Previous lag behind schedule and to provide placement of the first concrete of the dam on time. The channel part of the dam pit was excavated in 1.5 months.

Works in the powerhouse pit were carried out by the same technology, only the ramp to it was made on the lower pool side.

CONCLUSIONS

1. The proposed technology markedly increased the rate of rock excavation in the pits of the Kurpsa hydrostation.
2. A considerable reduction in expenditure of heavy manual labor on drilling holes and on works with picks was achieved.
3. The quality of the prepared foundation completely corresponded to the technical specifications.

LITERATURE CITED


EXPERIENCE IN LARGE-SCALE MECHANIZATION IN THE CONSTRUCTION OF THE UNDERGROUND INCLINED SPILLWAY OF THE NUREK HYDROELECTRIC STATION

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The spillway of the Nurek hydrostation with a surface intake and cross-sectional area of 170 m² has two sections: a horizontal section, for which a part of the route of the diversion tunnel was used, and an inclined (30-35°) section cut into the crown of the diversion tunnel. The entry portal of the inclined section is located at the surface level of the reservoir and is equipped with vertical-lift gates.

The Tadzhik specialized administration of the All-Union Trust for Special Hydraulic Engineering Works (Gidrospetsstroi) has gained considerable experience in constructing large-section horizontal tunnels [1]. By analogy with horizontal tunnels, the inclined spillway was constructed in six stages (Fig. 1): driving of the 2.5 × 2.5-m pilot chute; driving the upper bench to full cross section; concreting the tunnel crown; driving the lower bench; finishing off of the siderock, invert, and walls, assembly of the tunnel-wall reinforcement; concreting of the invert and walls.

Access tunnels were preliminarily driven to the route of the inclined section at different levels from the surface, which were then branched for access to the mass of the upper (1K and 5K) and lower (1KA and 5KA) benches. Rock pillars were left between 1K and 1KA and also between 5K and 5KA, which made it possible to work simultaneously in three isolated sections of the tunnel route.

The pilot chute was driven in section 1KA-5K and then in section 5KA-entry portal with the use of a mechanized KPN-1M mole [2]. During tunneling certain difficulties arose, which were overcome by modernizing the mole.
Fig. 1. Profile of the inclined part of the spillway and its cross sections. a) Driving of pilot chute; b) driving of upper bench; c) concreting of upper bench; d) excavation of lower bench; e) excavation of side rock, assembly of wall reinforcement; f) concreting of walls and invert; g) driving of pilot chute in funnel-shaped section; h) driving of upper bench in funnel-shaped section; i) concreting of upper bench in funnel-shaped section.

Fig. 2. KPN-1M mole modernized for driving tunnels with an inclination up to 30°. 1) Catch; 2) reduction gear; 3) cabin; 4) air cylinder; 5) working platform.

The blasted rock thrown by the explosion from the face of the pilot chute under conditions of considerable water saturation did not roll along its foot at an angle of 30-35°, which is less than the angle of repose, but lay as a heap whose height prevented passage of the working platform of the KPN-1M mole to the face. It was laborious and dangerous to make a bypass of the rock, being below its main heap.

To provide passage of the KPN-1M platform over the heap of blasted rock, its design was changed in the following way. The height of the cabin was reduced by 200 mm and the fastening rods of the working platform were replaced by air cylinders, which made it possible, having raised the platform (Fig. 2), to bring the KPN-1M platform to the face, where, having lowered the platform to the working position, the rock was thus bypassed from the top down. This greatly increased the tunneling rate, since simultaneously with bypassing the rock the face was drilled off. In addition, the safety of the works and convenience of performing them increased.

After driving the pilot chute in section 1KA-5K and later in section 5KA-entry portal the chute was completely cleared of rock, its base was concreted and covered with metal sheets to reduce the angle of friction of the rock sliding down the chute during subsequent