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ANALYSIS OF MODERNIZATION PROBLEMS FOR A LIFTING-TRANSPORT EQUIPMENT OF METALLURGICAL PLANTS OF UKRAINE

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The analysis of the problem of increasing energy efficiency, improvement modes and general economy of exploitation for elevating transport equipment and, In particular, modernization of bridge elevating cranes for metallurgical plants of Ukraine is carried out. The engineering solutions for mentioned problems with minimal financial and time costs are offered.

Keywords: bridge elevating cranes, electric drive, energy efficiency, power resistors, IGBT modules

A problem of energy-savings for lifting-transport equipment of Ukraine, as known, is a very urgent problem. Exploitation of physic- and morally obsolete equipment for a control by electric motors with the use of power is reduced resistors to 30-40 % losses burden from power of electric motors.

The lion's part of lifting-transport equipment on metallurgical plants is consisted bridge lifting's cranes work of which is the important constituent of technological processes. The characteristic feature of power-driven part of mechanisms of such equipment is application of electric motors of direct-current of successive excitation or alternating current with a phase rotor and contactor-relay apparatus in power circles [1].

During the calculations of losses of energy for such sort of electromechanics it is necessary to determine the type of mechanical energy which disperses in power resistors at work of existent lifting-transport equipment. In the mode of acceleration of mass of burden and mass of equipment, which presents almost 50 % burden, in a horizontal plane there is stocking only of kinetic energy on a formula:

$$W_k = \frac{m \cdot v^2}{2} + \frac{J \cdot \omega^2}{2} \ ; \qquad (1)$$

where W_k - kinetic energy of mobile elements in a horizontal plane; m, J - mass and moment of inertia of mobile elements for lifting-transport equipment, which move in a horizontal plane, respectively; v, ω is linear and angular speed of mobile elements of a lifting-transport equipment respectively.

At the same time on condition of moving of burden in relation to the vertical plane (getting up and lowering) general energy which provides oneself is the sum of potential energy of mass of burden and clamp facilities, and also kinetic energy of parts of mechanism of getting up with forward and rotatory motion.

$$W_g = m_b \cdot g \cdot h + \frac{m \cdot v^2}{2} + \frac{J \cdot \omega^2}{2}, \qquad (2)$$

where W_g - general energy on condition of the vertical moving of burden; m_b - mass of burden and clamp facilities which move in a vertical plane; g is an acceleration of the free falling.

The comparative analysis of values of kinetic energy of mobile elements of a lifting-transport equipment in a horizontal plane and potential energy of heaved up a

burden specifies on their considerable difference.

Except for the losses of energy considerable running expenses requires and current maintenance of bulky and high-priced contactor-relay apparatus which consists of numerous mechanical mobile parts. Actuation of these knots arrives 300-600 including in a hour and, which, as a result, have the limited resource of reliability. On the other part such frequent commutation results the power contacts of starting and braking currents to rapid electric erosion which also needs their acquisition and frequent replacement.

It is necessary also to pay attention and on influence of unfavorable factors, caused by the existent contactor-relay systems of electromechanics, on work of their mechanical part. To such factors it follows to take the considerable derivatives of moments of electric motors on condition of jumps of current in power circles, contacts of contactors caused by commutation through the sharp diminishing of electromagnetic permanent to time of anchor circle which ensues from correlation

$$T_a = \frac{L_a}{R_a + R_s} << \frac{L_a}{R_a} \ , \qquad (3)$$

where T_a, L_a, R_a - permanent to time, inductance and ohmic resistance of anchor circle respectively; R_s - resistance of starting resistor, $R_s >> R_a$.

Resistance of starting resistor R_s, speed of current increase and, respectively, and a torsional moment on the billow of electric motor arrives at considerable sizes, that negatively influences on the state of reducing gears and also working part of mechanisms of movement of faucet at presence of backlash's, which, as a rule, are in kinematics links. Maximum speed of increase of strength of current in a power circle also results in the increased wear of collector and brushes as a result of bad commutation of current between the lame's of collector for the electric motors of direct-current and mechanical burdening of frontal parts of winding of electric motors of alternating current and крутних moments core of anchor or rotor relatively arbor of electric motor.

The substantial lack of contactor-relay apparatus is a necessity of the frequent including of power circle for more exact positioning of burden which results in the considerable expense of time and wear of power equipment. Therefore the auxiliary personnel of crane must have the proper professional preparation and skills, which need considerable time for their acquisition which substantially influences on a technological process.

As experience of exploitation of a lifting-transport equipment, existent electric motors, specifies, have a large enough resource in relation to reliability of work and on condition of implementation of timely repairs and at condition of requirements of correct exploitation can work reliably enough yet during great time [2,3]. It is thus necessary to mark scientific developments of circuit technology of power circles and achievements in the sphere of microprocessor technique, which specify on possibility of the use of asynchronous engines with a phase rotor and which are the basic type of engines on an existent lifting-transport equipment, in the mode of machine of double feed. The most ponderable advantages of such mode of operations of asynchronous engines with a phase rotor are high power factors: possibility to work with passing advansing cos φ, inflexibility of mechanical description and possibility to get speed, which is higher than synchronous which is determined by permanent frequency of network of feed (50 Hertzs).

Due to considerable achievements in development of wireless communication networks and appearance of new generation of sensors of physical sizes with the built-in

microchips of microcontrollers and wireless transmission devices possibility of continuous diagnostics appear equipments on mobile objects, which are lifting-transport facilities [10] that also substantially reduce running expenses on repair and prophylactic works.

Development and introduction of such decisions to the domestic production needs the very limited financing and can be executed by designer subdivisions profile of higher educational establishments of engineering type. Compact concentration of hetero highly skilled specialists on one territory and in one organization is the guarantee of the high-quality and responsible job processing from effective modernization of a lifting-transport equipment, both from the point of view of energy affectivity and substantial upgrading of technological process, sharp diminishing of running expenses and increase of reliability factor.

Conclusions. Taking into account the presence of considerable park of an obsolete lifting-transport equipment of metallurgical plants of Ukraine, most expedient is implementation of modernization on individual projects with bringing in of scientific and engineering potential of profile higher educational establishments.

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