

- the fluid column pressure – 1 MPa,
- the bit pressure – 0.4 MPa,
- In the annulus and feeding lines pressure – 0.4 MPa.

Total pressure loss in air circulation drilling is 1.8 MPa.

Special drilling parameters were designed for interval: Bit load – not more 20 kN, bit rotating speed – 1 rotation per 0.1 meters of depth, maximum supply of compressed air – 91 m<sup>3</sup>/min. Surface casing drilling in Naryksko-Ostashkinskaya area with these parameters allows achieving accident-free drilling, and mechanical drilling speed up to 18 m/hour.

Finally, the time for surface casing drilling for wells № 13, № 15, № 17, № 19, № 25, № 27 and № 29 was on average 27 hours.

This result indicates the efficiency of fractured rocks destruction, including high drillability category rocks, with rotary-percussive drilling and blowdown.

The mentioned above facts show the possibility of using this technique at Dulisminskoye oil field with mobile drilling rigs by Sramm. We suggest using mobile drilling rig and then the standard drilling equipment. This method was informally called “advance” or “keep ahead drilling”.

The novelty and practical effect of the proposed solution is not only in the justification of the use of downhole percussive drill and air for surface casing drilling at Dulisminskoye field, but also in the development of technique, as well as optimal drilling modes, and also in the practical implementation of the “keep ahead” drilling.

As any other technical or technological solution, the implementation of blowdown requires a detailed analysis and research. An important component of the research is the results evaluation and the experience analysis of rotary-percussive drilling and blowdown. It is planned to do in solving mud loss problem at Dulisminskoye field for the nearest future.

To show other aspect of surface casing drilling at Dulisminskoye field, it should be noted that there is a disadvantage of actual G&G data for drilling wells. Thus, for example, due to various reasons, there are no data on the geophysical survey of Verkholskaya and Litventsevskaya suites. It prevents to identify the reasons for mud loss in the interval of 0 – 300 m and make difficult the development of drilling technique involving downhole percussive drill.

Nevertheless, it can be assumed that the analysis of rock, their genesis, and sedimentation conditions allows identifying the possibilities for advance drilling

#### Conclusion

The mentioned analytical data of the tectonic framework in the region, lithological rocks characteristics in the well cross-section, as well as rock composition, the process of geological area formation, and the similarity of geological conditions at Dulisminskoye and Naryksko-Ostashkinskaya fields in terms of rock fracturing, fossilization, and the successful experience of blowdown in Naryksko-Ostashkinskaya area is considered as positive aspect for advance drilling at Dulisminskoye field.

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## PERSPECTIVES OF SPECIALLY PROTECTED SITE NETWORKS OF TOMSK OBLAST

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Specially protected sites are one of the key tools for saving biological and landscape diversity. In recent years one can observe fragmentation of landscape due to linear building (roads, transmission lines, pipelines etc.), extension of farmlands and new field development. In these conditions protected natural sites are becoming shelters for some species of animals and plants which can otherwise be extinct.

At present there are 218 specially protected sites in Tomsk Oblast with the total area 1378,1 thousand hectares or 4,38% of Oblast area (Table). The most area is covered by the specially protected sites of regional significance among which there are the following types distinguished according to the Federal law of 14.03.1995 № FL-33 [4]: state reservations, natural monuments, botanic garden. Among the additional types accepted in accordance with the Law of Tomsk Oblast of 12.08.2005 № 134-OL [2], there are some recreation sites (see Table).

Table

*Specially protected natural sites of Tomsk Oblast (as of 31.12.2014)*

Type	Number	Area, thous. hec
Specially protected natural sites of federal significance		
State reservation «Tomskiy»	1	50
Specially protected natural sites of regional significance		
State reservation	17	1157,7
Natural monument	108	28,7
Siberian Botanic garden	1	0,1
Recreation sites	3	1,7
Specially protected natural sites of local significance		
	88	140
Total:	218	1378,2

Specially protected natural sites of federal significance are presented by one state natural zoological reservation «Tomskiy». It was established in the 1980's without withdrawal of sites from landowners and users. Hence, there are some residential areas within its borders. The Departmental identity of the reservation was not defined for a long time, only since 2008 by the Order of the Russian Federation Government of 31, December, 2008 № 2055-p it was placed under management of Ministry of Natural Resources and Environment of the Russian Federation. Up to the present time reservation «Tomskiy» has functioned juridically, but its main objectives were not performed, its functioning conditions were not met. In accordance with the changes introduced with the Federal Law of 28.12.2013 № 406-ФЗ, the state reservations of regional significance can be established by means of transformation of state natural reservations of federal significance. In August, 2014 Ministry of Natural Resources and Environment of the Russian Federation put forward a proposal on transformation of state natural reservation of federal significance «Tomskiy» into state natural reservation of regional significance «Tomskiy», which was supported by the Administration of Tomsk Oblast. The Government of the Russian Federation issued the directive of 29.01.2015 № 111-p on transformation of state natural reservation of federal significance «Tomskiy» into state natural reservation of regional significance «Tomskiy». Adjustment of regulatory legal acts to the current law requires sufficient money and time expenditures. According to the Federal Law «On specially protected natural sites» of 14.03.1995 № 33-FL it is necessary to perform complex ecological study to ground its borders and protection condition for making decision in establishment of regional significance reservation. One needs to develop and agree the solution project on establishment of reservation with the municipal bodies of two regions, landowners and landusers, where the restrictions of its use will be imposed, and local body of the Federal Agency for Subsurface Use, executive bodies for forestry affairs. It should be noted that it issues no guarantee that legal structure will be saved in the current borders when performing the agreements, since the permitted use of owned land plots can be inconsistent with the goals and objectives of establishing the protected site and require withdrawal of these sites from the reservation borders. Furthermore, it is necessary to perform state environmental expert examination of the materials justifying the regulation on the reservation, its borders and location, to agree the solution project with Ministry of Natural Resources and Environment of the Russian Federation, Administration of Tomsk Oblast [4].

Russia is a participator of international programs, agreements, and contracts in the sphere of specially protected natural sites, in particular: Convention for the Protection of Cultural and Natural Heritage, Convention for Wetlands of International Importance Especially as Wildlife Habitat (Ramsar Convention); International program "Important Bird Areas", the part of which is the program «The Key Ornithological Sites of Russia».

In the area of Tomsk Oblast there two sites included in the preliminary list (Shadow list) of Ramsar Convention: Large Vasyugan Bog and The River Pol'ta Basin [1]. It contributed to granting the sites with the status of legal protection. In 2010 within the territory of Kargasok region the natural monument «Pol'to Lake-River System» of regional significance was established. In 2013 to improve the site preservation duty the status of specially protected natural site was changed into the status of «State complex (landscape) wildlife reserve of regional significance «Pol'to». In 2014 to enhance the protection of wildlife items its status was changed into state zoological reservation.

State landscape reservation «Vasyugan» was established in 2006 in the area of Bakhchar region of Tomsk Oblast. In 2007 it was included in the preliminary list of Items of UNESCO International Heritage. At the initiative of Tomsk Oblast Administration, taking into account the importance of Large Vasyugan Bog, Ministry of Natural Resources planned to establish state natural reservation «Vasyugan» by 2016. Its area includes the existing state landscape reservation of regional significance «Vasyugan» in the territory of Tomsk Oblast and state natural reservation «Severniy» in the territory of Novosibirsk Oblast. At present the agreement on reservation borders with Administrations of Tomsk and Novosibirsk Oblasts is in progress. At this stage the solution of problems associated with hunting providers and wild crop gathering is underway.

According to the criteria of the program "Important Bird Areas" in the territory of Tomsk Oblast 6 key ornithological sites of international significance (IBA) are described [3]. In this case three of them are not included in the current network of specially protected natural sites. It should be noted that the protected sites of international significance are not considered specially protected natural sites. In Russian legislation the legal status of protected sites has not been stated yet, therefore, legal conditions of the given key ornithological sites is still not clear [5]. Taking into account importance of these sites the Department of Natural Resources and Environment Protection of Tomsk Oblast took decision on preparatory work for establishing specially protected natural sites including the key ornithological sites. To

determine and describe borders, to develop conditions of protection in 2015 an integrated ecological survey will be performed, the project of decision for establishing specially protected natural sites is prepared. In 2016 investments in state ecological survey are planned. In case of positive decision of state survey, agreement of establishing specially protected sites by the body of Federal Agency for Subsurface Use, executive body in the sphere of forestry regulations, Ministry of Natural Resources and Ecology of the Russian Federation, Administration of Tomsk Oblast the key ornithological site of Tomsk Oblast will acquire the legal status.

Thus, in the nearest future, in the network of specially protected natural sites of Tomsk Oblast the following changes will take place: the reservation «Vasyugan» as well as three more new natural monuments will appear on the map, new reservations of regional significance. It will permit protection of unique landscapes of Tomsk Oblast and enable to preserve the biodiversity of the region and international community in general.

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### ESTIMATION OF RELATIVE SPECTRAL CORRECTIONS IN REGIONAL SEISMIC STATION NETWORK (KAMCHATKA)

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Kamchatka Krai is located in the far north-east of Russia and covers an area of 472.3 km<sup>2</sup>. The southernmost point is Cape Lopatka (50,57 ° N), the northern one is situated near the Arctic Circle (65 ° N). Kamchatka borders on the Kurils in the south and the Chukotka Autonomous Okrug and the Magadan oblast in the north and north-west. It is washed by the Pacific Ocean in the east, the Bering Sea in the northeast, and the Sea of Okhotsk in the west [1].

Kamchatka is the only region of active volcanism within Russian. Over the 70% of the territory is covered by mountains. On the peninsula there are more than 1,000 volcanoes, including 28 active ones. Moreover, Kamchatka ranks the most seismically active region in Russia.

Researches of spectrographic corrections have been performed since 50s of the 20<sup>th</sup> century. It was found out that surface geology has an effect on conditions of seismic wave propagation, and this is the main factor, which determines seismic station corrections value. Station corrections are required for accurate determination of earthquake energy grade. In Kamchatka environments station corrections can characterize peculiarities of attenuation and propagation of seismic waves in volcanic media of active volcanoes [2].

The main purpose of the present research is to enhance reliability of Far-East earthquakes energy grade estimation.

Objectives are to sort out relevant seismic datasets from collection of Kamchatka regional seismic network data and to check the quality of this data and calculate spectral corrections.

Spectral characteristics are used for surface-consistent amplitude correction determination, microseismic zoning, etc. Under reference conditions determination of spectral characteristics (transfer functions) should be carried out relative to mantle (absolute values). However, in practice relative characteristics are employed. It means that base spectrum is recorded on base seismic station. Permanent registration points, for example, GS RAS base seismic stations are commonly used in this case. Among stations located within the surroundings of Petropavlovsk-Kamchatsky the station “Petropavlovsk” (PET) is referred to as a base station.

Spectral corrections determination of Kamchatka regional network stations was performed using MATLAB package. The procedure involved four stages.

The first stage was focused on acquisition of S-wave and seismic noise records from DIMAS-files (DIMAS – base operating program in tsunami watch). The second stage included mathematical processing of information, which involved smoothed Fourier spectrum selection. After that S-wave and noise spectra were superimposed and the obtained pattern distinguished “effective” sections, where value of S-wave spectrum is 5-10 times greater than value of noise spectrum. Spectral corrections were calculated as a ratio of “effective” sections of the station under the study to PET “effective” sections.

Data-processing operations were carried out using 20 records from Petropavlovsk area stations (Table).