

УДК 629.353.014.7

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Quarry Dump Trucks

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Today, transport plays an important role in our life. Many things and processes today are simply unimaginable without transport. From an economic point of view, transport is an integral part of any production, operation of enterprises, and also serves to deliver all types of raw materials, fuels and products from points of production to points of consumption. But transport brings a lot of problems, one of which is environmental pollution. With the increase in the number of cars over the past 50 years, more harmful substances have been released into the atmosphere than have not been released in several hundred years. As for large trucks and other large vehicles and vehicles, they pollute the environment much more. Off-road vehicles are no exception and also have a detrimental effect on the environment. Dump trucks, due to their power and size, as well as due to operating modes, account for the largest share of off-road emissions. Moving ore in quarries accounts for over 70% of the fuel consumed. As the scale of mining operations grows, the role of haul trucks is constantly growing. In particular, the number of mining trucks in operation in the world is constantly growing. Thus, the largest supplier of mining equipment BELAZ annually sells about 800 dump trucks in Russia alone, and this number is constantly growing. But apart from Russia, BELAZ supplies its products to other countries.

One of the most popular and large quarry dump trucks in the world is considered to be the Japanese Komatsu. The

Komatsu HD 605-7 model has gained wide popularity all over the world. This model has a six cylinder four-stroke turbocharged, air – to – air after – cooled engine with water – cooled. Komatsu SAA6D170E – 5 engine provides 533 kW 715 HP (Net). With a Common Rail Injection (CRI) system, the engine is capable of delivering high power while still consuming fuel to a minimum, thus improving the speed of the engine. Large amounts of torque at low engine speeds give good acceleration with low fuel consumption and help improve performance. Harmony with Environment is provided by: low operation noise, lead-free radiator, brake cooling oil recovery tank. But whatever technologies have been introduced to reduce the emissions of all the usual internal combustion engines, the electric engine is much more environmentally friendly [1]. 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. eDumper – this is the name given to this electric "monster" weighing 45 tons and the ability to lift more than 60 tons at the same time. An interesting feature of the eDumper is that it basically does not need to be recharged. This phenomenon is possible thanks to the innovative regenerative braking system. Regenerative braking is a type of electric braking, as a result of which, during braking, part of the energy generated by electric motors operating in generator mode is returned to the electrical network. When the eDumper moves uphill, it loses some of its charge, but during the descent 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. eDumper is based on the well-known Komatsu HD 605-7 dump truck. The maximum speed of the dump truck with such dimensions reaches 70 km/h. 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. What would you understand, the Tesla Model S long-range battery weighs 6.5 times less. 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. But soon the eDumper mining dump truck may not be the only electric dump truck in the world. By the end of 2021, tests of the new type of fuel cells will begin. Thus, the largest electric dump truck in the world can become a hybrid model from South Africa, capable of working not only on electricity, but also on hydrogen. The British company Anglo American has already begun to develop this, indeed, a giant electric car weighing more than 280 tons. By the beginning of 2030, Anglo American predicts to reduce greenhouse gas emissions by 30 percent. Most of the concept work has been completed, but UK-based Williams Advanced Engineering will try to implement a patented high voltage battery system for the mining truck, which is still under development. Their main idea is to replace our familiar diesel engine with an upgraded high-power modular lithium-ion battery. If the eDumper is a mining truck used to transport marl and lime from mountain slopes in Switzerland - fully adapted to clean electricity and physics as an energy source, then the Williams Advanced Engineering truck will be a hybrid, which will use both battery and lithium -ionic battery. This dump truck will have an energy reserve of more than 1000 k/h.

References:

1. Komatsu [Electronic resource]. – Mode of access: <https://home.komatsu/en/> – Date of access: 17.02.2021.