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USSR Report

ENERGY

(FOUO 7/81)

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ENERGY CONSERVATION

ENERGY CONSERVATION

PETROLEUM PRODUCT CONSERVATION IN RSFSR

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 11, 1980 pp 10-12

[Article by T.Z. Khuramshin, chairman of the RSFSR State Committee for Petroleum Products: "On the Careful Expenditure of Petroleum Products in the RSFSR Economy"]

[Text] Enormous importance is attributed throughout the entire world to the efficient and economical consumption of fuel and energy resources (TER). The strengthening of energy conservation policy in the national economy is an essential condition for further successes in the Soviet economy also. Its expansion is being accompanied by a rapid rise in the production and consumption of oil and petroleum products; gas, coal and other primary energy sources. It is planned that 606 million tons of petroleum (including gas condensate), 435 billion m^3 of gas and 745 million tons of coal will be extracted in the USSR in 1980.

With the present scales of production of fuel and energy resources, curtailing their consumption by just one percent in 1980 will make it possible to save about 20 million tons of conventional fuel (t.u.t.). For this reason, special purpose comprehensive scientific, engineering, economic and social programs encompassing all sectors of the national economy, are being created to provide for the efficient and economical utilization of fuel and energy resources.

In particular, boosting the efficiency of the use of liquid fuels is governed by the degree of their utilization in the operation of fuel consuming equipment, reducing the energy intensity of production processes, improving standards setting and accounting, as well as refining the production process operations of receiving, storing and dispensing fuels at bases and warehouses of the petroleum supply and consumer organs.

The considerable attention which is being devoted by the party and the government, as well as planning and management organizations to questions of conservation and efficient utilization of fuel and energy resources is promoting an expansion of socialist competition to economize with all kinds of fuel and energy. Along with working out the organizational and technical measures, which are the basis for the efficient and economic consumption of petroleum products, it is very important to apply scientifically substantiated norms for the consumption of fuel and lubricants, review them on a timely basis in line with the improved production equipment and technology, as well as organize monitoring for the observation of these norms.

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A significant place in curtailing losses of motor fuels and lubricants belongs to the correctly organized accounting for their storage and consumption.

Authorized specific and operational consumption norms for motor fuels should be applied in each industrial sector to all kinds of equipment which uses petroleum products. Accounting and trip sheets should be filled out for each motor vehicle, tractor or other equipment, where the fuel consumption results should be reflected along with the other indicators. These primary documents, approved by the USSR Ministry of Finance and the USSR Central Statistical Administration are obligatory for all enterprises and organizations operating motor vehicle fleets. The utilization efficiency of fuel and lubrication materials, as well as their quantitative and qualitative conservation depend in many respects on the level of technical outfitting and the state of the warehouses for storing petroleum products and caring for the equipment being operated.

More than half of the energy resources consumed by all kinds of transport is used by motor vehicle engines. However, the specific consumption of energy resources in motor vehicle transport is slightly more than 19 times greater than in railroad transportation and 14 times higher than for river transport. Motor vehicles are one of the major consumers of motor vehicle gasolines and diesel fuels. Because of the continuous growth in the motor vehicle fleet, the demand for these fuels is also increasing. For this reason, all measures directed towards saving motor fuels are extremely urgent (careful accounting for the consumption of petroleum products, systematic analysis of the actual consumption according to the types of work, establishing proper order in fuel storage, mechanized refueling of machines and mechanisms, high quality technical servicing, etc.). One of the largest users of oil products in the nation is agriculture. A reduction of fuel losses in this sector by only one percent will make it possible to save 20 to 30 million rubles and reduce the consumption of lubricating oils by 2.5 rubles/year.

Combatting petroleum product losses is not only of technical and economic importance, but also of social significance. Petroleum products, lost during equipment operation, as well as during transportation, storage and dispensing, do not disappear without a trace, but pollute the environment. For this reason, all measures which prevent the losses of these products are directed towards improving labor conditions, provide for cleanliness and high standards in production and protect the environment.

The work of the RSFSR Petroleum Inspectorate plays a great part in improving the efficiency of the utilization of fuel and energy resources in the national economy. Also assigned to the petroleum supply system in addition to the performance of the main functions (planning and control of the supply for the national economy) is the monitoring of the efficient and economical consumption of petroleum products at industrial enterprises, in transportation as well as in construction organizations and agriculture. To perform these functions, the RSFSR petroleum inspectorate was created in the RSFSR State Committee for the Supply of Petroleum Products, with inspectorates in the petroleum marketing administrations.

In accordance with a resolution of the RSFSR Council of Ministers, the RSFSR Petroleum Inspectorate has the right to obtain the requisite planning and reporting documents from ministries, departments, enterprises, institutions and organizations regarding questions coming under its jurisdiction, as well as data on consuming equipment and the consumption norms for petroleum products, plans for steps to

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conserve the products, to make unimpeded visits and inspect all locations and facilities where petroleum products are stored, dispensed and consumed and to issue orders to eliminated violations which are found, where these orders are obligatory for all organizations. Monitoring the efficient and economical consumption of petroleum products, as well as the handing over of used oil is the major task of the RSFSR Petroleum Inspectorate.

The work is carried out in close contact with the peoples' control organs. In 1979, about 9,000 enterprises and organizations in 13 sectors of the national economy in all oblasts, krays and autonomous republics were checked by the RSFSR Petroleum Inspectorate. At the same time, the workers of the petroleum inspectorate, the petroleum bases and administrations of the RSFSR State Committee for Petroleum Products rendered practical assistance to 1,800 kolkhozes, sovkhozes, enterprises and organizations in working out and implementing measures to save fuel and lubricants, improve the organization of the petroleum storage management, publish public relations materials, etc. The regularly assigned and special duty inspectors of the petroleum inspectorate make statements in the press, via radio and television (some 550 appearances in 1979) for the purposes of propagandizing advanced methods of saving, as well as analyzing deficiencies in the use of petroleum products.

The RSFSR petroleum inspectorate analyzes the materials of the inspections to ascertain the status of the use of petroleum products in the RSFSR economy, in each sector, autonomous republic, kray and oblast. The relevant ministries, departments and local organization are informed of the results of the analysis, and they take steps to improve the utilization of fuel and energy resources. The local party and soviet organs report on the deficiencies which are found. Materials on severe violations in the use of petroleum products, as a result of which material losses are sustained, are forwarded to the public prosecutor's offices. In 1979, 810 documents were forwarded and specific judgements were rendered on 530 of them.

In being governed by the decree of the USSR Gossnab, the RSFSR Petroleum Inspectorate is making increasingly wider use of the rights to apply penalty sanctions against consumers who forward petroleum products in violation of the procedure establish by this decree. The execution of the instructions of the RSFSR Petroleum Inspectorate and the implementation of the proposals of the inspectors by the consumers, which are directed towards the conservation of petroleum products, makes it possible to save resources amounting to three to six million rubles annually, depending on the volume of petroleum products consumed. As a result of the steps which have been taken, the utilization of fuel and lubricants is improving, their specific consumption is falling off and losses are being curtailed.

Along with this, fuel and oil are consumed inefficiently in many sectors, and the resources for reducing their consumption are not fully utilized. Thus, overconsumption of motor vehicle gasolines is tolerated in RSFSR agriculture, as compared to the allocated funds. In the first half-year of 1980, according to the data of the RSFSR Central Statistical Administration, the kolkhozes and sovkhozes of the 50 autonomous republics, krays and oblasts of the RSFSR overconsumed several tens of thousands of tons of motor vehicle gasoline.

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Considerable quantities of fuel and oil are lost because they are not used for their direct intended purpose. Despite the impermissibility of burning diesel fuel in boiler plants, the utilization of fuels and oils of some types instead of others, such facts are rather commonplace phenomena in the enterprises and facilities of the Russian Federation. Thus, in 70 percent of the kolkhozes and sovkhozes which were checked, diesel fuel is being used to heat household and residential rooms, as well as to wash parts, while fuel and lubricants are sold to enterprises and organizations not involved in agricultural operations.

The selling of fuel on the side in some farm operations in the Saratovskaya Oblast reaches 5 percent, and more than 10 percent of the diesel fuel is used for heating. Thousands of tons of the diesel fuel allocated for the operation of agricultural machinery were burned up in boilers in Tambovskaya Oblast agriculture in 1979. Some 27 tons of diesel fuel was sold, 4,485 liters of gasoline was dispensed free of charge and 400 tons of diesel fuel was burned up in boilers and baths, while 100 tons of this amount was written off for equipment operation in the Sarinskiy sovkhoz in the Orenburgskaya Oblast. The sale of petroleum products to unauthorized organizations by the kolkhozes and sovkhozes of the Bryanskaya, Kurganskaya, Orlovskaya, Tyumenskaya and Yaroslavskaya oblasts in 1980 was also discovered in the course of making the checks.

Violations of financial discipline in the utilization of motor vehicle fuels also occur at other enterprises in other sectors of the national economy. According to data of the RSFSR Central Statistical Administration, in 1979 just nine ministries and departments sold more than 20,000 tons of fuel to other organizations: the RSFSR Ministry of the River Fleet, 8.3 [tons]; the RSFSR Ministry of Motor Vehicle Transportation, 4.3; the RSFSR Ministry of Agricultural Construction, 2.3; the RSFSR Ministry of the Gas Industry, 2.2, and the RSFSR Ministry of Water Management, 1.5. Individual organizations of the Union of Consumers' Societies of the RSFSR use up to 40 percent of the lighting kerosene intended for the use of the populace not for its direct purpose; this includes that burned in boilers and sold on the side.

Deficiencies have also been revealed in the enterprises of the RSFSR Ministry of Forest Management and Ministry of Residential and Municipal Facilities Management in setting standards and accounting for petroleum products and work volumes. In 70 percent of the enterprises checked in these ministries, motor vehicles are being operated with nonfunctioning speedometers, something which promotes extra additions of work volumes and the illegal writing-off of fuel. In the majority of the enterprises checked in the RSFSR Ministry of the Gas Industry, Ministry of Water Management and Ministry of the Fuel Industry, the servicing and repair of the equipment and tractor fleet are not performed on time and not to the full extent, and for this reason, up to two percent of the fuel is additionally lost.

Matters are also unfavorable as regards the utilization of petroleum products in the RSFSR Ministry of Domestic Services for the Populace. For example, in the Tula oblast administration of this ministry, more than 2,000 tons of petroleum products are being consumed. However, the lack of the requisite control of its utilization, and the neglect in the accounting do not allow for the determination of the amount of saved or overconsumed fuel and lubricants. The storage of liquid fuel is poorly organized and petroleum storage areas are in an unsatisfactory condition. The fuel

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consumption limit has not been established for each motor vehicle. Coupons for fuel and lubricants are issued to the drivers immediately every month.

An analysis of the materials from checks of operations, as well as republic, kray and oblast organizations, has shown that deficiencies in the use of fuel and lubricants are a consequence of poor organization of the work to conserve them. The elimination of these deficiencies is the direct responsibility of the officials responsible for the use of petroleum products. As a rule, the overwhelming majority of violations can be eliminated in a short period of time without any expenditures. The ministries and departments should devote greater attention to saving fuel and lubricants, providing for the development of plans for steps to save petroleum products by every sovkhoz, kolkhoz, enterprise and organization, and strictly monitor their implementation. Permanent and efficacious monitoring of the efficient utilization of fuels and oils is to be set up in the subdepartmental enterprises and organizations.

The battle to conserve material resources is a multifaceted process. Not only economic and organizational measures are needed here, not just the application of improved equipment and advanced technology, but also directed educational work at all levels of operational management. Strict accounting for each kilogram of fuel – this principle of efficient and economical management – should become obligatory for all industrial enterprises, trasnportation, construction organizations and agricultural production.

The following will assist in further improving the utilization efficiency for petroleum products and the utmost strengthening of operational economy:

--The assurance by the ministries, departments and other organizations of state management of the observation of financial discipline in the area of petroleum product consumption by each subordinate departmental association, enterprise and organization;

--The development and implementation of scientifically substantiated consumption norms, which stimulate the battle to make economical use of liquid fuels; the realization of measures to reduce specific fuel consumption per production unit output;

--Strengthening the inspection of the observation of the procedure of petroleum product consumption on the part of the monitoring organs;

--Increasing the responsibility of enterprises, institutions, organizations and officials for inefficient or wasteful use of petroleum products;

--Expanding the network of public motor vehicle filling stations (AZS's), which will promote more favorable conditions for the operation of motor vehicle transportation. In this case, there will be no need for the construction of small unprofitable filling stations and petroleum storage areas at enterprises or in organizations.

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ENERGY CONSERVATION

EFFORTS TO CONTROL PETROLEUM PRODUCT LOSSES DISCUSSED

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 11, 1980 pp 25-27

[Article by T.Z. Khuramshin, chairman of the RSFSR State Committee for Petroleum Products: "Combatting Losses of Commercial Petroleum Products"]

[Text] Curtailing petroleum product losses during their reception, storage, delivery and transportation is an extremely important national economic problem.

Petroleum product losses are broken down into quantitative and qualitative losses. Losses due to evaporation, leaks, spills, incomplete draining of transport containers as well as accidents are numbered among quantitative losses; qualitative losses include losses due to mixing various types of petroleum products, water or dirt contamination, etc. The major kind of losses for gasolines are losses due to evaporation; for kerosenes and diesel fuels, they are losses due to leaks, and for viscous petroleum products, they are losses due to adhesion to the walls of the railroad tank cars and containers.

Gasoline losses due to evaporation are both quantitative and qualitative, since during their evaporation, the most valuable light fractions are lost. The detriment which results from petroleum product losses is determined not only by their cost, the reduction in resources and the decrease in quality, but also by the pollution of the atmosphere, water reservoirs and soil.

Considerable organizational and technical measures directed towards the reduction of petroleum product losses have been implemented over the years of the five-year plan at the tank farms, on the major product trunk pipelines and in the motor vehicle filling stations of the RSFSR State Committee for Petroleum Products. The major trend in combatting these losses is the hermetic sealing of reservoirs and conduits. Where effective methods and means are present, and given the state of the art, the majority of petroleum product losses can be reduced to a minimum or completely eliminated.

The bulk of the losses (from 60 to 80 percent) during transportation and storage of petroleum products is associated with the reservoir capacities. Losses due to evaporation as a consequence of large and small breathing cycles amount to up to 75 percent of all petroleum product losses in tank farms. The level of petroleum product losses due to small breathing cycles depends primarily on the volume of

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the gas space of the reservoirs. The losses of motor vehicle gasoline from a tank with a capacity of 5,000 m^3 due to large breathing cycles averages 0.56 kg/m^3 in the summer and 0.35 kg/m^3 in the winter; losses from "return delivery" when emptying a tank amount to 0.1 kg/m^3. With an annual turnover factor of 12 for a 5,000 m^3 capacity tank, the overall gasoline losses due to large respiration cycles amount to 34 tons/year.

Efficient technical means directed towards reducing the gas space of tanks are of great importance in curtailing petroleum product losses. The most effective means of reducing gasoline losses is outfitting tanks with pontoons; their use reduces losses from small and large breathing cycles by 80 to 90 percent as compared to the losses in tanks without pontoons.

As of 1 January, 1980, several million cubic meters of tanks for gasoline equipped with metal pontoons were in service in the RSFSR State Committee for Petroleum Products system. Their capacity amounts to 43.2 percent of the overall tank capacity intended for gasoline storage. A considerable portion of the pontoons are of the open type (without a top deck), something which considerable reduces their metal consumption and improves the operational conditions.

One of the most important assemblies of the pontoon is the gate which provides for the seal of the annular space between the wall of the tank and the cover. Loop type gates are the most widely used, which are distinguished by low cost as well as operational and fabrication simplicity. Loop type gates of the existing structural designs make it possible to hermetically a cover a gap with a width of no more than 180 mm between the hull of the tank and the pontoon. In some tank farms, the gasoline tanks are equipped with pontoons made of synthetic materials.

Along with this, such effective means of loss reduction as disc-reflectors, installed underneath the breather valves, are used in gasoline tanks. As a result, the petroleum product vapor concentration is reduced in the gas space of the tank and petroleum product losses are curtailed during deep breathing cycles. The use of disc-reflectors is most effective in tanks with large turnover factors. The loss reduction in this case reaches 20 to 30 percent.

Painting the outside surface of a tank with heat reflecting coatings, which reduce petroleum product losses by 30 percent, is being introduced on a wide scale in the tank farms. Petroleum product losses from tanks, because of the use of breather valves which do not stick (with a fluoroplastic coating on the surfaces of the valve seats and discs), where these valves hermetically seal the gas space of the tanks during the fall and winter, have been significantly reduced.

The introduction of automated devices to measure the level of petroleum products in tanks, and also for taking average samples as well as the "Radius" and "Kvant" type automatic systems for group measurement of petroleum product weight, have provided for sealing off the commercial metering operations, because of which, the losses involved when the seals on tanks are broken have been reduced (during level measurement and taking average samples manually). Equipping tanks with SUUZ-1 and SUUZ-2 ultrasonic signaling devices prevents the possibility of spillovers of petroleum products when filling the tanks. Periodic checks of the technical condition of the tank fittings for the purpose of ascertaining and eliminating a loss of seal significantly promotes a reduction in losses from tanks.

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It is planned in the immediate future that oil and gasoline resistant, anticorrosion paint with a low emission coefficient will the applied to the internal surfaces of tank shells for the storage of gasoline. As studies of the Central Scientific Research Laboratory of the RSFSR State Committee for Petroleum Products have shown, such coatings not only curtail evaporation losses, but also protect the metal against corrosion. For example, when an anticorrosion type KhS-717 paint is applied to the internal surface of tanks, evaporation losses are reduced by 30 to 40 percent, while simultaneous painting of the inside and outside surfaces of a tank can reduce losses by 30 to 65 percent as compared to the losses in tanks with unpainted surfaces.

The Central Scientific Research Laboratory of the RSFSR State Committee for Petroleum Products has developed a structural design of a tank flap with the control in the receiving and delivery pipe. The use of this flap makes it possible for the pontoons in the extreme lower position to go down to the "dead" residual level, while when flaps with lateral control are used in tanks, the pontoons go down only to 180 cm from the bottom of the tank.

In tanks with capacities of 700 to 5,000 m^3, the gas space volume beneath the pontoons amounts to 120 to 570 m^3, which is 11 to 17 percent of the total tank volume. Studies have shown that petroleum product losses due to evaporation from tanks with pontoons, equipped with flaps controlled in the receiving and delivery pipe, are reduced by 7 to 10 percent as compared to losses in tanks equipped with laterally controlled flaps. The series production of the new design flap will be mastered by the Saratov Petroleum Machine Building Plant.

A reduction in petroleum product losses during filling and draining operations is being achieved through the introduction of new mechanized and automated equipment which provides for the hermetic sealing of these processes. At the present time, more than 150 automated systems for filling ASN-5 tank trucks with petroleum products are in service at the distribution tank farms of the RSFSR State Committee for Petroleum Products. The utilization of the systems indicated here provides for a significant reduction in petroleum product losses by eliminating overflows, and also increases productivity during fill-ups.

A system for the low-end automated filling of UNN-100-1 tank trucks with petroleum products, which provides for complete hermetic sealing of the filling operations and the removal of petroleum product vapors exiting from the tank trucks during the fill-up process, into gas collectors, has been designed in the "Transnefteavtomatika" Special Design Office of the RSFSR State Committee for Petroleum Products. This system has successfully undergone industrial testing and is being prepared for series production.

Railroad drain devices have been equipped with installations for the bottom draining of petroleum products from the following types of railroad tank cars: ASN-7B and USN-150 (for light petroleum products), and ASN-8B (for dark ones). However, the utilization of the indicated devices does not provide for a complete hermetic seal of the draining operation because of the imperfect design of railroad tank cars, the bottom draining fittings of which have topside control, something which makes it necessary to open the necks of the tanks, something which breaks the seal.

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Mechanized installations with steam preheating of the petroleum products in URS-2 and PGMP-4 tanks, as well as with electrical preheating (GTTs-18) and mechanized cleaners are widely used to provide for complete drainage of high viscosity petroleum products from railroad tank cars at low temperatures. The RSFSR State Committee for Petroleum Products has put the question of improving the design of railroad tank cars for the shipment of petroleum products before the Ministry of Railroads (the transfer of the control of the bottom discharging attachment from the upper to the lower fitting, creating inclines from the bottoms to the lower discharge fitting, the introduction of thermos flask type tanks equipped with thermal insulation, etc.). However, the indicated questions have not been resolved at the present time.

Automated fill limiters of the NO-2M type are widely used when filling railroad tank cars with petroleum products. Automated hose devices for discharging and filling ASN-6A type tankers with petroleum products are in operation at the docks of maritime trans-shipment tank farms. The indicated devices provide for complete sealing of the discharging and filling operations, and also prevent spills of petroleum products which lead to the pollution of the water basin when the stand pipes are disconnected from the tankers, as well as during emergency situations. Stand pipes of a similar structural design (the ASN-16 type) have been designed for the docks of river tank farms.

Along with this, UPS-12-200 and UPS-22-300 automated installations for discharge and filling operations with several kinds of petroleum products which have a product selector have been introduced at the docks of maritime petroleum tank farms. In addition to the complete hermetic sealing of the dishcharge and filling operations, the indicated installations provide for complete preservation of the quality of the petroleum products through the use of cleaning devices. For small river petroleum tank farms, simplified URU-150 and URU-250 type installations are employed, which provide for hermetic sealing of the discharge and filling operations as well as preservation of petroleum product quality.

The trunk product pipeline of the RSFSR State Committee for Petroleum Products are operated in a "from pump to pump" mode without tank capacities at the intermediate pumping stations. This operational mode is provided by automatic pressure regulation systems at the pumping stations and makes it possible to eliminate petroleum product losses due to large and small breathing cycles, which are related to the operation of trunk product pipelines where tanks are tied in at the pumping station.

In the operation of trunk product pipelines, considerable attention is devoted to maintaining the quality of the petroleum products during their successive repumping. Automated ultrasonic UKP-1 and UKP-2 testers designed by the "Transnefteavtomatika" Special Design Office of the RSFSR State Committee for Petroleum Products are used at the terminal stations of trunk product pipelines to monitor the concentration of petroleum products in a mixture as well as the separation boundary of petroleum products when they are distributed in tanks with commercial petroleum products and a mixture of them. During sequential repumping of petroleum products, the automated "Kompaund" equipment is used, the operation of which is based on spectrophotometric measurements, which, in contrast to

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ultrasonic measurements, make it possible to monitor the concentration and separation boundary of not only different kinds of petroleum products, but also gasolines and diesel fuels of various types.

For the purpose of curtailing petroleum product losses at pumping stations and in trunk product pipelines, systems for collecting the leakage from pumping plants have been automated and hermetically sealed. The use of insulation coatings and electrochemical protection (cathodic protection stations, sacrificial anodes and drainage devices) on trunk product pipelines makes it possible to protect them against soil corrosion which leads to breakdowns, which are accompanied by large losses of petroleum products, and also produces leaks.

At motor vehicle filling stations (AZS's), the major reasons for petroleum product losses are evaporation, leakage and spillage. The widescale use of fast disconnect discharge couplings at AZS's makes it possible to hermetically seal the discharge of petroleum products from tank trucks into underground tanks. However, series production has not been set up for level gauges for the automated measurement of the level of petroleum products in AZS tanks. The fuel dispensing pump stands at AZS's are equipped with cranes having an automatic device which cuts off the flow of petroleum products into the tanks of motor vehicles when they are full, something which prevents spillage.

Improving the accuracy of quantitative accounting is of great importance in reducing petroleum product losses during reception, storage, dispensing and transportation. For this reason, the petroleum tank farms and trunk product pipelines should be equipped with meters and density gauges which make it possible to account for the weight of petroleum products with a precision of 0.5 percent.

A considerable reserve in the curtailment of petroleum product losses is their recovery from sewerage: drains from commercial establishments, industrial and washing facilities, as well as from drains contaminated with ethylated benzines as well as during the construction of conduit systems and scrubber installations at petroleum tank farms, pumping stations, trunk product pipelines as well as filling centers and motor vehicle filling stations. At the present time, 299 tank farms and their affiliates, or 17.1 percent of the total number, including 51 transshimpment stations (67.1) and 76 water stations (39.3 percent) as well as 40 repumping stations and filling stations on trunk product pipelines (61.5 percent) have been equipped with scrubber installations in the enterprises of RSFSR State Committee for Petroleum Products.

The resolution of the extremely important national economic problem - curtailing petroleum product losses at petroleum supply enterprises and consumers - requires the coordination of the efforts of the various ministries and departments, which manage the transport facilities, as well as the enterprises which produce production process equipment and means of automation of the production processes, involving the storate, reception, dispensing and transportation of petroleum products.

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FUELS

ECONOMICS OF THE SHIPMENT OF FUELS AND ENERGY

Moscow EKONOMIKA TRANSPORTA TOPLIVA I ENERGII in Russian 1980 (signed to press 28 Feb 80) pp 1-5, 190-192

[Annotation, foreword and table of contents from book "Economics of the Shipment of Fuels and Energy," by Serafim Sergeyevich Ushakov and Tat'yana Mikhaylovna Borisenko, edited by Ye. O. Shteyngauz, Izdatel'stvo "Energiya," 5000 copies, 192 pages]

[Text] The book examines the technical and economic characteristics of shipping fuel and their role in the formation of the energy balance and the development of the power engineering complex. For each type of transportation it presents the indicators reached, the scientific and technical progress made, the expected periods of its realization, and the trends in shipping development. It gives the comparative efficiency of using different types of transportation to solve specific problems of the power engineers.

The book is intended for power engineers and engineering economists.

Foreword

The economy of the Soviet Union is developing at high and stable rates. In the last 10 years, the volume of industrial products doubled. It is now about 20% of the world volume (versus 4% in prerevolutionary Russia).

In 1977, the Soviet Union already occupied the leading place in the world extraction of oil and coal, and the second place for extraction of gas and generation of electricity. The growth rates of industrial products was 9.3% in the period of 1951-1977 versus 4.2% in the United States. For agricultural production, the figures are respectively 3.5% and 1.8%. The national income of the Soviet Union has reached 67% of the national income of the United States. The volume of industrial products has exceeded 80% and the extraction of oil (including gas condensate) in 1977 was over 34%, etc.

The development of the country's economy predetermines the constant development of the fuel and energy complex that provides for the ever rising demands of industry, agriculture and the population for fuel and electricity, and that satisfies the export needs of the country for fuel resources.

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The percentage of the Soviet Union in world production in 1977 reached: for oil (including gas condensate) 18.7%, for gas 23.0%, for electricity 15.9% and for coal 18.5%. The planned economy of a mature socialist society predetermines the high growth rates of the fuel and energy complex of the country even in the future.

The Soviet Union is the only industrially developed country that is totally supplied with its own fuel and energy resources of oil, gas, coal, etc.

The arrangement of the main natural resources over the country's territory, however, is far from uniform. The main reserves of gas, oil and coal are located in the eastern regions of the country: West and East Siberia and Central Asia. The reserves of fuel and energy resources in the European regions of the country and in the Urals where the main part of the population, production funds and fuel and electricity consumers is concentrated are limited or have unfavorable technical and economic extraction indicators. Under these conditions, the development of the fuel and energy complex and the country's economy as a whole is determined by the development and perfection of transporting fuel resources, and first of all, in a latitudinal direction from east to west. Transportation systems have already been created and are currently in operation that guarantee the movement of oil, gas, coal of about a billion tons of comparison fuel per year a distance up to 3000 km, and even more in a number of cases. Movement of fuel is about 40% of all the work of the country's shipping system. The specific weight of transportation expenses in the cost of fuel for the consumer reaches very high values in individual cases. Thus, in the presented expenditures for production of gas from the North Tyumen' fields in the central and western regions of the European sector of the Soviet Union, the shipping percentage reaches 60-70%, 50-60% for production of coal from the Kuznetsk basin, etc.

Forecasting estimates of the development of the country's fuel and energy balance for the future indicate an ever increasing dependence of it on transportation.

The technical-economic indicators for production of fuel and energy resources by the consumers in the future will depend to an ever greater measure on the perfection of the shipping systems, supply of fuel to the consumers with the minimum labor, material and other expenditures.

The Soviet Union has very significant achievements in the development of shipping of fuel and energy resources great distances. Several gas-pipeline and oil-pipeline systems are already in operation. In their length, output and other indicators they surpass analogous systems abroad. Domestic railroad transportation guarantees transfer of coal fuel from the east to the west in quantities that do not occur in other countries of the world. The technical and economic indicators of intracontinental transportation of fuel are very favorable. This guarantees production of relatively inexpensive fuel for the consumers.

Further development of the fuel and energy complex is closely related to the development and perfection of such fuel sectors of the complex as transportation, and first of all, the broad introduction of the achievements of scientific and technical progress.

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Optimization of the formation of the country's fuel and energy complex requires very complicated and multiple-plan calculations that take into consideration all the diversity of factors that influence the final expenditures associated with guaranteeing the country's need for fuel and electricity, and in the final analysis, that predetermine the rates of development of the national economy and the rates of increase in the welfare of the population.

All the studies and calculations on formation of the fuel and energy complex generally include the shipping component. It must reflect as accurately as possible the actual national economic expenses for transportation and take into consideration the outlook for its development with regard for introducing the achievements of scientific and technical progress.

This book examines the role of individual types of transportation in solving the problems of the fuel and energy balance. It presents a technique for determining the comparable technical and economic indicators for different types of transportation and evaluating them to solve problems of optimizing the fuel and energy balance of the country and individual consumers of energy resources.

For this purpose the following are examined for each type of transportation: the dynamics of its development in the USSR and abroad, the technical and economic indicators reached, the possible trends in scientific and technical progress and its influence on technical and economic indicators, evaluation of the effect of individual trends of scientific and technical progress on technical and economic indicators of the transportation process, and the most interesting solutions that have been implemented or are being examined abroad in the area of fuel shipment whose use could be useful in domestic practice.

The authors hope that the book will aid specialists who are involved in forming the country's fuel and energy balance and its individual regions to make a more substantiated consideration for the transportation factor in optimizing the structure of the balance and thus guaranteeing an improvement in the efficient use of fuel and the development of the country's economy as a whole.

This book mainly covers the research of the authors that was conducted in the Institute of Complex Transportation Problems.

The studies of the authors are based on the latest achievements of science that are presented in the works of Academicians M. A. Styrikovich, L. A. Melent'yev, T. S. Khachaturov, N. V. Mel'nikov, Corresponding Member D. G. Zhimerin and Doctors of sciences B. S. Kozin, G. I. Chernomordik, V. I. Dmitriyev, A. Ye. Gibshman, A. A. Beschinskiy et al.

The authors express their gratitude to Doctors of economic sciences A. A. Beschinskiy and A. Ye. Gibshman and Candidate of chemical sciences E. B. Shlikhter for help given in working on the book.

Chapters 1, 4 and 5 were written by the authors jointly; the remaining chapters were written by S. S. Ushakov.

All remarks and wishes regarding the book should be sent to the following address: 113114, Moscow, M-114, Shlyuzovaya nab., 10, Izdatel'stvo "Energiya."

The authors.

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FUELS

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LOCATING DEPOSITS OF OIL, GAS

Moscow PROGNOZ MESTOROZHDENIY NEFTI I GAZA in Russian 1981 (signed to press 17 Dec 80) pp 1-6, 349-351

[Annotation, foreword and table of contents from book "Prediction of Oil and Gas Fields", by Aleksey Emil'yevich Kontorovich, Epaminond Epaminondovich Fotiadi, Viktor Ivanovich Demin, Vladimir Borisovich Leontovich and Aleksey Anan'yevich Rastegin, Izdatel'stvo "Nedra", 1900 copies, 351 pages]

[Text] The book describes the methods of quantitative and qualitative prediction of the oil and gas content based on modern mathematical equipment and processing computer data. It substantiates the set of parameters that can be measured on oil and gas fields and fields that can be predicted for oil and gas with geological-mathematical modeling and evaluation of the outlook for the oil and gas content. It presents a formal classification of the prediction and exploration tasks of oil geology. It examines methods of predicting the possible number of fields in the basin and their distribution according to reserves, and methods of predicting the oil and gas content of traps before the start of drilling. Geological-mathematical models are presented for long-term planning of geological exploration.

The book is intended for geologists and geophysicists of the scientific research organizations who are studying the oil and gas fields. It is of considerable interest to the teachers and students of the senior courses of petroleum VUZ's and geological departments of VUZ's and universities.

Foreword

The last decades have been a period of exceptionally rapid development of oil and gas extraction throughout the world. In 4 decades, from 1938 to 1979, extraction of oil and condensate in the capitalist and developing countries rose from 243 million to 2.490 billion tons, i.e., 10.2-fold, while gas extraction rose from 96 billion to 1.290 trillion m^3, i.e., 13.2-fold. Oil and gas extraction in the USSR rose very intensively.

According to the estimates of the specialists, the annual extraction of oil in the world will be 4-6 billion tons and 2.0-2.5 trillion m^3 of gas by the end of the century. These rates of development of the oil and gas industry governed the extreme urgency of the problem of preparing reserves of these types of mineral raw material. The researchers need to solve the following regional problems for a scientifically substantiated, reliable prediction of the outlook for the development of oil and gas extraction.

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First of all, determine (taking into consideration the finiteness of the oil and gas resources in the stratisphere and the outlook for developing alternative non-hydrocarbon sources of energy) the limit levels of oil and gas extraction in the world and in individual regions, and the periods of their attainment.

Secondly, find the largest of the undeveloped regions where considerable reserves of oil and gas may be discovered and explored.

Thirdly, isolate both in the developed, "old," and in the "new" regions, terri-tories and stratigraphic complexes that are the most promising for oil and gas exploration, and determine the oil and gas resources in them.

It is known that in the Soviet Union, the only large industrial state in the world whose economic development is based on its own fuel and energy resources, an estimate of the initial, potential resources of oil and gas is the main starting point for long-term planning of the fuel and energy complex of the country.

The experience of this planning that has been accumulated in recent years shows that for its realization with regard for the outlook for development, it is not sufficient to have an estimate of the resources of hydrocarbon raw material in the country as a whole and in individual regions. It is necessary to know the corre-lation of these resources of oil, gas, and condensate, their distribution in each region according to intervals of depths, types of reservoirs, accumulations of varying size, a number of characteristics of the quality of these types of mineral raw material, etc.

The results of a quantitative prediction of oil and gas content, in any case, the results of the resolution of certain specific tasks, are the basis for a compi-lation of five-year and annual plans for regional and exploratory work.

The need for a reliable resolution of these problems increased the entire world's interest in perfecting the methods of a quantitative prediction of oil and gas content and predetermined the drastic expansion in the prediction problems of oil and gas geology

I. M. Gubkin was the initiator of the development and application of methods for quantitative prediction of oil and gas content in the Soviet Union. A. M. Akram-khodzhayev, A. A. Bakirov, I. O. Brod, M. S. Burshtar, N. I. Buyalov, M. I. Varentsov, V. G. Vasil'yev, N. B. Vassoyevich, N. A. Gedroyts, F. G. Gurari, M. F. Dvali, G. Kh. Dikenshteyn, M. A. Zhdanov, N. A. Yeremenko, M. K. Kalinko, K. P. Kalitskiy, N. T. Lindtrop, S. P. Maksimov, M. F. Mirchink, M. S. Modelevskiy, V. D. Nalivkin, M. S. Napol'skiy, S. G. Neruchev, I. I. Nesterov, N. N. Rostovtsev, G. Ye. Ryabukhin, V. V. Semenovich, A. A. Trofimuk and others have been fruit-fully engaged in their development and perfection.

The work of these scientists developed the traditional, so to speak "classic" methods of predicting the oil and gas content, methods of analogy based on expert estimates and volumetric-genetic methods. A survey of their state and history of development can be found in many studies [9, 57, 71, 102, 104].

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In the last 10-15 years, methods of quantitative prediction of oil and gas content have been intensively developed, especially in the USSR. They are based on geological-mathematical modeling on a computer of the laws governing the arrangement of oil and gas deposits. The first publications of studies on this plan appeared in 1964-1965. A unified school of researchers is currently working on this problem in the USSR with major scientific centers under the supervision of: A. I. Kholin in Moscow, V. D. Nalivkin, G. P. Sverchkov and M. D. Belonin in Leningrad, I. I. Nesterov, V. I. Shpil'man, and A. M. Volkov in Tyumen', and at the first stage of research S. V. Gol'din, A. A. Trofimuk V. S. Vyshemirskiy and A. N. Dmitriyev in Novosibirsk in the Institue of Geology and Geophysics of the Siberian Department of the USSR Academy of Sciences, and the editors of this work in the Siberian Scientific Research Institute of Geology, Geophysics and Mineral Raw Materials. The group of scientists of the computer center of the Siberian Department of the USSR Academy of Sciences under the supervision of Yu. A. Voronin made a significant contribution to the development of the general theory of prediction and exploration of mineral fields.

The "new" methods of quantitative prediction of oil and gas content are deeply linked historically and ideologically with the "classic" methods. However, their development resulted in exceptionally rapid progress and methodological rethinking of the theoretical fundamentals and principles of predicting oil and gas content. The following features of the "new" methods as compared to the "classic" need to be stressed.

1. The "new" methods with the use of modern computer equipment and the achievements of the theory of oil and gas formation made it possible to simulate on the computer the laws governing the arrangement and processes of formation of their accumulations. For the first time, a real possibility appeared of "approaching the process of the formation of oil fields from a dialectical viewpoint, based on the thought that this process is one of the streams of the unified and great dialectical process of the earth's development" [47, p. 8], and of "...viewing it as a unified, integral and continuous [process]" [Ibid, p. 9]. The methodological correctness of this approach was stressed over 30 years ago by I. M. Gubkin. Geological-mathematical modeling on a computer made it possible to select from a large number of fundamentally possible models in the framework of this approach, those of them that describe most adequately the distribution of oil and gas deposits in the stratisphere.

2. Development of the "new" methods required refinement of the original concepts and corresponding statement of the tasks. As a result, a whole series of fundamentally important (including from the viewpoing of geology) features of the statement and resolution of these tasks were successfully revealed.

3. The "new" methods are used as an apparatus of modern mathematics, thanks to which they permit construction of strict, statistically substantiated criteria for the purposes of prediction, instead of subjective criteria and methods of the "classic" systems that are mainly based on experience and the intuition of the expert.

4. The "new " methods drastically expanded the circle of prediction tasks of oil and gas geology in accordance with the demands of practice. The statement of a number of these tasks in the framework of the "classic" methods was impossible.

5. The "new" methods have made it possible to construct fairly strict criteria for verifying the reliability of the obtained solutions and in addition to spot estimates, to make interval estimates.

The extensive development of the oil and gas content prediction methods governs the need for analyzying and systematizing from single methodological positions the most important of the findings. A number of works cover this to a certain measure [3, 72, 78, 99]. However, the entire circle of questions has not been examined as a whole anywhere. In this work, the authors have attempted to make up for this very serious omission which inhibits further development. They have attempted to refine the original concepts and classifications, to formulate an entire complex of tasks of oil and gas geology, and to suggest methods for their resolution based on geological-mathematical modeling. In addition to the results of their own many years of research, the authors examine a large number of works of Soviet and foreign researchers. In this respect, the monograph does not claim to be complete and is not a survey. The authors only analyze in it those works that make it possible to note the most promising directions in research.

Despite the fact that a number of results and developments that are given in the monograph can be used without significant changes in many regions, it primarily does not contain "prescription" type results. The authors hope, however, that after becoming acquainted with it, the reader will "feel" the principles and methods of solving individual tasks, and principles for constructing models and modeling.

The theory of prediction and exploration of oil and gas fields, as the authors present it, is based on the organic theory of oil and gas formation and certain sections of modern mathematics, such as the theory of statistical solutions, the theory of pattern recognition, regression and correlation analysis, etc. Separate chapters cover the most significant results of studies on these fundamental areas of science that are necessary for successive presentation.

In trying to stress the continuity of the "new" methods of quantitative prediction of oil and gas content, we preceded individual chapters and paragraphs of the epigraph with statements of a number of leading Soviet scientists on the problems discussed in the book.

While working on the book, the authors were given invaluable assistance by the many years of creative cooperation, discussion and work in one "invisible" collective with M. D. Belonin, N. I. Buyalov, N. B. Vassoyevich, Yu. A. Voronin, V. S. Vyshemirskiy, G. Kh. Dikenshteyn, S. P. Maksimov, M. S. Modelevskiy, V. D. Nalivkin, S. G. Neruchev, I. I. Nesterov, V. V. Semenovich, G. P. Sverchkov, A. A. Trofimuk and V. I. Shpil'man.

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