FORTIETH ANNIVERSARY OF THE V. I. LENIN DNIEPER HYDROELECTRIC STATION

The fortieth anniversary of the commissioning of the V. I. Lenin Dnieper hydroelectric station coincides with a significant date, namely the fiftieth anniversary of establishment of the USSR. A memorial plaque with the following inscription was set into the foundation of the first block of this station dam: "On November 8, 1927, on the tenth anniversary of the October Revolution, in fulfillment of the legacies of V. I. Lenin, leader of the world's proletariat, and by the efforts of the working masses of the first Labor Government in the world – the Union of Soviet Socialist Republics – the governments of the USSR and the Ukrainian SSR laid the foundations of the Dnieper hydroelectric station, with a capacity of 650,000 hp, a powerful level of socialistic construction of the USSR" [1].

This was the most powerful hydroelectric station of those projected in the Lenin Plan of the State Commission on the Electrification of Russia, 1920 (GOÉLRO). It was also the largest in Europe [2]. Its design and construction were directed by the most prominent hydraulic engineers of that time: Ivan Gavrilovich Aleksandrov, Boris Evgen'evich Vedeneev, Aleksandr Vasil'evich Vinter, Pavel Pavlovich Rotert, and others. The whole country participated in the construction of this firstling of GOÉLRO in the Ukraine. The body of people comprising representatives from many of the Union's republics, inspired by the Party's decisions regarding the industrialization of the Soviet Union's national economy and united by the leaders and public organization of the construction forces, successfully coped with the unit problems, and by 1932 the first units were commissioned [1-5, etc.]. Dneprostroi was a masterpiece of construction. Here, the level of mechanization provided was high for that time; the construction rates were high, and the standard of the works excellent; and the first world records for concrete placement were established. The construction work became a great school for hydraulic engineers, who were later faced with the execution of large hydraulic works in other Soviet republics.

This first of the Dnieper hydro cascade was of great importance in the development of the productive capacity of the Ukrainian SSR. The cheap electrical energy produced by this station and transmitted for the first time in the Soviet Union by 154-kV power lines to substations at Krivoi Rog, Dnepropetrovsk, Nikopol', and Dneprodzerzhinsk promoted the rapid development of industry and electrification of the cities and villages of the Dnieper region. In 1940, the Zaporozh'e-Kurakhovka 220-kV transmission line was put into service, connecting the Dnieper and Donbass (Donets Coal Fields) power systems; the energy generated at the Dnieper hydroelectric stations started to supply the coal industry also. This raised the role of the hydroelectric station as a regulator in increasing the operational efficiency of thermal power stations of the two power systems and in improving the reliability of power supplies to the most important users of electrical energy. The output of the Dnieper hydroelectric station increased with the demand for electrical energy, and in 1936 and 1937 its annual production exceeded that of the whole of Tsarist Russia in 1913. With the installation of the ninth unit in 1939, the station's capacity rose to 560 MW, and the energy output during 1932-41 amounted to 16.75 billion kWh. In April, 1939, the design and construction staff was awarded the Order of the Red Banner of Labor for its successful and accident-free work, exemplary organization of the Stakhanov movement, and adoption of new types of electrotechnical equipment.

The importance of the Dnieper hydroelectric station ranks high also in other branches of the water-industry complex. Its commissioning removed the 370-km transportation bottleneck in the lower reach of the river, hitherto not navigable. Beginning in 1932, through navigation commenced along the Dnieper from Smolensk to the Black Sea, over a distance of 1500 km. The reservoir formed by the Dnieper hydroelectric station subsequently was very valuable also in supplying irrigation water.

During the Great Patriotic War, fascist barbarians destroyed the hydroelectric station, but within four months of expulsion of the enemy from the occupied territory, restoration work was commenced under the direction of F. G. Loginov, and by 1947 power generation had begun again [6 to 12], and the station thereafter played a great role in the re-establishment of the national economy. The station's share in the Dnieper power generation system's

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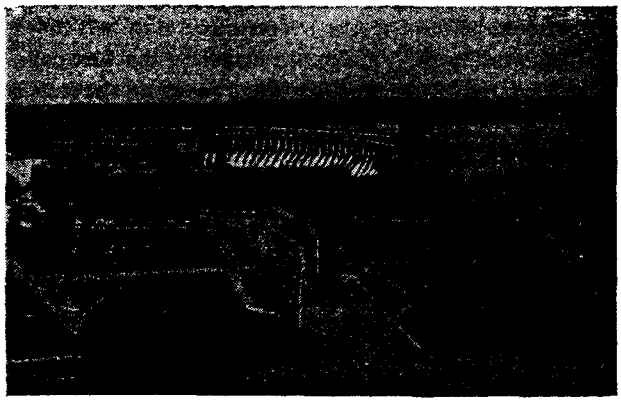

Fig. 1

energy output was very significant. In 1950 it amounted to 67%, and in 1955 it was 52%. Even now, the Dnieper hydroelectric station plays a very important role, irrespective of the new hydropower stations on the Dnieper and large thermal stations which have been put in service. Its installed capacity comprises 30% of the cascade total, and its energy output is 45% of the gross figure; furthermore, it serves as a highly maneuverable (flexible) source of power for peak regulation and standby reserve under normal conditions and whenever it becomes necessary to meet emergency conditions resulting from a power deficit. The station is distinguished by high technical-economic indices. Its internal services use 0.147% of the output, the net cost of producing electrical energy is 0.061 kopeck/kWh, and the utilization of installed capacity reaches nearly 5300 h/yr [13].

The V. I. Lenin Dnieper hydroelectric station is also an undertaking with a high operating efficiency. The completion of a complex automation of the operation of the principal and auxiliary equipment and the introduction of several elements of system automation have produced very good results. Many of the systems and equipment items introduced at this station were subsequently adopted at other hydroelectric stations of the Soviet Union, e.g., the putting in service of reserve units, automatic push-button interruption of electric transmission, automatic dewatering of the turbine-runner chamber by compressed air, simplification of the automation systems, speed regulation, etc. [13-27]. Improvements in the automation system raised its operational reliability (the number of plant failures dropped from 17 to 0.3 or 0.4%), and the automation of the operation of the principal and auxiliary equipment enabled the number of shift personnel to be reduced by two-thirds (from 18 to 6 per shift).

Great importance was and is being attached to raising the qualifications of the hydrostation personnel, combining professions, organizing socialist competition, as well as the rationalization, ingenuity, and introduction of advanced technology. All this enabled the operational reliability of the plant to be raised, the period between repairs to be increased, and the numbers of the industrial and production personnel to be halved following the prewar period and commencement of the postwar period of operation. The great experience gained by the staff at the Dnieper hydroelectric station was subsequently used at other hydrostations. The journal "Hydrotechnical Construction" played a big role in the dissemination of this experience [13-19].

Dozens of workers, engineers, and technicians of the Dnieper hydroelectric station were decorated with orders and medals of the USSR and awarded Certificates and Badges of Excellence by the Ministries of Power and Electrification of the USSR and the Ukrainian SSR for conscientious and highly efficient work. In June 1961, the station was awarded the title of an Enterprise of Communist Labor, subsequently confirmed by corresponding resolutions of the Ministerial Board and the Central Committee of the Trade Union. In honor of the fiftieth anniversary of the Great October Socialist Revolution, the station was presented, in recognition of its operational successes in a nationwide socialist competition, with the Memorial Banner of the Central Committee of the Communist Party of the Soviet Union by the Presidum of the Supreme Soviet of the USSR, the Council of Ministers of the USSR, and the All-Union Central Council of Trade Unions (VTsSPS).

Inspired by the historic resolutions of the 24th Congress of the Communist Party of the Soviet Union, the workers of the V. I. Lenin Dnieper station are successfully shouldering the socialist responsibilities undertaken in honor of the nationwide celebration of the fiftieth anniversary of the establishment of the Soviet Union. There is no doubt that the leading brigade of Soviet hydropower engineers – the famous V. I. Lenin Dnieper group – will successfully cope also with the new problems which arise in connection with the station expansion. In the postwar years, following this first of the Dnieper cascade, the following hydrostations were constructed and are operating: Kakhovsk, Dneprodzerzhinsk, Kremenchug, and Kiev. Construction of the Kanev station, the last step of the lower Dnieper cascade, is nearing completion, the power development and the reconstruction of navigation facilities of the lower Dnieper will be completed, and the irrigation of over 2 million ha by Dnieper waters will be made possible. A big role in this complex will be played by the great flood-storage reservoir of the Kremenchug hydro-

electric station. In this connection, the 13 submerged spillway outlets of the Dnieper hydrostation dam will now be used for enlarging the hydrostation. On April 22, 1972, the anniversary of V. I. Lenin's birthday, the first concrete was placed in the machine-hall foundations of Dnieper hydrostation II. A well-attended meeting was held at the site and P. S. Neporozhnii, Minister for Power and Electrification of the USSR, placed a commemorative plaque in the foundation. The capacity of Dnieper hydrostation II will be 828 MW, the first units will be placed in service in 1974, and in 1975, the end of the ninth Five-Year Plan, the total capacity of the station will reach 1500 MW [28].

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*This article and those in Nos. 4, 5, and 7-19 of the literature cited were published in "Gidrotekhnicheskoe Stroitel'stvo."