DRILLING AND BLASTING OPERATIONS IN POWER CONSTRUCTION

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The All-Union Planning, Construction, and Installation Association Soyuzgidrospetsstroi since 1960 had been carrying out drilling and blasting operations mainly on the construction of hydraulic-engineering facilities and subsequently on practically all power facilities.

A characteristic feature of the construction of power facilities is the steady increase of the volumes of rock excavation, which is related to the use of the drilling and blasting method of lossening the rock mass.

The volume of drilling and blasting operations performed increased from 4.5 million m³ in 1960 to 40 million m³ in 1990 (Table 1).

During 31 years, 987.5 million m³ of rock, including 281.5 million m³ of shaped excavations, was blasted.

The performance of drilling and blasting operations (DBOs) under complex climatic, topographic, and mining-geological conditions, with consideration of the high requirements imposed on preservation of foundations, walls of excavation and pits, and near existing structures without stopping them, necessitated the search for and development and introduction of new technological schemes and blasting methods, and also the use of new explosive materials and new drilling equipment, on the level of development of which substantially depend the technological possibilities of blasting operations.

During the first years low-productivity churn drilling rigs were used in DBOs in power construction. The markedly increased volumes of DBOs promoted the equipping of drilling stock with type BTS medium-weight and type BMK lightweight rigs.

In the 1970s powerful rotary-drilling rigs were developed with the use of roller cone bits as the drilling tool. The productivity of the drilling equipment increased by a factor of 5-6 in comparison with the former types of drilling. Today 81.5% of the total volume of drilling operations is performed by roller cone bit drilling rigs. The results obtained permit the assumption that the roller cone bit method will keep a dominant position in power construction for a long time.

The volumes are distributed according to types of drilling so: pneumatic hammer drilling 13.6%; roller cone bit drilling 81.5%, including with a 150-mm hole diameter 27% and 216-mm hole diameter 54.5%; rotary drilling 4.9%.

These data confirm the great need for BTS-150 roller cone bit drilling rigs and type SBSh rigs.

At present only the association is producing a modernized model of the BTS-150 rig, considering that it has not exhausted its mechanical possibilities. There are joint proposals of the Moscow Mining Institute and association for further modernization of the BTS-50 rig, markedly increasing its productivity. These proposals will be realized in 1992. The possibility of combining the pneumatic hammer and roller cone bit drilling methods is the main proposal.

The combination makes it possible to considerably reduce the axial force on the tool and to increase the rotational speed with increase of rock strength. Hence the energy consumption of the rock-breaking process under high-frequency impact loads and increased tool rotational speed increases less intensely.

Vibrations of the rig decrease owing to the absence of a rigid connection of the bit with the drill column. The use of the possibilities of hammer-roller cone bit drilling increases the drilling rate by 25-30% and the wear resistance of bits by 1.8-2 times. At the same time, with consideration of the need to use small-diameter blasthole charges (up to 100-120 mm), such drilling methods as pneumatic hammer and rotary also need to be preserved and developed. The use of such blasthole diameters is necessary for preserving rock foundations and walls of construction excavations.

At present the volume of drilling by the indicated method is 150,000-200,000 m per year.
### TABLE 1

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<td>Volume of construction and installation works, million rubles</td>
<td>70.9</td>
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<td>143.0</td>
<td>206.0</td>
<td>230.0</td>
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<td>Actual volume, million m³</td>
<td>96</td>
<td>143</td>
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<td>210</td>
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<td>including shaped excavations, million m³</td>
<td>27.4</td>
<td>40.8</td>
<td>39.4</td>
<td>54.2</td>
<td>58.8</td>
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<td>Quarries, million m³</td>
<td>68.6</td>
<td>102.2</td>
<td>98.6</td>
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<td>million m³</td>
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**Fig. 1.** Dynamics of the growth in the volume of drilling and blasting operations.

**Fig. 2.** Crushing of oversizes at the quarry of the South Ukraine power complex.

The given works are performed by pneumatic hammer drilling rigs. Development of this method is related to improvement of the technical and economic indices of the main tool — the downhole pneumatic hammer, the possibilities of which at the existing compressed air pressure have already been exhausted. An increase of the compressed air pressure is a major means of increasing the capacity of pneumatic hammers. Laboratory investigations of pneumatic hammers intended for driving holes with a diameter of 85-105 mm and calculated for a pressure of 1.8-20 MPa showed that the drilling rate, in comparison with hammers operating at a pressure of 0.5-0.6 MPa, increases by a factor of 3-3.5, in connection with which it is necessary to take into