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APPLICATION OF FLANGELESS RUNNING WHEELS IN BRIDGE CRANES

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In the process of using high-capacity overhead cranes at metallurgical plants, the largest number of downtimes are caused by problems in the transmission of mechanisms, the operation of the flanges of the running wheels and the heads of the crane rails.

Therefore, the search for perfect crane designs in order to reduce operating costs is of great practical interest.

To improve the design of the movement mechanisms, bridge cranes are made with flangeless running wheels, in which the transverse forces are transmitted to the crane rails or underrail structures by means of horizontal rollers.

In some cases, when rimless wheels are used, the functions of the rims are performed by horizontal rollers, which limit the skew of the running wheels and protect them from derailment.

The roller in contact with a rail transfers loading

$$H=TL/K', \tag{1}$$

where T – is the skew force, which is determined by the weight of the crane G and the load Q, the device of the movement mechanism and the design features,
K′ – the distance between the rollers.

Changing the direction of viewing the crane, canceling the wheels on the rails and other points make a more changed picture, which confirms the data obtained by Balashovim V.P., as well as special experiments with cranes with a capacity of 12,5 tons and 100 tons [1].

The results of the experiment give an approximate dependence H=0,04(G+Q) and correspond to the magnitude of the skew force.

To calculate the details of the mechanism of movement of the bridge crane and crane structures, it is necessary to determine the magnitude and nature of the change in transverse forces acting on the flanges of the running wheels of the cranes. Additional resistance to movement of cranes from friction of flanges about heads of rails is considered by factor of flanges K_p=1,2/1,8.

To calculate the mechanisms of movement of the bridge crane and crane structures, it is necessary to determine the magnitude and nature of the change in transverse forces acting on the wheel flanges and underrail structures [2].

Knowing the actual service life of the running wheels, the size and operating conditions of the crane, you can determine the maximum value of the transverse forces acting on the wheel flanges [3].

In order to reduce the value of the maximum values of the transverse loads acting on the shop building, it is proposed to use rimless running wheels with horizontal rollers in combination with hydraulic dampers.

Calculations show that the use of dampers with horizontal rollers reduces the effort of horizontal pressure on the crane rails or underrail structures in 3-5 times.

Thus, the use of flangeless running wheels with damping devices increases the service life of the mechanism of movement of bridge cranes, as well as reduces energy consumption.

Studies have shown that the crane with a separate drive and conical drive wheels, oscillating in the plan, when moving is centered on the crane track, even under the condition of friction of the flange on the rails.

Therefore, the use of conical drive wheels in bridge cranes with a separate drive mechanism is appropriate, because the crane acquires the ability to automatically fit into the unevenness of the crane track, which increases the durability of rails, wheels and other parts, as well as reducing energy consumption [4]. Experiments conducted on cranes with a capacity of 15 tons and a span of 28,5 m. mainly confirm the theory.

Compared to the central, the separate drive with bevel drive wheels has less centering capabilities, because in conditions of limited taper ($k \le 0{,}25 – 0{,}3$) and in the absence of mechanical and electrical synchronization between the rotors of drive motors, the period of crane oscillation in the plan increases significantly (at least 2-3 times).

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