

CONCEPTION OF CREATION OF CONTROL SYSTEM COUPLING OF NEW GENERATION

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The aim of the Ukrainian Railways to ensure high-speed traffic and the increasing traction of locomotives require modernization of the existing rolling stock and developing advanced systems to improve efficiency, energy saving, traction and braking characteristics of locomotives.

One of the advanced systems mentioned above is the sand system, which is designed to improve the cohesion coefficient of wheels and rails and reduce the probability of skidding. Study of the sand systems designs and their work allowed to identify the main shortcomings that affected the locomotive and the road economy, and also negatively affect the environment. Given these shortcomings, the authors have developed, tested and brought to the model samples two promising directions control traction rails: 1 – modernization of the existing sand system that will allow jet-abrasive effect on the surface of the rolling element, wherein a pulse shape to adjust the performance is used and, thus, reduce the consumption of abrasive material up to 3-7 times, depending on the operating conditions; 2 – to clean the railways with the brand new dry ice granules supplying system.

Obvious advantages of the second direction contribute to increasing its spread as in the industrial sector as in the service sector. Cleaning with dry ice granules surfaces of wheel and rail from a "third body" has the following advantages: dry ice is environmentally friendly solid phase of carbon dioxide (CO₂) with a temperature of -79°C, owing to these unique properties after contact with surfaces it heats up and sublimates (evaporates) into the atmosphere, does not require disposal of "secondary waste"; dry ice granules do not damage the surface, which after sublimation of the granules remain dry, which reduces the coefficient of friction due to the presence of water and does not affect sensitive electrical equipment.

The efficiency and intensity of cleaning with dry ice granules is provided by three effects: mechanical – compressed air flow with the dry ice granules impacts the surface at a speed of about 100 m/s, performing the removal of impurities; heat – heat exchange between the surface and the ice granules causes a intensive local cooling and fragility of contamination, causing thermal shock; freeze – formed through the cracks the dry ice granules penetrate into the layers of dirt and sublimate in them into more than 400 times expansion after fast change of the phase state, thereby forming a rarefaction wave and there is a complete separation of contaminants.

The feasibility of using dry ice granules is confirmed by the performed laboratory tests, analysis of basic and applied research, which shows that when cleaning surfaces covered by oil pollution, this method is most effective.

The authors have obtained patents for utility models and inventions of Ukraine in developed research areas. The search of scientific and industrial organizations for joint research, prototyping and participation in grants is conducted.