EXPERIENCE AND PROSPECTS OF USING VIBRATING ROLLERS
IN HYDROTECHNICAL CONSTRUCTION

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The fulfillment of the volumes of earthworks outlined in the Twelfth Five-Year Plan is possible only with the appropriate provision of builders with highly productive equipment for all stages of performing earthworks: excavation of borrow pits, transport of the soils to the construction site, placement, grading, and compaction.

Soviet industry has mastered the production of powerful excavators for excavating borrow pits, heavy-duty dump trucks, and wide-span bulldozers. Preparation is under way for introducing the cyclic flow technology of constructing dams, which calls for delivering soil to the dam with the use of conveyor complexes and efficient coordination of the works of the entire cycle on the basis of an automated system controlling the technological process of dam construction. However, in the overall technological chain of performing earthworks in hydrotechnical construction one of its most important elements still remains not being provided with appropriate means of mechanization. Builders have practically no compacting equipment which with a high rate of placing earth materials makes it possible to provide their required density.

It has been confirmed by investigations conducted in the country and by the practice of hydrotechnical construction that with mass placement of earth materials by the method of their layer-by-layer dumping, heavy vibrating rollers are the most effective compacting machines. The high intensity of the dynamic action created by the working implement (vibrated roll) in combination with the large number of repetitions of the loads make it possible to obtain with a fewer number of passes a degree of density substantially higher than in the case of a static roller.

Vibrating rollers effectively compact not only various types of earth materials but also stiff roller-compacted concrete and cement-soil mixes, which in recent years have been finding ever wider use in construction.

The requirements imposed on vibrating rollers for power construction substantially differ from those being met by the vibrating rollers being produced by Soviet industry for highway construction, primarily in connection with the use of different soils - coarse-fragmental and cohesive, requiring considerable specific energy expenditures for compaction when placing them as thick layers. In accordance with the conditions of modern technology of constructing earth and earth-rock dams, a higher (by 2.5-3 times) productivity of the compacting means is required. It is necessary to be able to regulate the intensity and frequency of applying the load for selecting the most optimal regimes of compacting when placing various materials. A higher degree of compaction is also required for Soviet hydraulic structures being constructed in seismically active regions.

Additional requirements are imposed on vibrating rollers for compacting rollcrete with respect to their dimensions and maneuverability for working in abutments and other confined places.

In essence the industrial production of vibrating rollers for hydrotechnical construction has not been organized in our country. The only type of heavy vibrating roller, the PVK-70EA (designed by the Volgograd Industrial Department of All-Union Planning, Surveying, and Scientific-Research Institute (Gidroproekt)), was produced in small batches (units per year), which in no way has solved the problem. Moreover, the production of these rollers in the first years in the 12th FYP was held up due to rejection of the tractors making up their sets. Modification of this vibrating roller with another tractor has still not undergone acceptance tests.

There have been attempts to create also other types of heavy vibrating rollers with directed vibration of the rolls on the basis of the developments of Gidroproekt. Among them is the SPVK-51 vibrating roller and its modification SSVK-51 and SVK-50, and also the PVK-71, which had a number of substantial advantages over other developments. However, not one of these machines was delivered for mass production, and some models have not even undergone thorough tests and further development.

In 1985-1986 the Krasnoyarsk Hydroelectric Station Construction Administration (Krasnoyarskgesstroy) reconstructed the SVK-50 vibrating roller to use it for compacting a lean concrete mix at an experimental test area. As a result of reconstruction, the design and arrangement of the roller was considerably changed with a reduction of the mass of the trailer part from 25 to 15 tons, the electromechanical drive was replaced by a hydraulic drive, the frequency of vibrations was increased, and the amplitude of vibrations was decreased. The modernized vibrating roller (Fig. 1) proved to be efficient for compacting the concrete mix, but it is inferior, according to the conclusion of builders, to the BW-200 vibrating roller (Federal Republic of Germany, FRG) in productivity, maneuverability, and convenience of operation.

In accordance with the contract design approved in 1983, the Zhigulevsk "Énergoremash" plant in 1986 manufactured the towed vibrating roller developed by the design department of the Main Administration for Mechanization of Construction (Glavenenergostroimehanizatsiya) (now Glavenergomash).

Tests of the vibrating roller (Fig. 2) were organized at the construction site of the flood-control structures of Leningrad and will be completed in 1987, after which further improvement of its design and small-batch production are planned.

In the search for highly productive means of compacting soils for the needs of hydro-technical construction, the Tadzhik Hydropower Construction Trust (Tadzhikgidroenergostroi) as long ago as 1980-1981 developed and manufactured the self-propelled V-22 vibrating roller,