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## IMPROVING THE EFFICIENCY OF PNEUMOPERCUSSION MACHINES

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**Purpose.** Using the special pneumopercussion machines it is improving the efficiency of the process of the thermodynamic processes in the working chambers.

**Methodology.** The studies were carried on thermodynamic processes of compressed air work in the working chambers of pneumopercussion machines for the increasing their efficiency.

**Findings.** The article presents efficiency of using compressed air energy in the operation of existing pneumopercussion machines is 15-20%, which significantly increases the cost of drilling operations. Therefore, an increase in efficiency pneumopercussion machines is an important technical challenge. The article discusses ways to increase the efficiency of pneumopercussion machines by combining the most effective thermodynamic processes of compressed air work in the working chambers of pneumopercussion machines and a new technical solution for the design of pneumopercussion machines is proposed. The design of a pneumatic hammer has been developed, which implements the combination of the most effective thermodynamic processes in the chambers of pneumopercussion machines. The design of a new pneumatic hammer is presented, which consumes twice less compressed air during operation than any of the existing hammers with the same frequency and impact energy. Its work and the method of calculating geometric parameters are described.

**Key words:** pneumopercussion machines, pneumatic hammer, efficiency, compressed air

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## **FUNDAMENTALS OF CREATING INNOVATIVE SYSTEMS OF MINERAL RESOURCES DEVELOPMENT ON THE MOON, MARS AND ASTEROIDS**

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**Introduction.** Human needs for resources are growing every year. Waste recycling and alternative sources of electricity will not be able to meet the growing needs of mankind. The number of useful resources on our planet, unfortunately, is limited [1, 2].

**Purpose.** Even now, some of mineral resources are more difficult to extract than, say, 150-200 years ago. According to the UN, a 3-fold increase in resource use is projected by 2050. In the long run, man will have to explore new resources outside the Earth. The only place for new reserves of resources and energy is space. This could be the development of minerals from the surface of asteroids and other planets.

**Methodology.** The results of spectroscopic studies and chemical analysis of meteorites that fell to Earth give us the right to believe that asteroids and comets can find a variety of minerals, including nickel, iron, silicates, gold, platinum metals, water, frozen gases and more. Asteroids contain platinum group metals about 100 g/t, ie 10-20 times higher than in the richest open deposits in South Africa or any other country in the world. The development of asteroids is now not only closer than we think, but, according to experts, in the future this direction will dominate the entire industry.

**Keywords:** design, planning, engineering solutions, innovations, mineral resources development systems, space mining

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