Mass investigations of trace elements in coal deposits and basins on all continents conducted over the past few decades have shown that coals are concentrators of many valuable metals, including rare and dispersed ones. Scandium is of interest as an element, almost having non own industrial deposits and extracted usually simultaneously with the development of ores of other metals, but it often forms geochemical anomalies in coal ash even industrially relevant concentrations (Valiev et al., 1993; Kashirtsev et al. , 1999; Arbuzov et al., 2003, 2007; Seredin et al., 2006; Yudovich, Ketris, 2006; Seredin, Finkelman, 2008)[cited by 3].

Kazakhstan is one of the largest regions of the world, with significant reserves and prospects of enlargement of the mineral-raw materials base of rare and rare-earth metals. In the republic, the production of RM and REM is carried out at specialized enterprises of non-ferrous metallurgy as accompanying products. However, nowadays, the production of RM, REM and their compounds in Kazakhstan can be characterized as unstable, not appropriate to its potential. It decreased, but at some enterprises, where the production of RM and REM used to be the main one, has now been suspended [6].

Meanwhile, considering modern and prospective requirements of the development of science and technology, in the world demand for rare metal and rare-earth products is rising, and the production of pure RM and REM and their compounds is highly profitable. Developed countries possessing high technology of refining metals of technical purity receive from them products for electronic, radio engineering, electrical engineering and other high-tech industries used in space, aircraft, instrument engineering [6].

Consequently, the priority direction in the future for the Republic of Kazakhstan, is extraction, selection, obtaining of pure RM and REM and their compounds and further development of semiconductor, electronic, instrument-making and other advanced branches of science and technology. This is very important because almost all developed and explored reserves of mineral ores in Kazakhstan are composed of RM and REM [6].

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FEATURES OF GEOPHYSICAL METHODS AND EQUIPMENT WHILE DRILLING

M.M. Bazylev

Scientific advisor – assistant A.A. Islyamova

National Research Tomsk Polytechnic University, Tomsk, Russia

Purpose of the research is possibilities of analysis of geophysical exploration, which is performed while drilling. The article discusses ways to implement the measurements in conjunction with drilling; methods used to perform geophysical tasks most effectively.

There is a trend towards integration of geophysical and drilling operations in order to reduce rig time and drilling risk significantly. To understand this issue we need consider this branch of geophysics, its potential and development at this stage.

Logging while drilling (LWD) is a technique of conveying well logging tools into the well borehole downhole as part of the bottom hole assembly.

Initial attempts to provide M/LWD date back to the 1920s, and attempts were made prior to WW2 with Mud Pulse, Wired Pipe, Acoustic and Electromagnetics. JJ Arps produced a working directional and resistivity system in the 1960s. Competing work supported by Mobil, Standard Oil and others in the late 1960s and early 1970s lead to multiple viable systems by the early 1970s, with the MWD of Teleco Industries, systems from Schlumberger (Mobil) Halliburton and BakerHughes. However the main impetus to development was a decision by the Norwegian Petroleum Directorate to mandate the taking of a directional survey in wells offshore Norway every 100 meters. This decision created an environment where MWD technology had an economic advantage over conventional mechanical TOTCO devices, and had led to rapid developments, including LWD, to add Gamma and Resistivity, by the early 1980s [6].

Logging while drilling is classified by several parameters [2]:

According to what measurements are used for:

Geosteering – well path parameters determination;

Formation lithology determination – rock, fault, reservoir type identifying;

Geomechanics – cementing quality control by acoustic log.

Equipment for providing it will be considered below.

There are two conditional groups of measurements according to measuring depth:

non-directional (axisymmetric, or axial) measurements of shallow depth (gamma-ray logging, neutron logging, acoustic logging, lateral logging are used) and large radial depth (quite long log sondes of induction logging are used);

directional (azimuthal) measurements of shallow depth (gamma-ray logging, neutron logging, acoustic logging, lateral logging – measurement methods by sector) and large radial depth (long sondes of induction logging are used) [1].

Logging while drilling is linked to a telemetry inseparably. The telemetry is a set of measurement tools and auxiliary equipment and communication facility for measurements and other data transmission to receiving equipment for monitoring. Telemetry consists of borehole tool and ground device for receiving and selecting formation signal with subsequent transformation and registration.

There is geophysical section among primary transducer of information in which there is rock resistance measurer, gamma-ray activity measurer, self-potential measurer and vibroacoustic properties measurer. There are also directional and technologic primary transducers of information besides geophysical section [3].

The telemetry type affects a gradation of the geophysical equipment in the bottom hole assembly [5]. The gradation also depends on what depth of investigation of exploration methods is and what the geophysical task is for certain conditions [1].

Considering exploration methods used in various companies, the basic of them was selected for the present article: gamma-ray logging, resistivity survey (induction logging is used, but it measures rock resistivity instead of rock electrical conductivity), directional survey, acoustic log.

Additional researches are used also for data validation. They are electromagnetic log, neutron density logging, lateral logging.

Let us consider the basic of exploration methods in detail. Gamma-ray logging is a shallow method, used in geosteering almost always. The gamma-ray logging instruments comparison will be addressed below (Table 1) [4, 5].

Table 1

The gamma-ray logging instruments parameters comparison

Parameters	Gamma-ray logging tool (Geolink, OJSC «Gers»)	Gamma-ray logging tool 'Scenturion' (JSC«Bashneftegeofizika»)	Gamma-ray logging tool (APS company production)
Vertical resolution	15 cm	No Data	15,2 cm
Update rate in real time	1 sample / 15 cm at 15 m/h 1 sample / 30 cm at 30 m/h 1 sample / 45 cm at 46 m/h (every 36s)	118 samples/m at 15 m/h (every 2s)	from 2,5 to 3,5 samples/ 30 cm at 15 m/h from 0,8 to 1,2 samples/30 cm at 45m/h (every 24s)
Rate of sampling	16 seconds, 8 seconds (with more storage place)	from 1 to 60 seconds (to storage – every 1s, to telemetry – every 2s)	5 seconds

Gamma-ray logging tool 'Scenturion' has the best update rate in real time and minimal rate of sampling comparing to the others, which give us the best accuracy and timeliness of the data because the rate of sampling is 2s and update rate is also 2s allow us monitor the data the moment they are measured. The other instruments have from 2 to 4 measurements for 1 update in real time that is not so accurate comparing to 'Scenturion'. Gamma-ray logging tool of APS company has the best vertical resolution though.

Electrical methods have a good depth of investigation for their using in geosteering. The resistivity meter comparison will be addressed below (Table 2) [4, 5].

Table 2

Resistivity meters parameters comparison

Parameters	Resistivity meter 'SlimTRIM' (Geolink, OJSC «Gers»)	Resistivity meter 'Centerfire' (JSC « Bashneftegeofizika »)	Resistivity meter 'WPR' (APS company production)
Research diameter	2,13 m at Rt = 1 ohm*m 2,845 m at Rt = 10 ohm*m 3,099m at Rt = 100 ohm*m	from 0,38 to 0,81m at Rt = 10 ohm*m from 0,49 to 0,97m at Rt = 100 ohm*m	from 0,117 m to 0,375m, depends on tool size
Operating frequency	20 kHz	400 kHz and 2 MHz	400 kHz and 2 MHz
Diameter of the tool	from 0,121m	No Data	from 0,089m to 0,204m

From the Table 2 the resistivity meter 'SlimTRIM' has the best research diameter among the others which is up to 3,1 m.

Acoustic log is used for cementing operation quality assessment, mud weight optimization, pore pressure prediction (geomechanics field), providing the effective porosity information to an operator and seismic data registration around the well [2].

Directional survey is a method used for well position determination. There are some parameters need to be researched: hole inclination, the azimuth of the deviation, whipstock orientation angle. To provide the parameters study the following tools are used: gyroscopic instruments, free gyroscope, inertial navigation system, magnetic device and etc.

Additional researches such as petrophysical rock properties are determined by the method of neutron density logging, which measures a density and a porosity of the rock. The method applies to the shallow depth methods.

When the rock parameters measurements are done, the data collected in storage place should be transmitted to receiving equipment in real time. There are several types of telemetry used for it, such as hydraulic, with the pipes, through the rock [3].

Therefore logging while drilling uses lots of geophysical methods in the analysis of it, basic of which are gamma-ray logging, resistivity survey, directional survey, acoustic log. In selecting of gamma-ray logging instrument it is recommended to choose the 'Scenturion' tool because it has the best update rate in real time and minimal rate of sampling, which give us the best accuracy and timeliness of the data. In selecting of resistivity meter it is recommended to use the 'SlimTRIM' device because it has the best research diameter. And also to get better data the additional researches are used.

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REVIEW OF GAZPROM BASIC STRATEGIC PROJECTS FOR SOLVING TASKS FOR GAS SUPPLYING OF RUSSIAN AND FOREIGN PARTNERS

N.Y.Bakalo, V.V.Chudinov

Scientific advisor – associate professor N.V.Chukhareva

National research Tomsk Polytechnic University, Tomsk, Russia

According to the strategy program for the development of gas transmission network under the auspices of PJSC Gazprom (the Company), the goal of long term growth, in accordance with [3], is sustainable global leadership because of creation of a united gas supply system, covering not only the entire territory of the Russian Federation (RF), including areas with poorly developed infrastructure, but also foreign projects. Specification of the Company is the combination of some different technological functions aimed at extraction, transport, storage and processing, which allows solving diverse tasks of the industry complex on the basis of a powerful resource base and having a widely gas transportation system.Delivering products to other producers and rendering services for the transit of hydrocarbons, the current direction of the Company's development is the formation of an "energy bridge" between the markets of Europe and Asia and the consolidation of Russia among the world's energy leaders.

The purpose of the work is to review the main strategic projects of PJSC Gazprom under construction in the Eastern Gas Program (EGP), in the West of the country and on the regasification of liquefied natural gas (LNG).

Eastern Gas Program

In 2007, the Government of the RF approved a development strategy of EGP in order to create a unified production, transport system for natural gas in the territories of Western and Eastern Siberia, Far East for gas supply to these regions, including taking into account the likely export of products to the markets of China and other countries of the Asia-Pacific region. The Eastern Pacific Region. EGP will allow to form a modern gas transportation system (GTS), gas processing and gas chemical industries and organize new gas export routes according to the requirements of the world standards of quality and ecology, which defines this project as the largest in the history of modern Russia. In addition, a specific feature of EGP is the development along two routes, due to two sections of the borders with China along the eastern and western directions.

Eastern route

The first strategic project of the EGP in the Eastern route is the GTS "Power of Siberia", which will run through the territory of the Irkutsk Region, the Republic of Sakha (Yakutia), the Amur Region, the Jewish Autonomous Region and the Khabarovsk Territory. In these entities, natural gas production capacities are being created almost from scratch and 1,000-kilometer gas mains are being built. The first joint of the main gas pipeline "Power of Siberia" was welded on September 1, 2014. At the moment, the work is under way to lay the first section of the 2200 km gas pipeline from the Chayandinskoye field to Blagoveshchensk, where a gas pipeline will be built then for export to China, which will allow the construction of a 3000 km stretch. In the future, the GTS "Power of Siberia" will be connected in Khabarovsk with the Sakhalin-Khabarovsk-Vladivostok GTS put into operation. The second main strategic project of the EGP is the Amur Gas Processing Plant, which together with the GTS "Power of Siberia" will allow to extract various kinds of gas chemical raw materials from gas and export purified methane to China. This plant will become the leader in the Russian Federation for the production and processing of natural gas, including the production of inert gases (helium).