

*Slesarenok E.V.,
post-graduate student, specialization "Ecology"
Scientific supervisor: Basalai I.A
Assistant professor
Belarusian national technical university, Minsk, Belarus
kslesaronak@bntu.by*

ENVIRONMENTAL SAFETY AND COMPLIANCE AT MINING ENTERPRISES

During the development of mineral deposits, during the operation of vehicles, environmental damage is inevitably caused to the environment, namely, emissions of pollutants into the air, traffic noise and vibration, pollution of soil and water resources, waste generation. In the process of ensuring the environmental safety of the transport system at the mining enterprises of the Republic of Belarus, a number of unresolved problems still remain: the tendencies of the aging of the vehicle fleet have not been overcome; insufficient technical and technological level of transport equipment and equipment; the possibilities of interaction of various industries related to the development, production, operation and disposal of vehicles have not been realized. Unfavorable trends associated with the use of the transport complex contribute to the search and development of new methods to minimize the negative impact of transport on the environment and human health.

In order to reduce emissions of harmful substances into the environment during the operation of mining dump trucks, it is necessary to pay attention to the perspectives for the construction of industrial dump trucks from leading world manufacturers, namely BelAZ and Komatsu.

BelAZ tends to increase efficiency, reduce operating costs, improve the safety and create environmentally friendly its mining equipment. Diesel trolley carriers are considered to be a promising direction in line with world trends in the use of alternative energy sources in quarry equipment. The use of quarry dump trucks of this class is an effective solution for mining transport operations, as it will increase the speed of the dump truck when travelling uphill by 1.8-2 times, which in turn will make it possible to increase productivity and increase the volume of traffic. Along the way, a decrease in fuel consumption will be ensured, emissions of harmful substances into the environment will be significantly reduced and the ecological situation in the quarry and adjacent areas will be improved. It can move up to 2 times faster than a conventional dump truck, while significantly reducing fuel consumption and emissions. The transition to diesel trolley vehicles will make possible the use of diesel engines of lower power. Three developments of BelAZ specialists in this direction can be pointed out: - a diesel-trolley vehicle, an electric-trolley vehicle and an electric-locomotive dump truck or an electric dump truck using a traction battery pack as a power plant. A control system for trolley equipment of BelAZ own production is being developed nowadays to create an electric trolley truck based on a 220-ton truck BelAZ-75306 - a completely environmentally friendly quarry vehicle, free from harmful emissions.

It should be taken into account some features of the operation of such a transport, in particular the fact that the best electrical energy storage units, in terms of their specific indicators, are capable of providing almost 20 times less power reserve in comparison with diesel vehicles. Now a dump truck, when moving with a load downhill, without recharging, can work for about eight hours. But since 95% of the movement of dump trucks in the quarries are carried uphill, then after each haul cycle the vehicle must be recharged.

The Komatsu company, producing dump trucks, that are also used at the mining enterprises of the Republic of Belarus, is also working in the same direction. Dump truck manufacturer Komatsu has seriously considered improving the environment and saving money on fuel by converting its mining truck to an all-electric one. The eDumper weighs 45 tons and is able to lift more than 60 tons at the same time. An interesting feature of the eDumper is that it basically does not need recharging the battery. This phenomenon is possible thanks to the innovative regenerative braking system. When the eDumper moves uphill, it loses some of its charge, but when travelling downhill, it generates more electricity than it spent on the ascent. Thus, thanks to new technologies, this electric giant is able to produce more electricity than it spends. The eDumper is based on the well-known Komatsu HD 605-7 dump truck. This dump truck is driven by an electric motor, namely a battery, the capacity of which is about 600 kWh, and the weight is approximately 5 tons. The maximum speed of the dump truck with such dimensions reaches 70 km/h. Thanks to regenerative braking, the eDumper can produce about two hundred kWh of excess energy daily, which is equivalent to 75 megawatt hours per year. A similar dump truck without an electric motor consumes 10,000 to 20,000 gallons of diesel fuel annually. This means that up to 196 metric tons of carbon dioxide is saved every year. Also, the rejection of diesel fuel towards the use of electricity will save from 45,000 to 50,000 tons of diesel fuel per year [1].

Referenses

1. Intelligent living [Электронный ресурс]. – 2019. – Режим доступа: <https://www.intelligentliving.com/> - Дата доступа: 10.03.2021.