



**MINISTRY OF ENERGY
OF THE RUSSIAN FEDERATION**

Experience of GURSH Company in implementation of measures to prevent harmful effects of mine methane emissions on the surface from mines, liquidated during restructuring of coal industry

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**FOR THE REORGANIZATION AND
LIQUIDATION OF UNPROFITABLE
MINES AND OPEN-PIT MINES
«GURSH»**



Restructuring of coal industry

Goals and objectives of FGBU "GURSH"

In 1993-1994 process of restructuring of coal industry of the Russian Federation has started

Main goals of restructuring of coal industry:

- formation of competitive coal companies which provide self-financing in long term;
- ensuring social protection of released workers;
- reduction of state subsidies to coal enterprises;
- socio-economic and environmental improvement of coal-mining regions.

Implementation of measures

Decree of the Government of the Russian Federation of 20.11.1997 No. 1462 "On improving the management structure of the coal industry"

Federal state budgetary institution for the reorganization and liquidation of unprofitable mines and open-pit mines "GURSH"

Government agency for coordination of local development programs and solution of social problems caused by restructuring of coal industry ("Socugol").

Main areas of GURSH work

- technical works on liquidation of coal industry organizations;
- elimination of consequences of mining operations (elimination of mine workings and exclusion of access to them, dismantling of equipment, demolishing of buildings and structures, recultivation of used land, elimination of environmental and other consequences of mining operations);
- monitoring of environmental consequences of liquidation of coal (shale) mines and open-pit mines;
- demolition of old houses, which, as a result of mining operations in liquidated coal (shale) mines, became unsuitable for living according to safety criteria;
- assistance to citizens in acquisition (construction) of houses to replace demolished houses, which, as a result of mining operations in liquidated coal (shale) mines, became unsuitable for living according to safety criteria;
- reconstruction of social infrastructure facilities of mining towns and villages affected by the liquidation of coal (shale) mines and open-pit mines;
- development (adjustment) and examination of projects for the liquidation of coal industry organizations.



Measures to eliminate consequences of mining operations

Local development programs

- ✓ 799 objects of social infrastructure of mining towns and villages were reconstructed
- ✓ 44,436 families relocated from mining territories to new houses

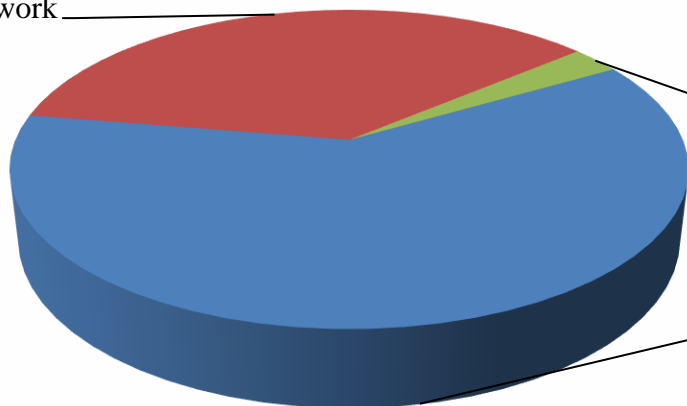
- ✓ Mine workings with a total length of 5.0 thousand km were liquidated
- ✓ Demolished 5247 buildings and structures in the amount of 15.2 million m³
- ✓ Recultivated 6882.4 hectares of land damaged by mining operations
- ✓ Fire extinguished at 66 mining waste dumps and 7 fires in underground mine workings

Technical liquidation of enterprises

- ✓ 12 mine water treatment facilities were built
- ✓ 34 water drainage complexes were reconstructed and 20 were built
- ✓ 85 measures were implemented to ensure protection against:
 - flooding of neighboring operating mines;
 - pollution of drinking water supply sources;
 - flooding of objects of the earth surface by mine waters
- ✓ Monitoring of environmental consequences of liquidation of coal (shale) mines and open-pit mines in 11 regions of Russia is carried out, including elimination of sinkholes
- ✓ Built, reconstructed and repaired - 61 social facilities, damaged as a result of mining

Costs ratio for implementation of measures to eliminate consequences of mining operations

Technical work
36%



Development and examination of project documentation
3%

Implementation of local development programs
61%



Stages of prevention of harmful effects of mine methane emissions to the surface

Threat to life safety of population

Dispersed release of mine gases to the surface

Mine liquidation

Termination of industrial emissions of pollutants into the atmosphere

Research

- Determination of a list of dangerous and threatened zones for the release of gases to the earth surface by specialized organizations.
- Formation of a list of objects subject to constant monitoring.

Monitoring

- Measurement of concentration of gas-air mixture and sampling for laboratory analysis
- Community outreach
- Analysis of obtained monitoring results, issue of recommendations

Measures

- Development and implementation of technical measures to minimize the harmful effect of mine methane emissions to surface objects

Ensuring environmental protection, safety of natural and industrial facilities, residential area and population from methane and other harmful gases released to the surface.



Implemented measures to prevent harmful effects of CMM emissions to the surface

Main measures

Coal mine “Kolchuginskaya”

Organization of methane drainage from worked-out area of liquidated Kolchuginskaya mine

Mines "Baidaevskaya", "Zyryanovskaya" and "Capitalnaya“

Comprehensive assessment of the process of gas release to the surface and possibility of its extraction through operation of degassing wells

Mines "Dalnevostochnaya", "Primorskaya", "Nagornaya“

30 wells, 2.5 meters each, were equipped for local degassing and gas-dynamic observations

Mine "Ozernaya“

2 gas drainage wells drilled with a depth of more than 200 meters

Mine "Capitalnaya“

5 degassing wells drilled with a depth of 24 to 86 m

Mines "Glubokaya", "Yuzhnaya", “S.M. Kirova” and "Komissarovskaya“

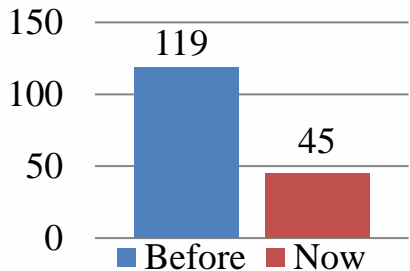
Stage 1 - isolation of underground rooms of residential sector from penetration of mine gases.

Stage 2 - installation of 60 automatic forced ventilation systems. Providing residents with portable devices for monitoring composition of air mixture, trainings for their use and safe living

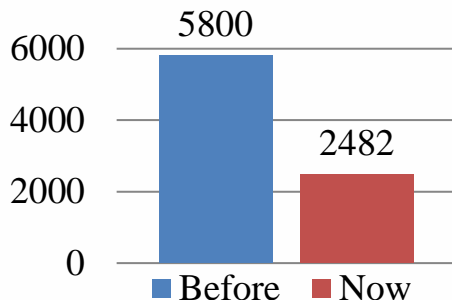


Results of measures and monitoring

Number of controlled mines



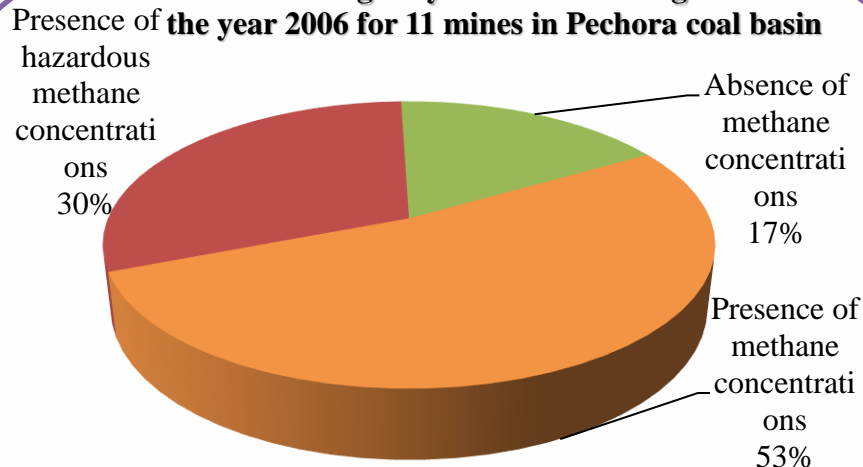
Number of controlled objects



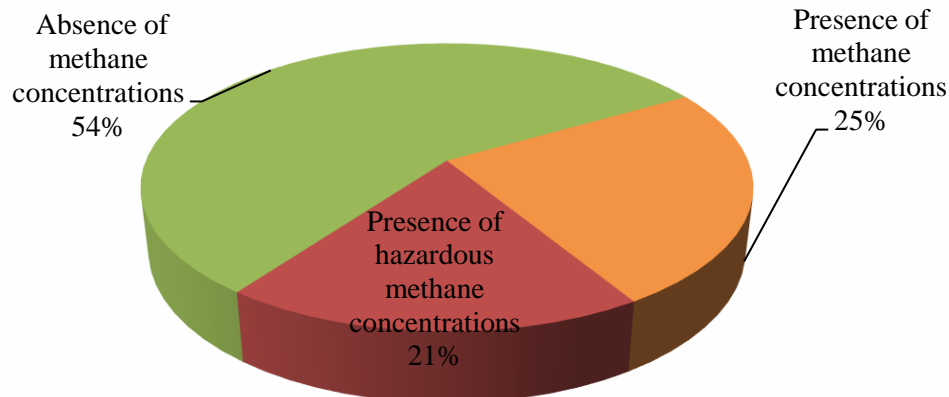
Coal mining region	Number of controlled objects in 2020	Total measurements taken in 2020	Total samples taken in 2020
Kuzbass	117	1588	66
Eastern Donbass	600	9268	164
Ural	16	216	36
Pechora	42	320	99
Slantsy	23	92	46
Primorye	1684	26664	1708
Bcero	2482	38148	2119

The system of monitoring of hazardous mine gas emissions in mining towns and villages, created by GURSH, allows to monitor their sudden appearance on the surface in 6 coal-mining regions.

Correlation of gas dynamic monitoring results for the year 2006 for 11 mines in Pechora coal basin



Correlation of gas dynamic monitoring results for the year 2020 for 9 mines in Pechora coal basin



Since 2006 till 2020 the number of objects on which it is necessary to carry out observations has decreased by 2.2 times. The number of objects on which the presence of methane concentrations was recorded decreased 4.4 times. The maximum concentration of methane recorded according to the results of observations has significantly decreased.



Release of coal mine methane to the surface within the mining allotments of mines of the Primorsky Krai region

More than half of all monitored objects within the framework of gas dynamic monitoring are concentrated in the mines of the Primorsky Krai region - 1684 objects

“Kapitalnaya” mine field is classified as “beyond category” in terms of methane gas emission (more than 15m³/t), and due to high methane saturation of the lower horizons and impossibility of degassing coal seams, the mine was closed in 1996.

Due to the threat to the life safety of the population at the mine allotment in 2003-2004 5 degassing wells were drilled, which ensured the protection of the population for a long time.

For more than 20 years, the mine **has not** been completely flooded. Unflooded mined-out space of the mine is constantly gassed with methane coming from the lower unworked horizons. Since 2013, hazardous and threatened zones **began to expand** with the fixation of increased concentrations of methane in the soil air.

By 2015, **all zones merged** into a single one, up to 400 m wide and more than 2.5 km long. By 2019, the concentration of methane reached 60.5% per volume unit of air at the “Kapitalnaya” mine, and there is no tendency to decrease it.

Development of project and implementation of works on "Degassing of territory of the village “Tavrichanka”, damaged from mining operations by mine “Kapitalnaya” (JSC “Primorskugol”).

Implementation of 3 stage of degassing works - forced degassing by a modular degassing unit.

An assessment of the efficiency of drilling degassing wells by means of subsurface gas survey was carried out, which showed a positive effect.

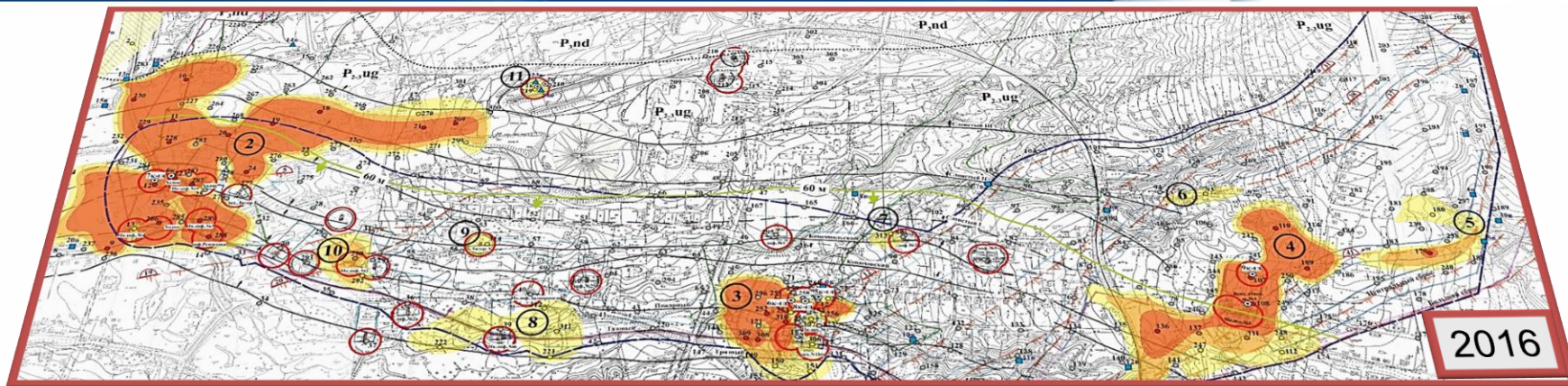
Drilling of 20 additional degassing wells with a depth of 7 to 108 m was completed.



Zones of coal mine methane emission to the surface within the mining allotment of the “Kapitalnaya” mine

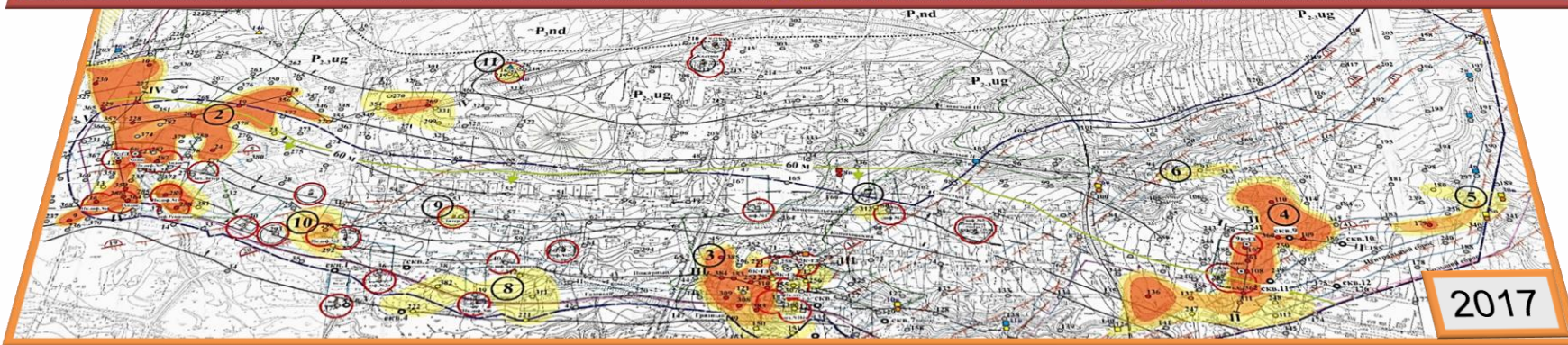


Project development



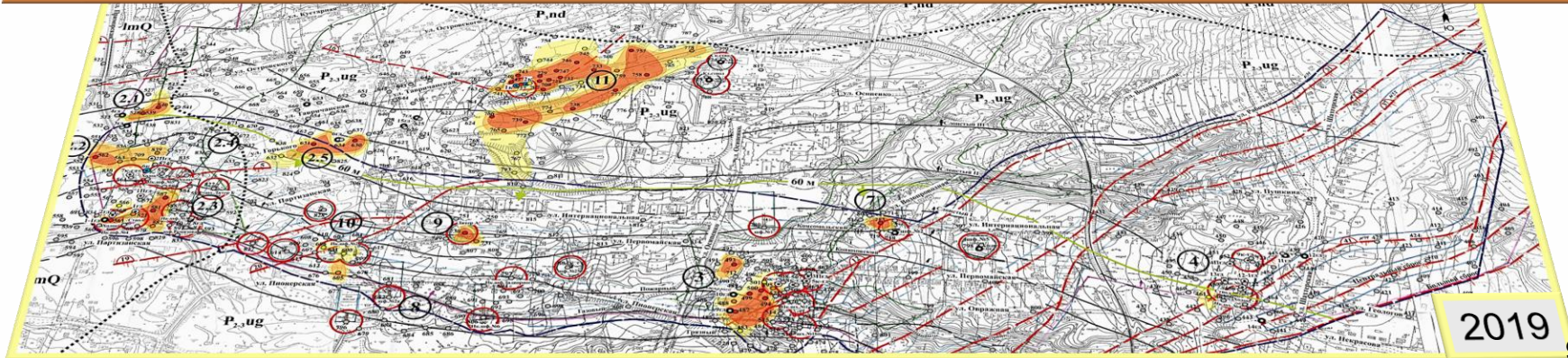
2016

After drilling 16 shallow
wells



2017

One year after drilling all 20
wells



2019

The results of the soil survey of the village Tavrichanka



Measures within the framework of restructuring of coal industry to prevent harmful effects of coal mine methane emissions to the surface



Measures planned for the near future:

To complete work on implementation of 3rd stage of work on project “Degassing of territory of village “Tavrichanka”, which suffered from mining operations by “Kapitalnaya” mine JSC “Primorskugol”, including forced degassing by a modular degassing unit.

To complete work on development of project and detailed documentation for the object "Degasification of territory of Artyomovsk urban district" of JSC “Primorskugol” (Mine “Amurskaya”, Mine “Dalnevostochnoe”) and start its implementation

Provide additional control over the development of an unfavorable gas-dynamic situation at facilities within the mining allotments of the Ozernaya, Amurskaya, Dalnevostochnaya and Primorskaya mines located within the residential area of Artem, Primorsky Krai for the period of development and implementation of degassing measures

Continue monitoring of environmental consequences of liquidating coal (shale) mines and open-pit mines in 11 regions of Russia.

Work carried out by GURSH on systematic monitoring of methane emission at mine allotments of closed mines and built-up hazardous and threatened zones, analysis and implementation of measures for degassing mine fields ensures prevention of possible emergencies in areas of residence of population and stabilizes ecological situation in mining towns and villages.