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Reliability of Mining Wagon Exploitation

Mining-geological features of coal bedding in Western and Central Donbass specifies the usage of conveyor and locomotive transport to haul the production. The most widespread is locomotive transport. Therewith the safety demands of its usage is higher than conveyor transport.

The main technological link of this scheme is rail wagon. It is necessary to point out that maintenance quality is essential for safe and effective production. However, old-fashioned and outworn wagons need increasingly bigger maintenance.

According to study chassis is influenced by wear and damages. The main causes of wagon damage are bearing destruction, outworn of wheel tread, destruction of axle fixing.

The cause of low reliability is high dynamical loading, which is induced by railroad imperfection, its insufficient maintenance, geological characteristics of mine working, condition of pumping system etc.

Enumerated factors increase the danger of wagon derailment because of wheel oncoming onto the railhead both during straight-line motion (wagon expression, lateral movement) and in curvatures. According to Sled's N. research it was found out that parameters of rail track differ from normative up to 20%. As a result there is lack of loading onto each wagon's wheel. It was determined that 10-15% of exploration time one of all wheels is totally off-load and provokes the derailment. According to MakNII research, the amount of locomotive derailment is 1-2 per day, while wagon is 2-3 per shift. As a result, every derailment causes nonproduction delay of transport, mining complexes, communication destruction, injuries.

The prospective way to improve mining wagon running stability and decrease dynamical loads is modernization its chassis. It reduces the influence of railroad imperfections onto wagon.

Such effect could be reached by adding the kinematical movability to wagon chassis' links. Implementation of this type of design, motion stability of mining wagon and wear resistance will increase.

However, experimental research of modernized wagon dynamics is the task, which needs significant financial expenditures. That is why the dynamical analysis of mechanical system is appropriate to provide mathematical simulation.

The objective of this work is to determine stability factor of oncoming wheel in small radii curvatures for stationary and oscillating chassis by mathematical simulation using certain math software.