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Geophysics innovative RSS / NMR in questions And answers

1. That is the RSS / NMR?

The technology RSS / NMR is he approach innovative for the revelation and enderdenenial nspection of hydrocarbon deposits, minerals and alsosources of water restored drinking in deep water. The technology RSS / NMR is he approach innovative for the revelation and inspection remote and terrestrial deposits of hydrocarbons, minerals and alsosources of sweet water restored in deep water.

The inspection remote of the sites and deposits provides he RSS service (spectral resonance research) through spectral processing resonant of images space analog (air). The use of said service does not require any permission or coordination since it is they use the images space of the access open. The NMR (Nuclear Magnetic Resonance) service provides the investigation of deposits in land crazy through a method of

magnetic resonance. It is possible to familiarize yourself with this method in more detail ithe scientific article "About the possibility of identification of deposits of hydrocarbons with the help of NMR" (http://www.geosci-instrum-method- data-syst.net/5/ 551/2016 /). HE requires the authorization official for the realization of the expeditionin he territory of the Customer.

2. By that the technology RSS / NMR HE refers to innovative.

Our technology is innovative in the geophysics market, as it realizes an essentially new physical approach to the revelation and investigation of underground hydrocarbon, mineral and freshwater deposits, and also provides the Client with much higher efficiency of *the investigations*. Of manner preliminary, we score The specters of the substances required and then through a resonance effect we reveal them on site. Regarding This, RSS / NMR technology is a direct method of investigations when the presence of required substances at an inspection site is carried out directly, and only then your further examination is taking place. In this consists his major difference with the methods indirect where HE makes ainterpretation of the various data indirect received in a place research.

3. Which is the efficiency of the technology offered?

As parameters main of efficiency of the methods geophysicists, serving three parameters basics:

- The productivity of works R (is a degree of achievement of theresults planned, is say, the attitude of the cracks perforated with success forehead to the number general of cracks perforated by the given technology).
- The operability of the works T, that is he time during he which the Client will receive the results of the plays geophysics ordered.
- *He cost of the plays* C, this parameter is extremelyclear for he consumer.





How RSS technology works for remote deposits survey directly





rss-nmr@fands-llc.biz

Land line +17863528843 Naaman's building suite 206 3501 silvenide road Wilmington Deleware 19810 USA

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4. Productivity

Work productivity RSS/NMR Rt exceeds 90%, which meansthat he number of mistakes in the research is lower at 10%.

The productivity of works accomplished by 3D seismicity Rs - makes up approximately 30%, that is, about 70% of the jobscompliments they lead to the drilling of the wells "dry." Comparing the percentage of possible errors, we see that RSS / NMR reduces approximately the risks of drilling of wells "dry" by a order minor.

5. Has technology testing been performed on known deposits?

Upon completion of the scientific and technical work on the creation of technology, repeated tests of technology have been carried out in Ukraine and also in Indonesia, Russia and USA. In 2009, the technology was tested in the difficult geological structures of the Green River formation in the state of Utah (USA). During the tests provided, technology has completely confirmed high parameters efficiency: 100% productivity and 98% precision of results. The High efficiency of technology is confirmed by more than 50 projects executed with success in twenty-one countries of the world.

6. Costs

The cost of our service considerably lower per 1 square kilometer. Furthermore, the larger the research area, the lower the cost of research services for 1km². In this sense No have competitors.



rss-nmr@fands-llc.biz

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Como la RSS-NMR y las sismicas clasicas muestran los resultados de terrenos







THE GENERAL IDEA

Technology is based on the effect of nuclear magnetic resonance. Nuclear magnetic resonance (NMR) - a physical phenomenon is used to study the properties of molecules under irradiation of atoms' nuclei by radio waves in magnetic field.

The essence of the nuclear magnetic resonance phenomenon is that during exposure of object placed in constant magnetic field to radio frequency impulses electromagnetic energy is consumed and further released in the form of response impulses that can be registered and analyzed.

For the discovery of the effect of nuclear magnetic resonance in 1952 the American scientist Felix Bloch and Edward Mills Purcell were awarded the Nobel Prize in Physics.

Nuclear magnetic resonance is widely used in science and engineering.

In medicine, it is called a magnetic resonance imaging (MRI).



MRI is based on the principle of re-emission of radio waves by hydrogen nuclei (protons) contained in the tissues of the body, immediately after receiving the energy from the radio wave signal, which the patient is irradiated. The patient is placed in a powerful magnetic field. At him affects the RF signal, causing nuclear magnetic resonance in the desired tissues or organs. The scanner receives response signals, which are then processed in the computer and creates an internal image (visualization).



Evolution of mobile phone and seismic technology



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EFFICIENCY COMPARISON FOR BIG EXTENSIONS

		Resul	ts (for a area ~1000 sq .	r a area ~1000 sq . km)	
M ething _	Job to produce	Effectivene Duration ss		average number _ of wells	
Methods all _ traditional	Space study geological study _Geophysical study _ Drilling _ _ search	30 – 40 %	1 - 2 years 	6 (Information from Russian State Institute of Oil and Gas)	
RSS-NMR	Spectral survey of resonance. Resonance probe nuclear - magnetic deposited in _ the place	➢ 80 % ➢ 90 %	23 Months 2/4 months	1	

Features _ _ comparatives with seismograph _ _ 3D

#	Parameters	3D-Seismic	RSS-NMR
1	Binding topographic	+ (anomalies)	+
2	Construction of models 3D of objects	+ (anomalies)	+
3	Search of traps not structured oil and gas		+
4	Detection of "caps" of gas in horizons of Petroleum		+
5	Definition of the pressure of the gas in the "tapas" of gas		+
6	Definition of the presence of mobility oil		+

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DESCRIPTION OF JOBS

1. <u>Stage regional</u> ("diagnoses" remote of the block of the Customer)

N⁰	Name of plays	Volume of the job done	Duration
1.	Jobs preparatory	 1.1. Order and receive images of satelite of the zone of study 1.2. Order and reception of products chemicals and consumables 1.3. Preparation of samples of the substances required and record of their ghosts electromagnetic. 1.4. Preparation of equipment for he job. 	1st – week
2.	The technological process of detecting and identify the desired objects inarea of study	 2.1. Prosecution of resonance spectral of Photographs spacein presence of Plates proof 2.2. Chemical treatment of negatives that have been exposed by resonance. 2.3. Display of the contours of the objects detected through the camera Kirlian 2.4. ID and selection of the objects desired 2.5. ID and detection of structures of failures 	2 ^{days} week
3.	Photogrammetric calibration of computer images of objects. The detention of the objects	 3.1. Obtain a image of computer of the objectsidentified wearing a camera Of video digital 3.2. Determination of contours and boundaries of objects, levelsof luminosity. 3.3. Layout of isolines of signs of answer in units relative 	3rd – week



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	 3.4. Geographic referencing of points of the images space sturces of objects to the map geographical thezone 3.5. Determination of the geographical coordinates of thesingularized objects. 3.6. Determination of the size and position of the deposits in 		
4.	Preparation and presentation of areport to Customer	 4.1. Elaboration of a map of the area with the boundaries of the contours of the deposits identified in the surveyed area, response isolines of signals and zones of peeling. 4.2. Elaboration of data textual, drafting of note explanatoryOf the report. 4.3. Provide he report to the Customer 	4 th week
	Total	100 % of the volume of jobs by he Contract	4-5 weeks



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2 days stage

Study remote detailed of deposits identified

N⁰	Name of plays	Volume of the job done	Duration
1a.	Jobs preparatory	1.1. Order and receive images of satelite additional for the exploration volumetric of the deposit identified1.2. Preparation of products chemicals and consumables	1st – week
1 B.	Jobs preparatory	1.3. Recording of the spectral electromagnetic required onplatesof proof1.4. Verification of the equipment (test of routine)	1st – week
2.	Process technological of study detailed in depth deposit	 2.1. Spectral resonance processing of photographs space additional for create a effect "stereoscopic" 2.2. Treatment chemical of negative that they have suffered exposure by resonance. 2.3. Refinement of the contours of the deposit and of the structures of failure in images detailed 	2 ^{days} week



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3	He prosecution of the data received	 3.1. Geographic referencing of points of the images space studied and contours of objects to the geographic mapping of thezone 3.2. Determination of the number of horizons in he deposit. 3.4. Determination of the depths of horizons in the sections transversal and longitudinal of the deposit. 3.5. Creation of banks deep of the deposit. 3.6. The construction of a model 3D of the horizon - base 3.7. The construction of a map structural of the horizon - base 3.8. Determination of optimal areas and uncovering points of thedeposit. 	3rd – week
4.	Preparation and presentation of areport to the Customer	 4.1. Preparation of a map of the area with the boundaries of the contoursof the deposits identified in the zone studied. 4.2. Elaboration of data textual, drafting of note explanatory of the report. 4.3. Provide he report to the Customer 	4th – week
TOTAL 4-			4-5 weeks





A LITTLE HISTORY

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1883 1900's 1914 1824 1930's 1830	Theorie de l'articilinal Forage Rotary Seismographe Log de puits 1° puits en "mer" Sismique ponctuelle	1° qualités des roches et des fluides Extension au domaine maritime (> 10m) Imagerie 10 Subsurface	i ^{èm} période 1880-1930 Explo.à partir des affleurements et des indices de surface
1830's-10 1950's	840's Géophysique Biostratigraphie Sismique et de logging	Généralisation de la 1D Cerrélations et datations géologiques précisées Amélioration des outlis	2 ^{ime} période 19:30-1950's Exploration encore « hosardeuse » des bassino
1990's	Ordinateur digital (1963) Rift continental (1969) Diagraphie moderne	2D image de subsurface Mellieure conncissance structurale Propriétés des roches et fluides de aubsurface	3 ^{les} période 1950's-1970's Exploration « seul-colibrée »
1970's 1977	2D migration (1976) Forage directionnel Rock Eval Analyse stratigraphique	Sismique numérique calibrée Concepts "noche mère et formation des HC" approfondis Amélioration de la prédiction	4 ^{bes} période 1970's-1960's Exploration = colibrée =
1985 1985	Sismique 3D Système pétrolier	Melleure précision des objectifs à forer Mellieure définition des zones à potentiel	5 ⁸⁴⁴ période 1980's-1990's "Exploration-Production optimisée"
t990's bab Sist	Simulation 20 et 30 des sins et des réservairs Attributs stemiques sigue 40 et monitoring attributs parts	Prediction des mouvements et de la localication des fluides Prédiction des fluides et extensions de réservoirs	6*** période 1990's Exploration-Production + rationalisée >

