today, the most radical means of enhancing the effectiveness of stimulation to enhance production and recovery is a combination of different methods of nature and technology, which allows, including the trigger and run in place of mechanisms for natural synergies (self, yet not fully investigated). Combining ultrasonic treatment with reagent (chemical) methods, such as hydrochloric acid treatment or the injection of surface-active substances, has its own technological difficulties related to the fact that most chemical reagents, as a rule, represent the aggressive environment.

To ensure the stable operation of our emitters in such aggressive environments, we have mastered the technology of coating (sputtering) the surface of tungsten carbide, as well as the manufacture of emitters made of ceramics. This ensures their high resistance to corrosion and does not lead to significantly-higher costs.



PROGRESS ULTRASONICS GROUP LLC
www.ProgressUltrasonicsGroup.com

RESULTS OF PRIMARY TECHNOLOGICAL EFFECTS AND MECHANISMS OF ULTRASONIC STIMULATIONS

1. Mainly due to pore space (increase in volume and effective permeability):

Near-wellbore decontamination of different contaminants – contaminants of a different nature (solids carryover, crushing of colloid — dispersed system — coagulation structures, dispergation (solution) of paraffin and other asphalt resin and paraffin deposits with the breaking of polymer bonds in paraffin and resin molecules — cavitation and accompaniment, periodic, “quartz wind” etc.)

Increasing effective cross-section (volume) of capillars (and respectively permeation recovery) due to breaking high shear strength water films — destruction (cavitation collapse) of double electric layers.

2. Mainly due to the saturated fluids:

Change in the rheological properties of oil (reducing the effective viscosity, threshold shear strength, spatial restructuring and break-long molecules of heavy hydrocarbons) – kavitatsiya, and the accompanying phenomena, dissipation of acoustic energy into heat, catalysis of chemical reactions, etc.

Reducing the water content of products – to change the permeability of the mixture. Degassing of liquids with the formation of micro bubbles of gas and flotation of liquid – kavitatsiya and accompanying phenomena.

Berkness effect – coalescence of bubbles dispersed in water oil and increase its flow.

3. Mainly due to particles (matrix and cement):

“Peristaltic” effect – displacement of a traveling wave – **S-wave in Solids**. Changing of the fracturing and openness of fractures, possible new-fracture formation (hydraulic micro-fracturing) – periodic pressure.

4. Mainly due to joint show and at phase boundary:

“Uncapping” and integration of the production of new production zones (interlayers). Capillary effects – changing surface tension, moisture resistance, etc.

CONTACTS

Oleg Koshkur
President
Progress Ultrasonics Group LLC
Switzerland
tel.: +41 79 9040905
E-mail: progressis@bluewin.ch



Prokic Miodrag
Director
Ultrasonic World LLC
Switzerland
tel.: +41(0)329314045
E-mail: mpi@bluewin.ch



PROGRESS ULTRASONICS GROUP LLC
www.ProgressUltrasonicsGroup.com

REPRESENTATIVE OFFICES

SWITZERLAND

ULTRASONIC WORLD LLC

LE LOCLE, 2500

MARAIS 36.

Ph. +41 0 32 9314045

Fax +41 0 32 9314045

E-mail: mpi@bluewin.ch

INDIA

IMPACT TECHNOLOGY INDIA

J-133, R.B.ENCLAVE, PASCHIM VIHAR,

NEW DELHI - 110063.

Ph. 011-2528 1536, 011-2526 0964

Fax 011-4567 1539

E-mail: omronbioideal@gmail.com

impacttech.in@gmail.com

PROGRESS ULTRASONICS GROUP LLC

www.ProgressUltrasonicsGroup.com