2 1 OF 1

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000100020004-4

JPRS L/8259

2 February 1979

USSR

TRANSLATIONS ON USSR RESOURCES

(FOUO 3/79)

U. S. JOINT PUBLICATIONS RESEARCH SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

BIBLIOGRAPHIC DATA SHEET	1. Report No. JPRS L/ 8259	2.	3. Recipient's Accession No.
4. Title and Subtitle TRANSLATIONS ON USSR RESOURCES, (FOUO 3/79)			5. Report Date 2 February 1979
			6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Organization Name and Address Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201			10. Project/Task/Work Unit No.
			11. Contract/Grant No.
12. Sponsoring Organization Name and Address As above			13. Type of Report & Period Covered
			14.
15. Supplementary Notes			

16. Abstracts

This serial report contains information on energy, fuels and related equipment; fishing industry and marine resources; water resources, minerals, timber, and electric power.

17. Key Words and Document Analysis. 17a. Descriptors

USSR
Natural Resources
Electric Power
Energy
Energy Conservation
Fisheries
Fuels
Minerals
Timber
Water Supply

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group 5C, 10, 21D, 2C, 8G, 2F

18. Availability Statement FOR OFFICIAL USE ONLY. Limited Number of Copies Available From JPRS	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 41
	20. Security Class (This Page) UNCLASSIFIED	22. Price

FORM NTIS-35 (REV. 3-72) THIS FORM MAY BE REPRODUCED USCOMM-DC 14952-P72

JPRS L/8259

2 February 1979

TRANSLATIONS ON USSR RESOURCES

(FOUO 3/79)

CONTENTS

PAGE

ELECTRIC POWER AND POWER EQUIPMENT

UDC 621.31.001.891

RESEARCH IN POWER CONSTRUCTION

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 9, 1978 pp 79-80

[Article by Candidate of Technical Sciences L. I. Kudoyarov: "Problems of Administering Scientific Research in the Field of Power Construction"]

[Text] The decisions of the 25th CPSU Congress map out the basic directions of intensifying the adoption of key scientific advances in the national economy. They include: Conversion to program-goal planning of science, concentration of research on the most promising themes, cost-accounting organization of research and development, and improvement of the system of economic incentive for the assimilation of new equipment and systems of wages paid to scientific personnel.

All national economy development depends on the country's power base, and a sector such as power construction determines the effectiveness of this development.

The resolution of current tasks facing power construction and the transition to new directions relating to the accelerated construction of AES's and the creation of maneuverable generating capacities in GAES's in the European regions, the development of a cluster GRES running on Kansk-Achinsk and Ekibastuz coal, the construction of large GES's in Siberia, and also the transmission of large quantities of electricity over great distances, require substantial and completely new scientific studies.

Science, as a modern production force, must be fully involved in the process of the reproduction of the power engineering base, fully responsible, morally and materially, for the results of accomplishment of assigned tasks. Under the present system of planning of scientific research, unfortunately, science frequently stands aloof from the resolution of urgent problems, and indicators of its effectiveness hardly depend at all on the successful accomplishment of assigned tasks.

At present, the basic shortcoming in the planning of scientific research is the financing and allocation of the wage fund based on the principle of the actual accomplished level and the securing of the completed base. This leads to a situation in which the results of previous investigations and accomplishments are utilized, while not enough attention is focused on the resolution of new, urgent tasks. As a result, science becomes inert, passive under conditions of changing situations in the sector.

In the author's opinion, the allocation of appropriations to support science should reflect long-range capital investments in the development of individual directions. In the next five-year plan, for example, it will be necessary to invest basic funds in the development of nuclear power, the creation of maneuverable capacities, the construction of large GES's in regions of low temperatures and permafrost, and the construction of superpowerful transmission lines. For this reason, it is necessary now to finance science in such a manner as to reflect in percentages, at least approximately, the prospective distribution of capital investments. This will guarantee the concentration of scientific research on promising directions; it will make it possible to achieve a substantial national-economy effect from investments in science.

The proper determination of promising lines of scientific research is a complex task. It can be resolved only on the basis of long-range sector planning. At present, all sectors have development plans generally extending 15 years, and development forecasts even farther into the future. These must serve as the basis for determining the necessary levels and basic directions which can serve as the basis of the sector's scientific development after a certain amount of confirmation by directive agencies. Plans of long-range sector development can also serve as the basis, and inseparable component part, of the long-range plan of development of individual scientific efforts.

At present, for example, the key hydroengineering institutes--Gidroproyekt [All-Union Order of Lenin Planning-Survey and Scientific-Research Institute imeni S. Ya. Zhuk], the All-Union Scientific-Research Institute of Hydroengineering imeni B. Ye. Vedeneyev, and the Georgian Scientific-Research Institute of Power Engineering and Hydroengineering Structures--have already worked out such plans extending 15 years in the main scientific directions. They are based on a specific anlaysis of the long-range plan of construction of GES's up through 1990. The program of GES construction includes about 40 long-range projects to be built in different areas of the country. An analysis of this program makes it possible to determine the most promising types of hydroengineering structures and power equipment, to set forth specific tasks of a technological nature, and to formulate the requirements on other sectors of the national economy with respect to supplying the hydroengineering builders with modern equipment and materials.

Such long-range plans in science cannot be drawn up correctly without a detailed analysis of the technical level of the subsector as of today, without a comparison of the planned indicators of projects against similar indicators taken from both Soviet and foreign scientific-technical documentation. The accumulation of data characterizing the present technical level must be handled by the key institutes in accordance with a unified procedure. Then these data must be submitted to the subsector's head scientific-research institute for summarization and systematization. At present there is a large number of surveys, card files, and reference manuals which frequently contain the same information but do not make it possible to correctly analyze the sector's technical level. Work on analyzing the sector's technical level must go on constantly rather than being confined just to the time of compilation of the 15- or 5-year plan, because the dynamics of indicators of the sector's technical level make it possible to determine more graphically the feedback between planning and the development of new equipment and its adoption in practice.

In this way, having unequivocal data concerning the present technical level and proceeding on the analysis of prospective power construction, it is possible to determine both the thematics and the volume of necessary scientific research. The assembly of selected scientific-research themes will make it possible to draw up a substantiated five-year program of scientific-research work for each scientific direction.

The inclusion of a theme in this program of projects for the subsector must be preceded by the compilation of a TEO [Technical-Economic Substantiation], which must include a brief description of the project, procedures for carrying it out, an analysis of the prospects and timetables for adopting the results, and a chart of the technical level with indicators of patent clearness and the project's economic effectiveness. In addition, the TEO must contain a consolidated calculation of labor outlays on completion of the project.

In determining the range of problems which must be resolved by individual institutes of the subsector, it is necessary to take account of the scientific profile of their specialists. In addition, bolder use must be made of their abilities to resolve new tasks facing Soviet science. In the author's opinion, in the sector institutes it is most rational to set up a problem-solving structure in which a number of specialists of differing profile in the institute form a collective designed to resolve a specific urgent problem. The list of problems laboratories should be revised once every five years in order to enhance the creative vigor of the scientists and raise their motivation in resolving assigned tasks effectively and promptly.

The experience of the USSR Ministry of Electrical Equipment Industry and Ministry of Heavy and Transport Machine Building indicates that program-goal planning yields the maximum effect only when combined with conversion to the new system of planning, financing, and economic incentive. At present, the USSR Ministry of Power and Electrification's Glavniiproyekt [Main Administration of Scientific-Research and Planning Organizations] is actively preparing to convert scientific-research, planning-design, and technological organizations to the new conditions of planning and economic incentive.

It must be admitted that the lack of seriality and the long time it takes to build unique power facilities make it impossible to make full use of the experience of adopting the new system in organizations of the Ministry of Electrical Equipment Industry and the Ministry of Power Machine Building. But a number of valuable recommendations worked out as a result of analysis and generalization of the experience of scientific administration in these ministries should be studied comprehensively and utilized.

The fundamental principles governing the work under conditions of the new system are: Integral planning of the whole cycle of projects, financing of them from a unified scientific and technical development fund, and making incentives for collectives of institutes and each scientific worker dependent on the national economy effect gained by the adoption.

To ensure unified principles of planning at all stages of development and adoption of new equipment it is necessary to convert from the present system of thematic planning to the order plan. The order plan for NIOPKR [Scientific-Research and Experimental-Design Work] is not just a document specifying the makeup, timetables, and volume of work to be completed but also an indispensable part of the institute's thematic plan. The order plan obligatorily stipulates the stage of adoption and designates the object of adoption, the source of financing, and the economic effect of NIOPKR.

Depending on the volume of outlays, the order plan must be approved by the ministry management or the main administration involved in the adoption. The distribution of projects among the coexecutor organizations must not be made at random, at the whim of the client, but centrally via the scientific-research institute designated as the head institute for the particular project or mission. The order must be renewed periodically for the head institutes, and its implementation must be monitored closely.

Of even greater importance is the centralization of funds in the head organization when carrying out projects within the framework of vital scientific-technical problems. To this day a number of institutes are still dealing with petty themes. This is happening not only as a consequence of the variety of sources of financing but also because of the poorly-considered fragmentation of scientific directionality in the activities of sector institutes, substantial duplication in their efforts, and poor ministry control over the inclusion of sector institutes in adjacent scientific-technical programs.

Conversion to the new system of planning and incentive in science promises to strengthen the role of the economic considerations in the unified science-planning-production chain. In the first link of this chain it is necessary to strengthen the connection between wages paid to scientific personnel and the success rate of their labors.

One measure of the success rate of scientific-research work should be the extent to which its recommendations are adopted in the practice of power construction and the technical-economic effect gained as a result. "Adoption" should mean the use of the results of scientific-research work in construction projects, in approved technical documentation, normative-procedural documents, and certificates of authorship.

An obligatory condition on enhancing the efforts of science personnel should be a competitive system carried out on the basis of the results of completion of five-year plans, and the main criterion should be the economic effectiveness of the work done and the results of adoption.

6854
CSO: 1822

ELECTRIC POWER AND POWER EQUIPMENT

UDC 621.31.001.891

INCREASED EFFECTIVENESS OF POWER CONSTRUCTION

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 9, 1978 pp 76-78

[Article by G. A. Denisov, Ye. A. Gel'man, and Ya. F. Sokolov, engineers: "Introduction of New Equipment--A Way to Raise the Effectiveness of Power Construction"]

[Text] At the 25th CPSU Congress the country's power engineers were assigned the job of substantially raising labor productivity in the construction of power facilities--that is, reducing the amount of builder and installer labor outlays per kilowatt of installed capacity and per kilometer of installed power transmission lines.

The reduction of specific labor outlays should be accomplished by optimally increasing capacities of power plants under construction, unit capacities of power equipment (boilers, turbines, reactors, transformers, and so on), and layout designs of power plants in order to shorten utility lines, reduce the number of separate buildings in the power plant complex by block construction, and so on, improving the structural design of power lines, introducing new and advanced technology, organization, and administration in the construction and installation of power facilities, and new technological structures of buildings and facilities of main and auxiliary power equipment.

Analysis shows that in the next few years one of the main ways to boost labor productivity and effectiveness in power construction will be to introduce advanced technology in construction and installation work while simultaneously improving structural technological effectiveness.

The development and introduction of new technology should be accomplished through the use of:

advanced integrated technological processes, sometimes requiring changes in facility design;

highly-productive mechanisms developed by Soviet industry;

special machinery for power construction developed and manufactured by organizations and plants of the USSR Ministry of Power and Electrification and Soviet Industry;

new building materials.

It should be noted that in this regard the Ministry of Power and Electrification has done considerable work. For example, in capital construction from 1974 through 1978 in accordance with approved plans financed from central funds for the development of new equipment, 339 items yielding a total economic effect of 225 million rubles were introduced, compared with total outlays of 52.9 million rubles on research and development.

The introduction of new equipment in leading construction and installation organizations of the Ministry of Power and Electrification has substantially reduced the cost and shortened the construction timetable of facilities while simultaneously reducing labor outlays. The introduction of new structural components and technologies of building pile foundations in the construction of the Kama Motor Vehicle Plant made it possible to shorten the zero cycle by 1.5 years and reduce labor outlays by 500,000 man-days.

The extensive use of the new technology in pouring concrete mix in the building of the dams of the Cherkeya and Toktogul' GES's tripled labor productivity in concrete work.

Gidroproyekt [All-Union Order of Lenin Project-Survey and Scientific-Research Institute imeni S. Ya. Zhuk] developed floating foundations for crossing supports of 330-kilovolt power lines; these foundations were installed in 1977 in the construction of the Zaporozh'ye GRES--Nikopol' Power Line across the Kakhovskoye Reservoir. The economic effect from the adoption of the new works method, compared with the project plan variant of building around the reservoir, came to more than eight million rubles.

Orgenergostroy [All-Union Institute for the Project Planning and Organization of Power Construction] developed, and the Kuybyshev Elektroshchit Plant started the series production of, KTPB [expansion unknown]. In the Ninth Five-Year Plan, 2,279 35 to 110-kilovolt substation sets were produced, making it possible to save 16,500 tons of metal and 8,500 cubic meters of cement; labor outlays were reduced by 292,000 man-days. The total economic effect over the five years came to about 31 million rubles.

The Ministry of Power and Electrification plans the development and introduction of new equipment centrally in capital construction. For this purpose, new equipment plans are approved every year, one of which calls for construction industry enterprises and machine building plants to start the production of new items, while the other calls for new technology in the implementation of construction-installation work. Both plans are financed by centralized deductions from construction-installation organizations and ministry enterprises.

In addition, every year the ministry issues an Order increasing labor productivity, which stipulates the basic measures involved in introducing new equipment and manufacturing new machinery and components in the ministry's enterprises.

This system of planning has a number of drawbacks which impair the effectiveness of introducing new equipment in capital construction. The plans call only for the development and assimilation of new technologies and components by construction-installation organizations. They do not include plans for the manufacture of the necessary experimental models of machinery, gear, and components necessary for this. Because most of the construction trusts do not have sufficiently powerful and well-equipped machine plants or an adequate system of component acquisition, the development of experimental models either drags on for years or is never completed. In this way, a large number of uncompleted although generally effective solutions are accumulated. This is the basic reason for failure to further develop certain effective solutions (such as, for example, automatic welding of technological piping and components, cement and mortar storage facilities that can be set up rapidly, and new, economical metal forms), block-built substations that can be set up rapidly are not being introduced at a fast enough pace, and so on. Yet considerable funds have been spent on their development.

Another defect in the present system of adopting new equipment is the absence of adequate, highly-qualified appraisal to determine the effectiveness of new equipment designs proposed by the institutes. For this reason, 25 to 30 percent of the measures on new equipment for capital construction adopted by way of experiment from 1973 through 1977 failed to yield the desired effect and, for this reason, cannot be recommended for extensive adoption in the ministry's construction projects.

A number of experimental models of mechanisms necessary for the adoption of new equipment are not being manufactured on time, which in the long-run leads to delays in the experimental adoption of certain advanced means and methods of organizing the work in power construction. A number of other experimental models of components and machinery developed and manufactured in accordance with the plan of assimilation of new equipment of the ministry's industry have not been accepted for series manufacture because of inadequate analysis of effectiveness.

The use of concrete based on lightweight claydite or aggloporite fillers for power line supports makes it possible to reduce their mass by 20 percent. Investigation and experimental work on the adoption of such supports have been underway in GruzNIIEGS [Georgian Scientific-Research Institute of Power Engineering and Hydro-Engineering Structures] since 1975, with the corresponding material outlays. But these supports have not yet become widespread in use.

It must be pointed out, moreover, that the system of material incentive for the adoption of new equipment has not been organized properly. This is indicated by the fact that only about 20 percent of the items included in the new equipment development plans in capital construction are included in bonus orders, so that insufficient use is being made of the central bonus fund for the assimilation of new equipment in the ministry.

The ministry has failed to arrange a system of extensive use of the most effective possible applications with regard to new technologies of construction-installation work and scientific and technological advances already assimilated by other ministries and departments.

For example, the institutes of the Ministry of Power and Electrification are working on several designs for the welding of non-rotating large-diameter type joints, but the experience of the Ministry of Construction of Petroleum and Gas Industry enterprises is not being utilized sufficiently. Insufficient use is being made of the experience of the construction ministries with regard to the adoption of ductless heating systems.

According to estimates by ministry organizations, the annual reduction in the cost of construction of power facilities through the adoption of new technologies just according to the plan financed from the central fund should amount to at least 100 to 120 million rubles. In practice, however, the annual reduction amounts to a considerably smaller sum. Therefore, substantial improvements are required in the planning and organization of the adoption of new equipment in power facilities.

In order to eliminate these defects and to make more effective use of central funds in capital construction and industrial activities, the Main Production-Technical Administration for Construction and Orgenergostroy have drawn up proposals calling for the development of a unified system of planning applications and the adoption of advanced technologies in construction-installation work, new machinery and equipment, and component items.

They call for the formulation of a unified plan with the following sections:

development and assimilation of new equipment in capital construction;

development and assimilation of new equipment in industry enterprises;

manufacture of experimental models of new equipment;

payment of bonuses for the adoption of new equipment.

For the plan section financed from the central fund for new equipment in capital construction, the following are being worked out and adopted:

technologies of construction-installation work and experimental models of effective construction components;

technologies and gear for the installation of prototypes of equipment;

experimental components for a number of power facilities;

non-series and non-standard machinery, equipment, and gear relating to the new technology for structural designs of power facility structures;

structures of package-unit and stationary buildings for construction bases and permanent bases for construction industry trusts;

layout and structural designs of regional and supply bases, also advanced forms of organization and administration of construction, including ASU's.

In accordance with that section of the plan financed from the central industrial activities fund, the following are developed and adopted:

experimental models of machinery, equipment, and gear intended for series manufacture;

instrumental gear and technological processes of its manufacture;

improvements in the technology of item production;

prototypes of standard automatic lines, also new and advanced forms of organization and administration of production, including ASU's;

normative documents and estimate calculations of prime cost of manufacturing new items.

Work completion by all sections of the plan is monitored every year, and timetables are coordinated as follows.

If the development of an advance technology in construction requires the development of new machinery or the modernization of previous items produced by industry, the section of the plan dealing with the assimilation of new equipment includes the appropriate items with respect to the development of such machines. Conversely, the development and assimilation of the production of new construction machinery or components are incorporated in the plan if it is possible to make extensive use of them on projects under construction. The section "Assimilation of New Equipment in Capital Construction" includes the appropriate items with respect to the experimental adoption of new models of construction machinery and new components in construction. Both sections indicate the development, manufacture, and adoption timetables.

Experience has shown that when an experimental model of a new item of equipment is manufactured at one plant while the experimental batch or series of the same item is manufactured at another, the time necessary to introduce the new unit is extended by at least one to two years. This circumstance must be taken into account in the planning of the manufacture of new machinery, equipment, and components. The proposed object of their adoption (construction project, enterprise) must be decided on two years before the item is realized. Verification of the workability and reliability of assemblies of machinery, equipment, and components or technological processes which require additional investigation prior to beginning the manufacture of the experimental models or the experimental testing of the technology, are also taken into account in the plans. The machinery, equipment, and components are to be tested at the Kuybyshev Experimental-Testing Plant, the Solnechnogorsk Scientific-Experimental Complex of Orgenergostroy, or other experimental bases of the ministry, and are coordinated with the timetables for the production of experimental models. Specifications on component parts and materials for the manufacture of the experimental model, also the manufacture of an experimental batch of items, are to be submitted to Glavenergokomplekt [Main Administration for the Supplying of Complete Sets of Power Equipment to Power Plants, Substations, and Networks] and Glavsnab [Main Administration of Material-Technical Supply] by the general project planner not later than 1 April of the year preceding the planned year.

In the author's opinion, it would be advisable to set up a special earmarked material-resource fund in the USSR Ministry of Power and Electrification's Glavsnab and Glavenergokomplekt which could at any time allocate materials and component parts for the manufacture and introduction of new equipment. It should be pointed out that these purposes would require not more than two to three percent of the total volume of funds allocated to the ministry for capital construction, and for this reason the proposal is quite feasible. This will make it possible to resolve more efficiently problems involved in the adoption and assimilation of new equipment (at present, materials, component parts, and equipment for the manufacture of experimental models of new equipment are allocated from the funds of the client main administrations).

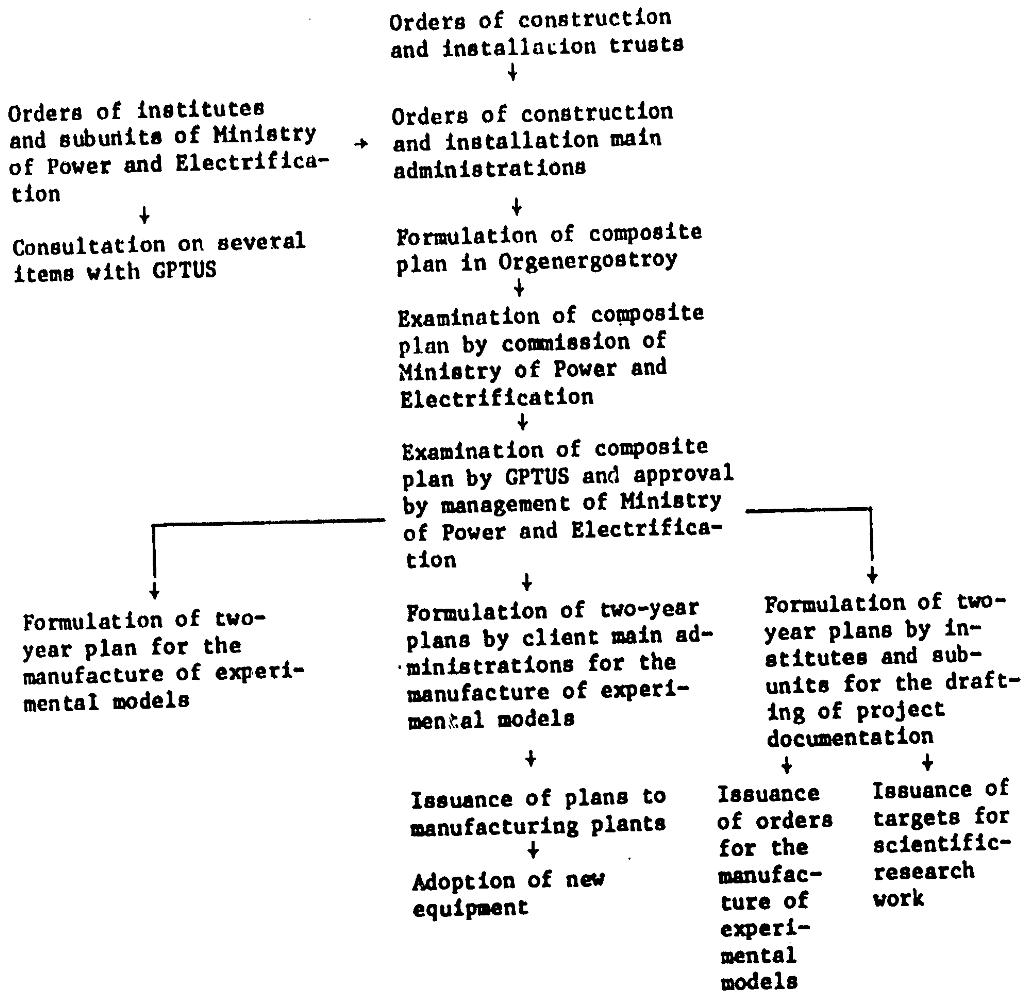
For more efficient planning of the adoption of new equipment, it is advisable to have composite and local plans. The composite coordinated plan for the five-year period (see chart), drawn up on the basis of orders of construction-installation organizations and institutes, is approved by the ministry's management. On the basis of this plan, the client main administrations draw up two-year local plans. The composite plan must be approved in the third quarter of the year preceding the planned year, while the local plans are to be drawn up in the fourth quarter.

The job of coordinating the work of formulating composite plans and submitting them to GPTUS [Main Production-Technical Administration for Construction] should be assigned to Orgenergostroy, which is responsible for:

organizing the collection of orders on item formulation;

preparing plans of development and assimilation of new equipment;

organizing the conducting of appraisals and conclusions concerning the advisability and effectiveness of items to be implemented in accordance with capital construction and industry plans;



Structure of Formulation of Composite Plan for New Equipment

analyzing the effectiveness of the adoption of new equipment by completed projects (items);

working out specific proposals for the extensive dissemination of advanced experience on other construction projects.

The advisability of including items (capital construction and industry) in the plan for new equipment must be determined by a special commission made up of appropriate representatives of institutes, to be designated by the ministry's management.

The rapid resolution of all organizational problems dealt with in this article will make it possible to substantially reduce the amount of time from the beginning of project planning through to the adoption of new equipment in power construction.

6854
CSO: 1822

FUELS AND RELATED EQUIPMENT

UDC 553.94.001.12

MAIN PROBLEMS IN STRENGTHENING THE RAW MATERIAL BASE OF THE COAL INDUSTRY

Moscow SOVETSKAYA GEOLOGIYA in Russian No 11, Nov 78 pp 14-21

[Article by V. F. Cherepovskiy, Ministry of Geology of the USSR]

[Text] A great deal of attention was devoted in "Main trends of development of the national economy of the USSR for 1976-1980" to strengthening and expanding the fuel-energy base of the country. The structure of the fuel-energy balance must be improved and various types of fuel must be efficiently combined for this (coal, shales, water power and atomic energy must be used more widely along with oil and gas). Further development of other branches of industry, agriculture and transport depends on successful solution of this most important problem.

Coal production should be increased to 790-810 million tons in 1980 compared to 700 million tons in 1975 and prospecting for coking and energy coal fields must be intensified, especially in the European USSR. Open-pit coal mining in the eastern regions of the country should be extensively organized during the 10th Five-Year Plan and during subsequent years. It is planned to accelerate development of the Southern Yakutsk coal region and to organize operations for accelerated development of the Kansk-Achinsk Fuel-Energy Complex and more complete development of the Ekibastuz Basin to significantly increase the fuel-energy resources in the future, along with development of existing coal basins -- the Donets, Kuznetsk, Karaganda, Pechora and others. In this regard a large volume of production and scientific research work must be carried out, directed primarily toward strengthening the mineral-raw material base of the USSR and toward further improvement of the methods of prospecting to increase the efficiency of geological prospecting work for coal.

The reserve of proven fields created in all coal basins and coal-bearing regions of the country and of sections for construction of new coal enterprises in total ensure the development of the coal industry planned for the 10th and future five-year plans. At the same time one cannot but take into account that the growth rates of coal mining during subsequent years will increase even more with expansion of the sphere of its use. This determines the need for accelerated construction of new coal enterprises in proven areas, the number of which cannot meet the demands of developing industry in most basins, according to preliminary calculations. The most significant gap between the need for coal and the possibility of increasing mining of it is expected in the European USSR and that for coking coal is expected in other basins. In this regard it was planned to prepare a reserve of proven sections in 1976-1980 for total capacity of 254 million tons, including 55.3 million tons of coking coal, and to confirm reserves in the amount of 13.6 billion tons of coal in the GKZ [State Commission on Mineral Resources] of the USSR.

It should be noted that not enough was done during the first 2 years of the current five-year plan due to irregular distribution of confirmed reserves and due to an increase of proven capacities by years for the period 1976-1980. Therefore, fulfillment of the geological tasks in coal is the main requirement for the closing years of the five-year plan.

High rates of geological prospecting operations are being maintained in the Donets Basin during the 10th Five-Year Plan. It is planned to complete explorations for coking coal in the outlying regions (the Southern Donbass), where new industrial sections have already been determined. Work in the eastern regions of the basin must be continued, where new promising areas with high-quality anthracites have been established during the past few years, which will make it possible to significantly expand the raw material base of this scarce fuel and also to intensify exploration and prospecting for coking coal at deep horizons. It is planned to prepare sections with a total shaft capacity of more than 40 million tons.

Detailed prospecting of the large Usinsk field of metabituminous coal for construction of mines with a total capacity of 9 million tons is being completed in the Pechora Basin. Study of coal-bearing deposits on the northeastern edge of the basin must be continued here with regard to the extremely limited possibilities of developing the mining of coking and lean agglomeration coal in the European USSR. Specifically, the prospects of the deep horizons of the Verkhne-Syr'yagin field of coking coal for more complete geological-economic analysis of it should be refined and explorations for highly metamorphisized coal in regions adjacent to the Arctic Urals should also be carried out. Exploration of an area to a depth of 1,200 m containing coal suitable for coking is feasible in the Vorga-Shor-Usinsk strip. Moreover, geological-commercial analysis of the gaseous coal reserves of the Pechora series in the region of the Usinsk megasyncline must be carried out during the next few years. Despite its high ash content, this coal is distinguished by high heat of combustion (Q_n^r of 23,000-25,000 kJ/kg) and can be widely used in power engineering.

The possibilities of increasing coal mining have been essentially exhausted in the Moscow Basin. Fields with coal seams of reduced sulfur content lying at depths up to 150 m have been mainly depleted. Preparation of those sections in which the quality of coal and mining-geological conditions will be similar to exploitable conditions is required to maintain the level of mining achieved (approximately 35 million tons). Construction of deeper mines due to low-quality coal and small size veins is not yet feasible.

The coal reserves in other well-known basins of the European part of the country -- Dneprovsk, L'vov-Volyn' and in the Urals -- are also limited. Only the northern regions, where Lower Carboniferous, Permian and partially Jurassic deposits, still studied extremely weakly, are developed, are apparently more promising for determining new payable coal-bearing areas. Further study of Jurassic coal-bearing sediments is planned on the eastern edge of the Urals, but establishment of a sharp subsidence of them toward the West Siberian lowland limits the possibility of determining fields for strip mining. The most promising for meeting the needs of the Urals for energy fuel, except the Ekibastuz field, are the fields of the Turgay Basin in Kazakhstan. It is planned to complete study of fields, economically more favorable for development, in these regions during the current five-year plan.

The most rapid solution of the problem of deep concentration and commercial use of high-ash coal is of important significance to increase the reserves of the coking coal of the Karaganda Basin.

It is planned to increase coal mining from 130 to 160 million tons throughout the Kuznetsk Basin during the 10th Five-Year Plan. The plan provides for an increase in the volumes of the geological prospecting work mainly to study regions promising to determine scarce reserves of coking coal. The most interesting in this regard is the southeastern part of the basin, where wide distribution of coking and lean caking coal is assumed among the thick veins of the Upper Balakhon Formation, lying at depths from 300 to 1,000 m. Overlapped by rock of the Kuznetsk and younger formations, they are very promising for determination of significant resources of scarce coking coal. The coal of the Lower Balakhon Formation on the southwestern edge of the basin (the Berezovo field) also merit attention. It is planned to continue operations during the 10th Five-Year Plan to develop a reserve of large sections with metabituminous coking coal and to determine and prospect for new fields for strip mining. It is planned to prepare sections for construction of mining enterprises with a capacity of 49 million tons in the Kuzbass, which will provide significant development of coal in this basin with regard to the existing reserves of prepared sections.

Geological prospecting work in this direction with regard to the planned growth of coal mining rates should be intensified in the Kansk-Achinsk and Irkutsk basins of Eastern Siberia, depsite the significant reserve of proven fields for strip mining. Exploration of new fields for strip mining under favorable geographic conditions and also more careful study of the quality of coal and the accompanying minerals are accomplished for these purposes. The resources and technological properties of caking coal of Sayano-Partizanskiy Rayon of the Kansk-Achinsk Basin must be more dependably analyzed.

Especially important attention should be devoted to investigations on the complex use of minerals: refining of hydrogeneous coal, the use of waste gases in the chemical industry, liquid fuel production technology and so on.

A number of timely problems on expansion of the mineral-raw material resources of the Arctic regions of Siberia and the Far East is advanced by construction of the Baykal-Amur Mainline Railroad. One of the first large objects planned for industrial development in the BAM region is the Southern Yakutsk Basin. The need for its high-quality coking coal is high. Fulfillment of the plan on an increase of the proven reserves in the Southern Yakutsk Basin is related to great difficulties due to the low coal density and unexposed coal-bearing content. In this regard a significant increase in the volumes of geological prospecting work to refine the prospects of the basin and to determine large fields in Aldano-Chul'manskiy and other rayons, more accessible for development, is provided here in this regard. New sections for mining enterprises with a total capacity of 6 million tons will be explored during the five-year plan.

A tense situation with fuel resources has developed in the southern regions of the Far East with regard to depletion of the Raychikhinskoye lignite field -- the main supplier of energy coal. The hydrogenous coal proven during the past few years in Amurskaya Oblast (Svobodnoye and Sergeyevskoye fields for strip mining) have both lower economic and qualitative indicators compared to the Raychikhinskoye field. Therefore, continuation of wide exploration for new coal fields in Amurskaya Oblast and Khabarovskiy and Primorskiy krays remains one of the main tasks of geologists during the 10th Five-Year Plan. Special attention should also be devoted in this case to regions adjacent to the BAM which have still been little studied geologically. We note that the promising Lianskoye coal field, exploration of which is planned for completion prior to 1980, has already been discovered in Khabarovskiy Kray immediately near the BAM route.

There are essentially no adequate reserves of proven fields for development of mining on Sakhalin. Almost all the fields developed here are distinguished by a complex geological structure and mining of them is related to high material expenditures. Moreover, one of the largest fields of high-quality energy coal on Southern Sakhalin -- Gornozavodskoye (Nevel'skoye) -- has been underexplored up to the present time and has not been prepared for design of a larger mining enterprise. Complete exploration of this field will significantly improve the fuel-energy base of Sakhalinskaya Oblast. Along with complete exploration of the industrially developed fields of Sakhalin, it is feasible during the next few years to begin exploration of adjacent well-known coal-bearing areas to create a reserve for construction of new modern mining enterprises.

The forecasted estimate of coal reserves in the USSR, made in 1968, indicates the comparatively limited possibilities of sharp expansion of the coal-bearing areas with coking coal in exploited basins. The problem of intensifying geological prospecting in scientific research work to study new basins promising for determination of large technological coal fields, especially scarce coal -- coking and lean caking, is present in this regard. The existing need of industry for these types of coal during the next few years and primarily to support the European part of the country cannot be satisfied without creation of new raw material bases.

One may conclude on the basis of the completed investigations that determination of large reserves of coking coal is possible only in the northern basins of the country, of which the most promising is the Taymyr, located in the immediate vicinity of the Northern Sea Route. The Pyasinskoye field located in the lower course of the Pyasina River, navigable for ocean-going ships, should primarily be studied here. The predicted reserves of primarily coking and lean caking coal only to a depth of 600 m comprise more than 1 billion tons, and throughout the western part of the basin as a whole they comprise 5 billion tons. Additional investigations of LOPI [Leningrad Oblast Pedagogical Institute] of the USSR Academy of Sciences and of IGI [Institute of Mineral Fuels] of the Ministry of the Coal Industry of the USSR, carried out in 1974-1976, confirm the presence of coking coal here.

It is feasible for the Krasnoyarsk Geological Administration to provide drilling of two-three lines of boreholes in the Pyasinskoye field during the current five-year plan in order to obtain dependable data on the quality of the coal and of its prospects. Exploration to determine coking coals and estimates of them in the Tunguss, Lena and Zyryansk basins should also be continued.

It is planned to expand work to analyze the resources of fuel shales, study of which was restricted for a long time only to industrially developed regions of the Baltic area, with regard to the enormous significance of all types of fuel for development of the national economy of the country. The main task of these investigations should be to determine the possibility of revealing large fields of fuel shales in shale-bearing formations of the Phanerozoic on the territory of the country.

A large complex of scientific research work for further improvement of the methods of study, search and exploration of fields to increase their efficiency and quality and also to increase the dependability of data must be carried out for successful fulfillment of the decisions of the 25th CPSU Congress.

Attention must be concentrated in the following main directions in the field of science.

Development of the fundamentals of this study, which is the theoretical foundation of a complex of search and prospecting for solid fuel minerals, should be continued in the field of study of coal-bearing formations. All stages of geological study, search, exploration and exploitation of coal basins and fields should be based on concepts of coal-bearing formations. The main task of study of the latter in general form is to determine and refine the regularities of location, conditions of formation, the history of development and all subsequent changes. This problem can be formulated more concretely as determination of the conditions of formation and variation of coal seams, their paragenesis with country rock and to determine the principles of arrangement in space and time. Understanding these principles makes it possible to predict the coal-bearing content, the behavior of the coal seams and variation of the properties of coal on a sound basis in genetically different types of coal-bearing formations. Investigations must be continued to improve the methods of lithological-facial and formation analysis, methods of studying the structures of fields, conditions of formation and transformation of organic matter, physical, chemical and technological methods of investigating coal and fuel shales and more attention should be devoted to working out the genetic and geological-industrial classification of solid fuel minerals and to establishing the regularity of arrangement of peat, coal and fuel shale fields.

There are important advances in investigation of the coal-bearing formations in the USSR: the main principles of their structure and conditions of formation have been established and the real composition and quality of coal of the main basins has been studied in general form by methods of coal petrography and coal chemistry; the regularity of the manifestation of regional coal metamorphism and the epigenesis of country rock have been established with high reliability and the principles of development of folding and faults and the forms of manifestation of magnatism, clearly zonal in nature, have been studied; several schemes for classification of coal-bearing deposits, basins and fields have been proposed and the fundamentals of genetic classification of coal-bearing formations by a complex of genetically related features have been worked out.

The achievements of Soviet coal geology made it possible to lay the scientific bases for complex formation analysis of coal-bearing masses in which the paragenetic relationships between the main genetic features of coal-bearing formations are used: thickness, phase composition, evenness, coal-bearing content, the metamorphism of coal and the epigenesis of country rock, tectonics and magmatism. Taking into account and using the variations of these features are the basis for developing methods of exploration and scientifically based prediction of the coal-bearing nature both by area and by depth. The term "formation" is understood in most cases abroad as formation, series and other stratigraphic subdivisions and does not include the concept of formations as regularly structured geological bodies, accepted by most Soviet coal geologists.

However, there are still many debatable and unresolved questions in all fields of coal geology. Specifically, there is no generally accepted definition of the concept "coal-bearing formation." The phase composition of coal-bearing deposits is frequently determined subjectively and contradictorily due to the absence of a generally accepted method of lithological-phase analysis; much has not yet been tied together in the understanding of evenness (cyclicity) of coal-bearing masses and in establishing the quantitative relationships of it to coal-bearing content, which plays a primary role in predicting the latter. Some problems of the phenomenon of coal metamorphism, the role of one or another factors (pressure, time and so on) are unclear. All these and other unresolved problems in the field of coal geology require further, more extensive study.

Investigations to determine the optimum density of the exploration network in specific geological-industrial regions of the main basins of the USSR should be intensified in the field of search and exploration methods. Many problems in the field of exploration of coal fields must be solved, as is said, not so much in words as in skill. Unfortunately, geological prospecting organizations in some cases proceed along the path of extreme constriction of the borehole system and an increase of the volumes of drilling and laboratory investigations without inadequate basis for this. In this regard scientific justification of the density of the network at each stage of the geological prospecting process is primarily required with regard to obtaining sufficient information about the geological structure and the mining-geological conditions of fields.

As before, the main thing in solution of the indicated problems remains drilling boreholes -- a method whose resolution is very low. To correct this situation, serious measures must be implemented on technical reequipping of drilling operations for a sharp increase of the sinking rate and to increase the yield of the core by the mineral. Moreover, the method of conducting geological prospecting operations for solid fuel minerals must be essentially improved and introduction of the latest advances of geophysical, nuclear, electronic and computer technology must be accelerated.

One of the most important problems of prospecting coal fields is timely prediction and establishing fault disturbances in coal fields for optimum planning of mining operations using highly efficient mechanized equipment. The exploration complex, which includes drilling of boreholes and investigation of them by geophysical methods (logging), does not now provide determination of disturbances with amplitude less than 15-20 m, which comprise a significant fraction of all the disjunctive aspects encountered in the mine field.

Geological data on the dislocation of veins acquire very important significance at the modern stage since the veins of almost all coal basins are subject to this process. Widely distributed small faults (with amplitude less than 10 m) are essentially not determined even with significant concentration of boreholes. This is explained by the fact that they are located beyond the range of resolution of the test borehole network. Low-amplitude displacements remain undetermined even on the drilling lines of so-called reference profiles. Geophysical investigations must surpass geological prospecting work and must be widely utilized (especially seismic radioscopy, radar methods and so on) during the period of turning over primary sections for operation and exploitation.

There is a need to develop essentially new methods of prospecting and conversion from study of single points to study of an area by volumetric, threedimensional methods. The problem of illuminating the interborehole and near-borehole space is extremely important. In this regard investigations must be continued on further improvement of prospecting methods, being oriented mainly toward geophysics. The Oktyabr' Branch of VNIIgeofizika [All-Union Scientific Research Institute of Geophysics] in the Kuznetsk Basin has begun working out methods of seismic prospecting to determine and trace faults of coal seams in the interborehole space and in mines. Preliminary data indicate the high potential capabilities of geophysical methods in increasing the information content of prospecting data. However, problems of predicting tectonic displacement during exploration have still not been clearly resolved. DonbassNIL [Donbass Scientific Research Laboratory], VNIIgeofizika and production administrations must intensify scientific research in this field in order to work out dependable procedures and hardware which permit an increase of the dependability of determining vein displacements during prospecting.

Attention has now been intensified toward complex development of fields and implementation of environmental protection measures. Complex coal and shale refining made it possible to organize industrial production of valuable chemical by-products. However, only 60 percent of the resources of by-product components contained in coal is now being developed (for example, only 0.5 percent of the sulfur is utilized). Methane resources are now taken into account primarily by coal mining enterprises. There is a need for more extensive study and analysis of the resources of this gas, specifically, the objects of study may become gas-coal (methane-coal) fields. Utilization of by-product methane will be helpful in the struggle for gasification of the mines and will help to improve working conditions.

Investigations to determine the regularities of variation of the material composition and metamorphism, which determine in the final analysis the properties of the extracted fuel, must be intensified in the area of studying the quality of coal and fuel shales. A lag in study of the material and chemical composition and also of the technological properties of coal delays solution of the problem of the interchangeability of coal of one basin with that of another.

Requirements on energy coal for powdered burning in the combustion chambers of large boiler units where impurities of easily sublimated compounds of alkali metals have a harmful effect, have increased. Study of the material composition of this coal must be carried out at the modern level with regard to the need to solve an entire complex of problems related to that of utilization of highly mineralized waters and the use of coal of unusual composition. An example of this complex study is the Bogdanovskoye field in the Donbass.

Improvement of the methods of determining the optimum complex and volume of sampling and study of fuel minerals, which ensure receipt of the universal characteristics of their quality and all possible directions of use, should be continued at all stages of geological operations.

Efforts must be concentrated in the field of studying mining-geological conditions on improving the methods and technology of gas sampling since the effectiveness of investigations of the natural gas-bearing content of coal seams is still low. Up to 50 percent of the samples are now rejected because of their nonrepresentative nature due to the imperfection of the hardware and methods. As a result the characteristics of the gas-bearing content of coal seams by area and depth are of little value in some cases.

Along with improving the existing methods of predicting the gas-bearing content of coal fields and the stability of country rock, special attention should be devoted to development of methods of predicting the blowout danger of rock and coal by geological prospecting data, improvement of existing and development of new hardware for study of gas-bearing capacity.

New, more effective methods of studying the physicomechanical properties of rock, the geothermal regimes of future mines, hydrogeological conditions and the direction of using the water of coal fields must be developed.

Introduction of new methods of studying the borehole profile and interborehole space, detailed lithological division of profiles, determination of the coal complex and the physicomechanical properties of country rock, determination of low-amplitude displacement, disintegration and washout of coal seams must be provided in the field of geophysical investigations. Work to introduce methods of field geophysics (seismic, gravimetric, electronic and magnetic prospecting) with the use of their results at all stages of geological operations -- from determination of new fields to refinement of the structural details of the mine field or section -- should be sharply intensified.

The complex of geological-geophysical methods of prospecting to increase the completeness and dependability of investigations, primarily on forecasting displacements of coal seams, study of the morphology of seams, the gas-bearing capacity and blowout danger of coal and also of country rock must be further improved and measures to increase the geological and economic effectiveness of coal operations must be developed, specifically, the resolution of exploration methods now used.

This is far from a complete list of the problems faced by coal geology.

Unanimity of science and practice is required now as never before. In this regard I would like to turn special attention to the need for extensive study of the enormous factual materials at the disposal of the science of exploration practice. The science of coal cannot be successfully developed without relying on this richest information which requires deep analysis. However, preliminary processing of incoming materials and core samples are poorly accomplished in some cases, which leads to a loss of valuable information which permits one to recognize and decipher many natural phenomena. Deep geological interpretation of logging diagrams and a complex approach to analysis of primary input materials are required to correct this situation. We are talking about joint geological-geophysical documentation and about combining the efforts of geologists and geophysicists and their methods to obtain the maximum information.

Search-exploratory operations for coal can in turn not be effective if the specific principles of formation and spatial arrangement of such diverse coal fields in their structure are not taken into account and if progressive methods of exploration and the latest hardware which contribute to an increase of the level of geological prospecting and scientific research work are not utilized in daily practice.

The task posed by the 25th CPSU Congress for a significant increase of fuel-energy resources will be solved successfully. This will be a weighty contribution of mining geologists to strengthening and development of the mineral-raw material base of the country.

6521
CSO: 1822

FUELS AND RELATED EQUIPMENT

UDC 553.982.2(571.5)

PROSPECTS OF THE OIL- AND GAS-BEARING CAPACITY OF CARBONATE DEPOSITS OF THE SIBERIAN PLATFORM

Moscow SOVETSKAYA GEOLOGIYA in Russian No 11, Nov 78 pp 22-34

[Article by A. V. Ovcharenko, Ministry of Geology of the RSFSR]

[Text] The Siberian Platform may in the future become a new large base of the petroleum and gas industry. Gas fields have been discovered here within the boundary Mesozoic depressions of the Yenisey-Khatanga trough and the Vilyuysk syneclise. The Mesozoic-Upper Paleozoic terrigeneous deposits are mainly productive.

Positive results have been achieved during the past few years along the Tungusskaya syneclise and the Nepsko-Botuobinskaya anteclise. Their area comprises more than one-third of all the promising lands of the Siberian Platform and the profile consists of primarily carbonate deposits of the Late Riphean and Lower Paleozoic.

Several small oil and gas fields -- Sukho-Tungusskoye, Nizhneletninskoye and Volodinskoye -- have been discovered in the Tungusskaya syneclise within the Kureysko-Letninskiy arch. The main hydrocarbon deposits are confined to cracked dolomites of the Lower Cambrian.

Oil and gas inflows from dolomites of Riphean age have been found in the southern part of the Tungusskaya syneclise in the Kuyumbinskaya area. A more complete profile of Lower Paleozoic deposits has been revealed in the eastern parts of the Tungusskaya syneclise of the Vanavarskaya parametric well and a payable oil inflow has been found in this well from the sands of the Motskaya formation.

However, the most significant geological results have been obtained along the Nepsko-Botuobinskaya anteclise, within which the Srednebotuobinskoye, Verkhnevilyuchanskoye and Vilyuysk-Dzherbinskoye gas fields and also the Markovskoye, Yaraktinskoye and Ayanskoye gas-oil fields have been discovered in the Yakutskaya ASSR and Irkutskaya Oblast.

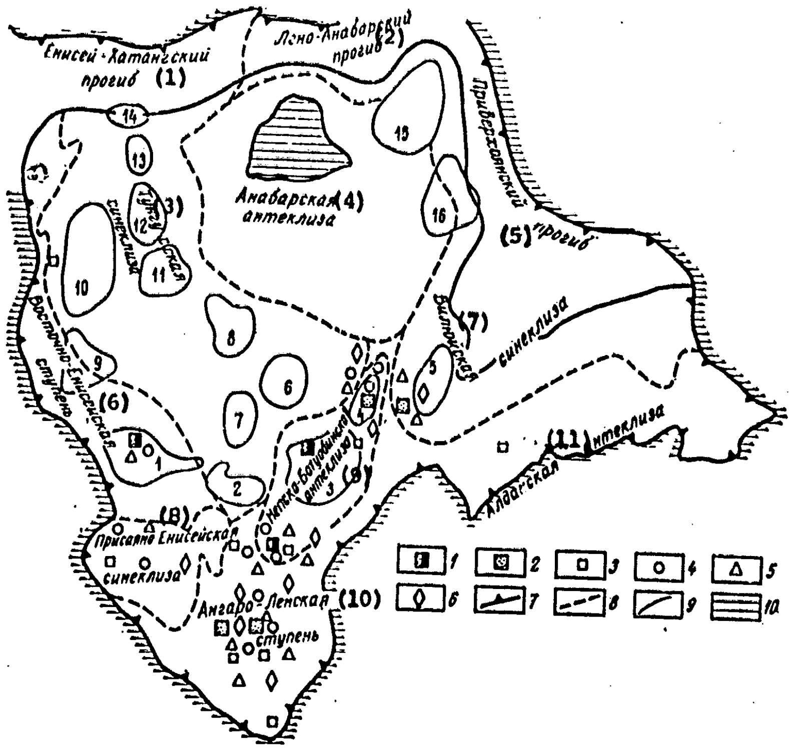


Figure 1. Oil- and Gas-Bearing Capacity of Carbonate Complexes of Siberian Platform: 1 -- gas-oil fields in carbonate complex I; 2 -- gas fields in carbonate complex I; oil and gas manifestations; 3 -- in complex I; 4 -- in complex II; 5 -- in complex III; 6 -- in complex IV; boundaries: 7 -- of Siberian Platform; 8 -- of largest structures of sedimentary mantle elements; 9 -- of main arched uplifts; 10 -- sections of the absence of a sedimentary mantle; the figures on the chart are the main arched uplifts: 1 -- Kamovskoye; 2 -- Vanavarskoye; 3 -- Nepskoye; 4 -- Mirninskoye; 5 -- Suntarskoye; 6 -- Ilimpeyskoye; 7 -- Chun'skoye; 8 -- Gurunskoye; 9 -- Bakhtinskoye; 10 -- Suringdakonskoye; 11 -- Kochechumskoye; 12 -- Yuktemiyskoye; 13 -- Ayanskoye; 14 -- Ledyanskoye; 15 -- Olenekskoye; 16 -- Munskoye

KEY:

1. Yenisey-Khatanga trough
2. Leno-Anabar trough
3. Tungusskaya syneclise
4. Anabarskaya anteclise
5. Priverkhoyansk trough
6. Vostochno-Yenisey terrace
7. Vilyuysk syneclise
8. Prisayano-Yeniseyskaya syneclise
9. Nepsko-Botuobinskaya anteclise
10. Angara-Lena terrace
11. Aldanskaya anteclise

The main gas and oil deposits in all the enumerated fields are confined to sandstones of the Lower Cambrian, Wendian and Riphean, lying at the base of the sedimentary mantle. No significant deposits were determined in the carbonate profile, the fraction of which comprises approximately 80 percent of the entire thickness of the sedimentary mantle (2,000-2,500 m), since geological prospecting work was primarily oriented toward Lower Paleozoic and Wendian-Riphean terrigeneous deposits.

However, geological data have appeared during the past few years which permit a higher estimate of the prospects of the oil- and gas-bearing capacity of the carbonate profile of the Siberian Platform. It was established that the Wendian-Riphean and Lower Cambrian carbonate deposits of the sedimentary mantle are universally developed. They are a thick mass of limestones and dolomites which alternate with salt benches exposed over the entire area of the platform.

The carbonate rock is regionally oil- and gas-bearing (Figure 1). Oil and gas features and frequently inflows of them were usually noted directly under salt-bearing streaks which serve as dependable covers. Local oil- and gas-accumulation zones are sometimes controlled by streaks of other dense rock -- argillaceous limestones and dolomites, separate lenses of gypsum, anhydrites or salts. Stratigraphic deposits are known where argillaceous rock plays the role of a shield.

Four oil- and gas-bearing complexes can be distinguished in the carbonate profile of the Siberian Platform (Figure 2). The propagation characteristics of these complexes caused by each other indicate several independent cycles of oil and gas formation and oil and gas accumulation to which the carbonate formations included between regional oil and gas barriers correspond.

The most ancient oil- and gas-bearing complex I is represented by Riphean-Lower Cambrian carbonate deposits and terrigeneous rock is also found among them on sections of intensive downwarping. This complex is shielded on the entire Siberian Platform by a 150-meter salt bench in the upper part of the Usol'skaya formation of the Lower Cambrian.

Porous-cracked dolomites and limestones of Riphean age, exposed by deep boreholes only in the Kuyumbinskoye field, are deposited at the base of the complex. A rather complex structure of a Riphean productive mass has been established here in which several oil and gas pools are included. Judging by the position of the water-oil and oil-gas sections in the profile, the pools are hydrodynamically unrelated to each other, which indicates the presence of streaks of dense impermeable rock between them which fulfill the role of local oil and gas barriers.

Riphean limestones and dolomites of the Kuyumbinskoye field are distinguished by a complex structure of porous space. As indicated by sampling results, the yields of individual wells differ sharply from each other. Productive horizons essentially do not correlate even in adjacent wells.

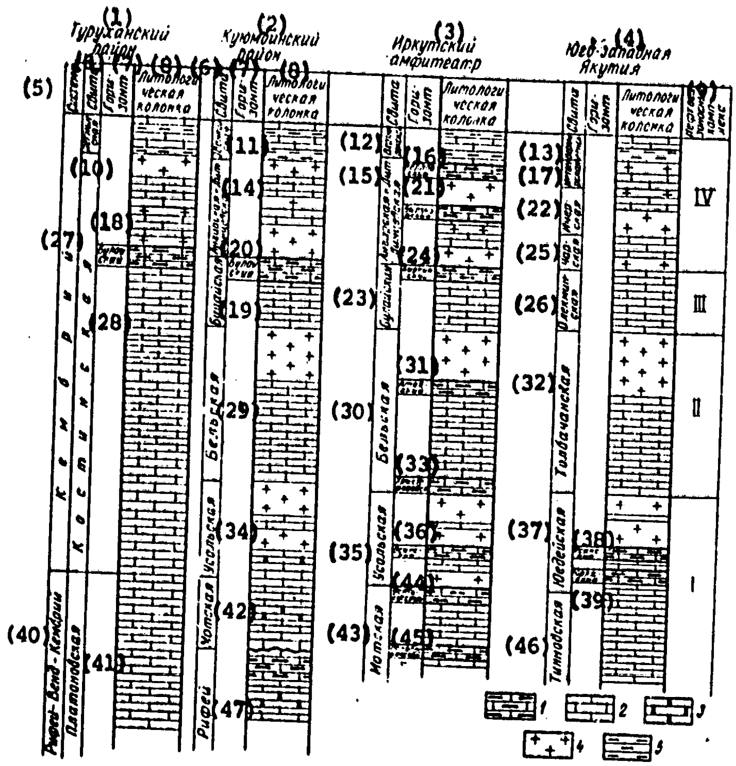


Figure 2. Comparison Diagram of Profiles of Carbonate Deposits of Siberian Platform: 1 -- oil- and gas-bearing limestones; 2 -- limestones; 3 -- dolomites; 4 -- salts; 5 -- clays

KEY:

1. Turukhanskiy Rayon
2. Kuyumbinskiy Rayon
3. Irkutsk amplitheater
4. Southwestern Yakutiya
5. System
6. Formation
7. Horizon
8. Lithological column
9. Oil- and gas-bearing complex
10. Letninskaya
11. Evenkiyskaya
12. Verkhnelenskaya
13. Verkhnelenskaya
14. Angarskaya and Litvintsevskaya
15. Angarskaya and Litvintsevskaya
16. Kellorskiy
17. Metegerskaya
18. Bulayskiy
19. Bulayskaya
20. Bulayskiy
21. Bil'chirskaya
22. Icherskaya
23. Bulayskaya
24. Birkinskiy
25. Charskaya
26. Olekminskaya

(Key continued on following page)

27. Cambrian
28. Kostinskaya
29. Bel'skaya
30. Bel'skaya
31. Atovskiy
32. Tolbachanskaya
33. Khristoforovskiy
34. Usol'skaya
35. Usol'skaya
36. Osinskiy
37. Yuyedeyskaya
38. Osinskiy
39. Yuryakhskiy
40. Riphean-Wendian-Cambrian
41. Platonovskaya
42. Motskaya
43. Motskaya
44. Ust'kutskiy
45. Preobrezhenskiy
46. Tinnovskaya
47. Riphean

Carbonate deposits of the Motskaya formation of the Lower Cambrian are deposited within the Kuyumbinskoye field directly on Riphean limestones and dolomites with significant interruption in the sedimentary accumulation. Formation of an independent oil- and gas-bearing complex controlled by Motskaya clays and argillites, is possible in the lower carbonate mass of the Riphean in the part of the Siberian Platform where terrigeneous deposits are maintained in it.

Carbonate rock of the Motskaya formation, revealed in the Kuyumbinskoye field directly above Riphean formations, are followed over the entire remaining territory of the Siberian Platform. In this case their maximum thickness (300-400 m) coincides with zones of intensive sediment accumulation (the central parts of the Angara-Lena bench of the Prisayan-Yenisey syneclise). Reduced thicknesses of this mass (120-170 m) have been established in the more uplifted sections of the Nepskiy and Kamovskiy arches.

The carbonate deposits of the Motskaya formation are distinguished by regional oil- and gas-bearing content. Oil and gas inflows of different intensity were observed in practically all drilled wells in the northern part of the Tungusskaya syneclise within the Kureysko-Letninskiy rampart when they were exposed.

Two productive beds have been determined in the central part of the Nepskiy arch in the carbonate deposits of this formation. The Preobrazhenskiy horizon, from which a gas inflow with a yield of 62,000 m^3/day and a small quantity of oil have been produced in an area of Irkutskaya Oblast of the same name, has been determined in the central part of the formation. A payable gas inflow could be produced from them only after hydraulic-acid treatment.

The Ust'-Kut horizon has been determined in the upper part of the Motskaya formation in the Preobrazhenskaya area. A gas inflow with a yield up to 7,000 m^3/day and an oil inflow up to 1.8 t/day were obtained upon sampling of it. Oil and gas features were also noted in the Markovskaya and Ust'-Kutskaya areas.

The greatest number of oil and gas manifestations and also of hydrocarbon pools in the lower carbonate complex is confined to the Usol'skaya formation.

Comparatively thin benches of rock salt, which performs the role of a shield for the Preobrazhenskiy and Ust'-Kutskiy productive horizons lying below, have been established in some areas at its base. In those locations where it is absent, features of oil- and gas-bearing content in the upper part of the Motskaya formation have not been established.

Oil and gas are found primarily in the lower part of the Usol'skaya formation consisting of a 100-150-meter thickness of carbonate rock. Two productive horizons -- the Yuryakhskiy and Osinskiy -- have been determined here. The Yuryakhskiy horizon has been established only in the northeastern part of the Nepsko-Botuobinskaya anteclise in the Verkhnevilyuchanskaya area and consists primarily of dolomites and dolomitized limestones approximately 20 m thick. Gas inflows with yield up to 120,000 m^3/day were obtained when they were sampled and insignificant inflows of gasified oil were also noted together with gas in some cases.

The Yuryakhskiy horizon is shielded by a 25-meter bench of strongly argillaceous limestones, above which gas-saturated porous-cavernous-cracked limestones and dolomites of the Osinskiy horizon are primarily deposited. Lithologically, both horizons do not essentially differ from each other and the bench of argillaceous limestones separating them is not distributed everywhere; therefore, the horizon may be regarded as the lowest part of the Osinskiy oil- and gas-bearing horizon found on the entire territory of the Siberian Platform.

Carbonate deposits of the Osinskiy horizon are located directly under a thick salt-bearing mass on the greater part of the platform, which provides dependable isolation of the oil and gas pools formed in the carbonate rock. The nature of the collectors is complex and porous-cracked and cracked-porous-cavernous types predominate. Individual streaks or lenses of increased capacity are usually distributed among cracked carbonate rock with low porosity, as a result of which the productivity of productive wells frequently does not correspond to data of field geophysics or core sampling.

Considerable improvement of the collector properties of productive deposits in the zone of tectonic displacements and also in sections of development of organogenic and aquifer limestones among carbonate rock of the Osinskiy horizon has been established by drilled wells. The latter indicates the possible presence of riphogenic systems in the carbonate deposits of the Siberian Platform.

The greatest number of oil and gas manifestations in deposits of the Osinskiy horizon was noted in the territory of Irkutskaya Oblast. This is related to the large volumes of drilling operations carried out here. Whereas the Osinskiy horizon has been tapped by more than 300 wells in Irkutskaya Oblast, the number of these wells comprises 56 and 32, respectively, on the territory of the Yakutskaya ASSR and Krasnoyarskiy Kray.

Most deep wells which expose carbonate deposits of the Osinskiy horizon have been drilled in the Markovskoye field. Oil inflows with a yield from several tens of liters to 306 t/day have been obtained in 16 of them. Many investigators explain these differences in yields by the wide range of variation of the collector properties of the productive mass. However, such factors as the effect of flushing fluids and methods of tapping and sampling on the filtration properties of productive beds are not taken into account to the proper extent in this case. At the same time work carried out during the past few years at Yakutneftegazrazvedka and Krasnoyarskneftegazrazvedka trusts to establish the potential capacities of the collector beds under optimum conditions of tapping and sampling of them showed that the enumerated factors considerably affect the productivity of the wells.

Payable oil and gas inflows from the Osinskiy horizon were also found in the Ilimskaya, Potapovskaya, Atovskaya, Khristoforovskaya, Osinskaya and other areas. Confinement of oil and gas pools to local uplifts is typical for all of them. Beds of increased capacity have been determined among cracked rock in tapped profiles of the Osinskiy horizon and their thickness and porosity increase toward the arch.

A gusher inflow of gas with a yield of more than 180,000 m^3/day has been obtained from carbonates of the Usol'skaya formation in the Irkutsk area, located in the southern, more developed part of the oblast. Search-exploration operations carried out previously for terrigeneous deposits of the Motskaya formation did not yield positive results since the latter do not contain oil and gas pools with regard to the significant flushing of the profile.

There are far fewer data on the oil- and gas-bearing content of the Osinskiy horizon in Krasnoyarskiy Kray. However, this circumstance, as already noted previously, does not indicate in any way the lower prospects of oil- and gas-bearing content of the described mass in the given region. Profiles of Cambrian carbonate deposits for individual wells are rather clearly correlated with rock of the Irkutsk amphitheater of the same age. Several promising carbonate masses have also been determined in them which are controlled by thick regional oil and gas barriers consisting of salt-bearing formations.

As indicated by sampling results, there is porous rock favorable for oil and gas accumulation in the Osinskiy horizon. A stratal water inflow with a yield above 50 m^3/day has been found in the Tayninskaya parametric well upon testing of limestones of Osinskiy horizon. A characteristic feature of the profile of the Usol'skaya formation within the Prisayano-Yenisey syneclise is light gasified oil saturation of limestones of the Osinskiy horizon (the Sutyaginskaya well).

The payable gas content of the Osinskiy horizon has also been established in the eastern part of the Nepsko-Botuobinskiy anteclise in Yakutiya. Porous-cavernous type collectors are widely developed here in the Srednebotuobinskoye gas field. They are represented by limestones formed as a result of recrystallization of primary dolomites and replacement of limestones and also organogenic limestones with lixiviation cavities and caverns. Gas inflows of different intensity have been found upon sampling of them. The maximum yield was 200,000 m^3/day, but the inflows were nonpayable in most wells.

Carbonate-halogen deposits of the Bel'skaya formation are located above the Usol'skaya formation which form the oil- and gas-bearing complex II. The formation is divided into three subformations -- lower, middle and upper -- by lithological features. The lower and middle subformations consist primarily of carbonate rock up to 400 m thick. They include the main productive horizons of this complex. Halogen-sulfate formations of the Upper Bel'skaya subformations are noted above which serve as a regional oil and gas barrier. This structure of the Bel'skaya formation is maintained in practically the entire Siberian Platform. Its analog in Yakutiya is called the Talbachanskaya formation and the upper part of the Kostinskaya formation corresponds to it in Turukhanskiy Rayon of Krasnoyarskiy Kray.

Deposits of the Bel'skaya formation have been studied more in Irkutskaya Oblast. Two productive horizons have been determined in its lower part here. The lower Khristoforovskiy horizon is located directly at the base of the formation and consists mainly of dolomites with sparse limestone streaks. Its thickness is usually 50-60 m and is up to 140-150 m in the northwestern part of the Irkutsk amphitheater. The Khristoforovskiy horizon is shielded by carbonate rock which, unlike the productive profile, is less cracked and more argillized.

The oil- and gas-bearing content of the horizon was first established in the Khristoforovskaya area, where intensive degasification of the clay mud with periodic oil discharges was noted upon tapping of it and a weak oil and gas inflow was obtained upon sampling. Superficial oil and gas manifestations upon tapping of this horizon were also noted in the Balykhtinskaya, Ust'-Kutskaya, Markovskaya, Verkhnetirskaya, Kasatkinskaya and other areas. Tapping was accompanied in many cases by intensive absorption of the clay mud, which indicates the presence of porous beds.

The Atovskiy productive horizon consisting of dolomites and limestones up to 45 m thick was determined in the roof part of the carbonate profile of the Bel'skaya formation directly under the halogen formations. The secondary pores formed in carbonate rock as a result of their lixiviation and sulphatization comprised the main capacity of the productive profile. Moreover, high porous intervals have been established in different parts of the productive mass in the profile of the horizon. Their total thickness increases in the arched parts of local uplifts (Khristoforovskoye and Birkinskoye). In this regard the large uplifts are of primary interest for oil and gas prospecting in deposits of the Bel'skaya formation.

The clearest oil and gas features in the Atovskiy horizon were noted in the Birkinskaya and Atovskaya areas. The clay mud was intensively degasified upon tapping of the horizon in the first of them. Gas inflows with a yield up to 10,000 m^3/day were obtained upon sampling of the horizon. The rock of the Atovskiy horizon has improved collector properties in all the drilled wells. The horizon does not contain gas everywhere in the Atovskaya area. Inflows of it were obtained only in one of eight drilled wells.

Intensive gas manifestations from the Atovskiy horizon were recorded in the Bol'sherazvodnaya and Khristoforovskaya areas. Significant absorptions (up to 140 m^3/hr) of the flushing fluid (well 8, Nikitskaya, and well 12, Khristoforovskaya) were noted in many areas upon tapping of the horizon. This is obviously related to the abnormally low bed pressures in the productive beds.

The deposits of the Bel'skaya formation and its analogs are widely developed on the Siberian Platform, but data on the lithology, physical-collector properties and oil- and gas-bearing content of the productive profile are based on materials of individual wells throughout Krasnoyarskiy Kray and Yakutiya. Concepts of the prospects of the oil- and gas-bearing content of the carbonate profile of Bel'skaya formation are based on fragmentary data on superficial gas manifestations upon tapping by individual parametric wells.

Thus, porous-cavernous dolomites with numerous inclusions of liquid bitumens through the microcracks, pores and small caverns have been tapped in the Tynysskaya test well and in one of the salt-exploration wells drilled within the Prisayano-Yenisey syneclise within the lower and middle parts of the Bel'skaya formation. A hot gas inflow with yield of approximately 12,000 m^3/day was obtained upon sampling of them. The dolomites of the Bel'skaya formation are also impregnated with bitumens in the Fedinskaya parametric well. Oil saturation of dolomites of the Bel'skaya formation has also been established in the more northerly regions of Krasnoyarskiy Kray. Thus, oil-impregnated dolomites were uplifted from the central part of the formation in several wells in the Kuyumbinskoye oil and gas field. Extensive development not only of cracked but also of porous-cavernous rock to which the most intensive oil and gas manifestations are confined was recorded in this case.

The deposits of analogs of the Bel'skaya formation -- the Tolbochanskaya and El'ganskaya formations -- have not been sampled in Yakutiya, although oil features were noted in the core sample upon tapping of them in the Nelbinskaya and Syul'dyukarskaya parametric wells. Increased gas indications were recorded simultaneously with this in the latter well upon passage through the upper part of the Tolbochanskaya formation.

Abundant oil saturation of the limestones and dolomites of the Tolbochanskaya formation was established in one of the core-sample holes drilled to the north of the Srednebotuobinskoye field. A gas inflow with yield of approximately 6,000 m^3/day was obtained here from the unseparated mass of the Tolochanskaya and El'ganskaya formations.

More extensive oil distribution in that part of the Tolbochanskaya formation which is located directly under salt-bearing formations is typical for the described profile in Yakutiya. Besides the previously mentioned wells, the bitumen content of carbonate deposits was noted in the Murbayskaya parametric well drilled in the northeastern part of the Nepsko-Botuobinskaya anteclise.

The halogen-carbonate formations of the Bel'skaya formation are overlapped everywhere by carbonate rock of the Bulayskaya formation sufficiently maintained in thickness which comprise oil- and gas-bearing complex III. The salt-bearing deposits of the Angarskaya formation approximately 200 m thick located above perform the role of regional oil and gas barrier.

Carbonates of the Bulayskaya formation are characterized by considerable constancy of thickness (120-190 m) and are found in practically the entire area of the Siberian Platform. Similar deposits in Western Yakutiya are called the Olekminskiy horizon, while the upper part of the Kostinskaya formation also consisting of carbonate rock corresponds to them in the northwestern part of Krasnoyarskiy Kray.

Deposits of oil- and gas-bearing complex III have been studied in more detail in the Irkutsk amphitheater, where they have been tapped by more than 350 wells. The Bulayskaya formation is universally represented by cracked dolomites with numerous porous-cracked limestone streaks. Thin salt seams sometimes appear among carbonate rock in the more submerged regions.

Gas-saturated limestones maintained along the strike, which have been named the Birkinskiy horizon, have been established in the profile of the Bulayskaya formation in the Birkinskaya and Khristoforovskaya areas of Irkutskaya Oblast. Gusher inflows of gas with a yield up to 80,000 m^3/day and condensate with a yield of 7 m^3/day have been obtained upon sampling of them.

Increased gas indications (the Krivolukskaya, Osinskaya and Potapovskaya) were noted in many areas upon tapping of Bulayskaya formation. The rock is impregnated with liquid gasified oil in deposits of the Bulayskaya formation in individual wells drilled primarily in the northern part of the oblast (Markovskaya, Nepskaya and so on). Tapping of the carbonate deposits of the formation was frequently accompanied by catastrophic absorptions of the clay mud (up to 95 m^3/hr), which indicates the presence of porous strata in its profile.

The prospects of the oil- and gas-bearing content of the described complex and in Yakutiya, where it is represented by limestones and dolomites of the Olekminskaya formation, have been positively evaluated.

The regional oil saturation of the Olekminskaya formation has been established in the northeastern part of the Nepsko-Botuobinskaya anteclise (Murbayskaya and Syul'dyukarskaya areas). However, no oil inflows could be obtained in a single well upon testing. It is obvious that this was caused by significant cooling of the interior of southwestern Yakutiya, where the bed temperature at the depth of deposition of the Olekminskiy horizon (900-1,000 m) does not exceed 2-4°C. This circumstance undoubtedly leads to a significant increase of the viscosity of oil in the bed and makes it difficult to extract it to the surface without using some secondary methods of acting on the bottom zone.

Moreover, intensive gas manifestations were noted in the carbonate mass of Bulayskiy age at the bottoms of some wells and a gas discharge with yield of more than 300,000 m^3/day occurred in the Verkhnevilyuchanskoye field upon tapping of the absorption zone confined to the cracked limestones of this complex.

Gas manifestations from this complex were also established in the Syul'dyukarskaya parametric well and absorption zones of the flushing fluid are confined to it in the Srednebotuobinskoye field, as in the Verkhnevilyuchanskoye field.

The prospects of oil- and gas-bearing content of the Bulayskaya formation in Krasnoyarskiy Kray have been studied considerably less. Thick benches of carbonate rock, primarily limestone, have been tapped by individual wells. Porous-cavernous dolomites with a sharp petroleum odor were found in the Tayginskaya and Kuyumbinskaya parametric wells. The total thickness of the oil-saturated rock is approximately 150 m.

Wider development of porous collector rock and a decrease of the total thickness of halogen formations, including those in the lower part of the Angarskaya formation, are typical for the carbonate profile of Krasnoyarskiy Kray. The total thickness of oil-saturated limestones increased significantly in the Kuyumbinskoye field because of this.

The carbonate profile of the Siberian Platform crowns the oil- and gas-bearing complex IV with a total thickness up to 600 m. The deposits of the complex, dated to Angarskoye and Litvintsevskoye time, are developed almost universally and are represented by limestones and dolomites with halogen rock streaks. The latter jointly with the upper lying argillaceous deposits of the Verkholenskaya formation perform the role of an oil and gas barrier.

The described structure of complex IV is essentially present over the entire area of the Siberian Platform. Analogs of the Angarskaya and Litvintsevskaya formations -- carbonate deposits of the Charskaya, Khar'yalakhskaya, Icherskaya and Metegerskaya formations -- are related to productive structures within Yakutiya (Mirninskiy arch) and the Verkhnekostinskaya subformation whose oil and gas saturation is controlled by argillaceous rock of the Letninskaya formation, is related to productive structures in Krasnoyarskiy Kray.

Deposits of the upper oil- and gas-bearing complex in Irkutskaya Oblast have been studied more. Carbonate rock comprises a fraction of 150-200 m with total thickness of 600 m of the Angarskaya and Litvintsevskaya formations which comprise it. The latter are deposited primarily in the upper part of the described complex, alternating with benches of sulfate-halogen rock.

Several productive horizons are localized in the carbonate profile due to the shielding effect of salts, anhydrites and gypsums. The Bil'chirskiy and Kellorskiy horizons and a stratum of algal dolomites have regional distribution within the oblast. All the named horizons have much in common in the lithological plan -- they are represented by dolomites and limestones and porous-cracked, cracked and porous-cavernous collectors. The productive horizons are located between thick benches of rock salts. The latter are not universally distributed and joining of separate horizons into a unified productive carbonate mass is possible in sections where their thickness and outcropping are reduced.

The same oil and gas manifestations as in the more ancient carbonate masses -- oil saturation of the core sample, absorption of flushing fluids and surface manifestations during drilling up to gas discharges -- are noted in the given complex. However, the greater distribution of gas manifestations with significant gas inflows reaching 100,000 m^3/day or more throughout the area compared to the previously considered complexes must be noted in this case.

Obviously, such intensive gas manifestations are explained by the shallow depths of deposition of productive deposits and by the wide development of lixiviation of carbonate rock in individual sections, due to which karsk and improved collector zones are formed.

Deposits of oil- and gas-bearing complex IV within the northeastern part of the Nepsko-Botuobinskaya anteclise in Yakutiya have been tapped by sparse parametric and core-sampling wells. More extensive development of sulfate-halogen streaks is typical for them, due to which determination of a large number of productive horizons compared to the Irkutsk amphitheater is possible in the carbonate profile.

Improvement of the porosity and permeability parameters in the lower part of the carbonate profile -- in the Charskaya formation -- is typical for oil- and gas-bearing complex IV. The most intensive gas manifestations in core-sampling boreholes, drilled in the immediate vicinity of the Srednebotuobinskoye field, have been obtained from here. Besides gas saturation, inclusions of solid and liquid bitumens and in some cases intensive impregnation of cavernous carbonate rock by liquid oil have been noted in the carbonate deposits of the Charskaya formation.

Materials on the oil- and gas-bearing content of the upper part of a carbonate profile, related to the Icherskaya and Metegerskaya formations, are sparser. There are only data on the absorption of the clay mud in the Nelbinskaya parametric well with intensity up to 5 m^3/hr, which indicates the presence of porous rock here.

Deposits of the Metegerskaya and Icherskaya formations are characterized by universal distribution of absorbing horizons in southwestern Yakutiya. A stratal water inflow with gas was obtained upon sampling of one of them in well 610 of the Verkhnevilyuchanskaya formation; the gas yield exceeded 1,000 m^3/day and the water yield comprised approximately 400 m^3/day.

Solid bitumens were noted in the core sample taken from both formations in core-sampling and hydrogeological boreholes in the immediate vicinity of the Murbayskaya parametric well. Oil entered along with water in slight quantities upon testing of individual water-bearing horizons and determinations of methane gas were also observed.

Similar gas manifestations during sampling of both horizons were observed upon testing of the hydrogeological boreholes also drilled in more southerly regions. All these facts indicates the regional development of the Icherskaya and Metegerskaya formations and of their possible oil- and gas-bearing content.

Undoubtedly, formation of oil and gas pools depends to a significant degree on retention not only of collectors but also of covers in the profile, since displacements of the oil and gas barrier structure and unsealing of the gas-oil pools are possible due to the shallow depths of the productive mass and of the dense rock overlapping them.

The deposits of the upper oil- and gas-bearing complex in Krasnoyarskiy Kray have essentially not been studied. There are only data on the general similarity of the carbonate-halogen profile of the Angarskaya and Litvintsevskaya formations of the Tungusskaya syneclise and of the Angarskaya bench. However, taking into account the previously given characteristics of the oil- and gas-bearing content of the upper carbonate complex in Irkutskaya Oblast, one can optimistically estimate the prospects of its analog in Krasnoyarskiy Kray as well.

The given materials indicate the regional nature of the oil- and gas-bearing content of the carbonate profile of the Siberian Platform. As can be seen from Figure 1, its oil and gas saturation has been established in practically all areas of the region where deep boreholes have been drilled. Oil and gas features and their payable inflows have been noted in the entire mass of carbonate rock from the Riphean to the roof of the Lower Cambrian. The oil- and gas-bearing content is confined in most cases to carbonate rock lying directly under regional oil and gas barriers. Oil and gas manifestations have also been found in individual dolomite and limestone benches where rock similar in composition, but with higher density and less cracking, is located above them.

Rather contradictory materials on the oil- and gas-bearing content of the carbonate profile draws attention to itself in those areas where several deep wells have been drilled. Oil or gas features were frequently not established in the presence of oil and gas manifestations or even of hydrocarbon inflows from individual intervals in one or two wells in similar sections of the profile of the remaining wells. Many investigators explained these cases by the absence of persistent strata with high capacity parameters and by the development of primarily cracked collectors in the carbonate profile. However, the previously described correlation of regional oil and gas barriers and the persistence of individual carbonate complexes and oil- and gas-bearing horizons over the entire area of the Siberian platform contradict these concepts.

The low geological effectiveness of study of the described profile is explained mainly by the fact that main attention was devoted for a long time to the terrigeneous deposits of the Wendian and Riphean at the base of the sedimentary mantle. The carbonate deposits of the Lower Cambrian lying above were drilled mainly without core sampling and they were essentially untested with regard to overlapping by technical core samples. Study of the oil- and gas-bearing content of the carbonate profile was also carried out within limited volumes during drilling due to the large diameters of the boreholes and the absence of the appropriate equipment for testing the boreholes.

The carbonate deposits in the boreholes were affected for a long time by the drilling mud as a result of orientation of deep drilling toward the lower horizons of the sedimentary mantle located in the upper part of the profile. Penetration of the mud filtrate into the stratum occurs as a result due to capillary hydrodynamics and the filtration parameters of the stratum decrease. Since numerous halogen streaks in the carbonate profile lead to a significant increase of mineralization of the drilling mud, the depth of filtrate penetration into the stratum increases significantly and its physical-collector characteristics are reduced. The volumetric parameters of the strata also deteriorate due to plugging of the pores with slurry and by formation of an argillaceous crust.

A clear example of deterioration of the filtration properties of productive horizons due to prolonged contact of the stratum with clay mud is the results of testing well 1 of Balykhtinskaya formation. A gas inflow with a yield of approximately 50,000 m^3/day was initially obtained in it upon sampling during drilling of the dolomites of the Khristoforovskiy horizon. However, no gas inflow was noted into the exploitation column prior to the tested interval after completion of the well by drilling and subsequent sampling. The results upon testing of the Osinskiy horizon in the Srednebotuobinskoye field are similar. Gusher gas inflows with a yield up to 400,000 m^3/day were obtained here immediately after it was tapped in some wells (wells 9, 36 and so on) upon testing of the promising profile. However, the gas inflows decreased significantly upon testing of the same intervals after the wells had been driven to the planned depths and they were completely absent in some cases (wells 2 and 4).

The situation is aggravated by the fact that the productive horizons of the carbonate profile, especially of its upper part, are distinguished by a bed pressure deficit. This leads to absorption of the drilling mud and to sharp deterioration of the volumetric parameters of productive horizons and to loss of filtration properties.

Besides plugging the pores by filtrate and slurry, absorption leads to mixing of the sodium chloride of the absorbed mud with natural highly concentrated brines. As indicated by the investigations of A. Ye. Zheleznova, A. N. Zolotov and L. V. Nikolayeva, salt crystals which reduce the porosity and permeability parameters of the productive bed may be formed due to this mixing in the rock pores and cracks.

Significant deterioration of the collector properties of productive horizons during tapping and sampling of them may also be caused by precipitation of the salts in the borehole shaft and bottom zone of the bed due to disruption of thermodynamic equilibrium in the interior. It is shown in [1, 2] that the bottom zone around the borehole shaft is cooled by the drilling mud during drilling and testing and the pressure in it fluctuates sharply. The salts in the water-bearing strata and in horizons containing brines with gas or oil may also precipitate out as a result of the effect of both factors in the borehole shaft and bottom zone of the bed.

Intensive saturation of the productive carbonate profile by a filtrate of highly mineralized drilling mud leads to distortion of the true commercial-geophysical characteristics of oil- and gas-bearing horizons and to approximation of it to the parameters of water-bearing strata. Because of this frequently promising intervals of the profile in the wells were not determined by field-geophysical methods and were not tested in time.

All this explains why large oil and gas pools have not yet been found in the carbonate profile. At the same time the great thickness of this rock, numerous oil and gas manifestations and other features permit one to talk about the significant prospects of the oil- and gas-bearing content of the described masses. The lack of discoveries of large oil and gas fields indicates the absence of a scientifically developed method of finding the carbonate profile rather than of the low prospects of the described collectors. Development of a method of tapping and study of the oil- and gas-bearing content of carbonate deposits must be accelerated, using scientific-practical developments realized in other regions of the USSR (the Volgo-Urals and Timan-Pechora oil- and gas-bearing provinces). It must be taken into account in this case that the oil- and gas-bearing carbonate rock is less informative than terrigeneous collectors.

For accelerated and dependable analysis of the prospects of the oil- and gas-bearing content of the carbonate profile of the Siberian Platform, it has been proposed that a complex of geological-technical measures be carried out, the most important of which are the following.

1. An increase of core sampling from the productive profile and study of the arrangement of the more volumetric porous and porous-cavernous collectors in reserves in the carbonate masses. Determination of the biogenic formations, development of which may indicate the presence of Riphean systems in carbonate complexes of the Cambrian, is of important significance in investigation of the core sample.

2. Expansion of the existing complex of field-geophysical investigation of boreholes by inclusion of neutron methods, acoustic and induction logging in it which are more effective during investigation of carbonate productive horizons.

3. Extensive use of direct geophysical methods of ZSBZ [expansion unknown] and seismic investigations by the "Zalezh'" program, used to determine the

contour of oil and gas pools and thus reduce the number of deep wells drilled to explore the fields.

4. Study by seismic prospecting, besides the reflecting horizons in terrigeneous deposits of the Wendian and Riphean, of the wave characteristics of carbonate deposits with regard to the presence of productive masses in them.

5. Drilling special boreholes with planned depths of 1,000-1,500 m in individual, larger areas. The purpose of this drilling is qualitative study of the oil- and gas-bearing content of the upper carbonate complexes without losses of filtration properties of promising horizons as a result of sinking wells to deeply submerged deposits. For this purpose it is rational to use light drilling rigs of type BU-80 and BA-2000.

6. Development of a rational technology of tapping and testing oil and gas pools in carbonate deposits with deficit bed pressure. Tapping similar productive horizons in lightened muds and invert emulsions should occupy a special place in this.

7. Passing through the intervals of the profile with expected carbonate beds with subinterval testing of IP. Various depressions and the standing time in the inflow to determine the optimum sampling conditions must be used in this case. This method made it possible to estimate the productivity and scales of the oil- and gas-bearing content of the Riphean carbonate mass under conditions of maintaining its main volumetric parameters even at the drilling stage in the Kuyumbinskoye field.

Development and implementation of a concrete scientific-production program to improve logging, tapping and sampling of the carbonate profile will make it possible to obtain essentially new geological information on the least studied, but highly promising part of the sedimentary mantle of the Siberian Platform.

The practice of searching for a carbonate profile when main attention was devoted during the first stage of exploration primarily to the terrigeneous profile and when the carbonate rock began to be carefully studied only after a reduction of the geological effectiveness of search operations, should not be repeated during search-exploratory operations on the Siberian Platform. The carbonate profile should be studied with regard to its lithological-textural characteristics and simultaneously with the lower part of the sedimentary mantle consisting of terrigeneous rock.

BIBLIOGRAPHY

1. Antsiferov, A. S., "Precipitation of Salts From Lower Cambrian and Wendian Brines in the Irkutsk Amphitheater," GEOLOGIYA NEFTI I GAZA, No. 4, 1974.

2. Fuks, B. A., V. V. Kazanskiy, T. I. Moskalets et al., "Tapping and Testing Productive Beds of the Lower Cambrian of Eastern Siberia," GEOLOGIYA NEFTI I GAZA, No. 2, 1977.

3. Drobot, D. I., A. N. Zolotov and A. Z. Kontorovich, "Geokhimicheskiye kriterii otsenki perspektiv neftegazonosnosti dokembriyskikh i nizhnekembriyskikh otlozheniy yuga Sibirskoy platformy" [The Geochemical Criteria for Evaluating the Prospects of the Oil- and Gas-Bearing Content of Precambrian and Lower Cambrian Deposits of the Southern Siberian Platform], Moscow, Nedra, 1974.

4. Kontrorovich, A. E., N. V. Mel'nikov and V. S. Starosel'tsev, "Oil and Gas Geological Regionalization of the Siberian Platform," GEOLOGIYA NEFTI I GAZA, No. 2, 1976.

5. Samsonov, V. V., "Irkutskiy neftegazonosnyy basseyn" [The Irkutsk Oil- and Gas-Bearing Basin], Irkutsk, Vost.-Sib. kn. izd-vo, 1975.

6. Trofimuk, A. A., "The Prospects of Finding Oil and Gas in Eastern Siberia and in the Far East," GEOLOGIYA NEFTI I GAZA, No. 5, 1971.

6521
CSO: 1822

END