we have already achieved a lot, progress does not stop. Even if robotization destroys some jobs, it will also create new jobs in other industries. For example, due to a decrease in production costs, goods will become cheaper, they will be bought more, which means that more personnel will be required in the trade sphere. And professions focused on working with people will not disappear. In its turn, robotization may also be the key to solving environmental problems.

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PROSPECTIVE STRATEGIES TO SAVE ENERGY BY MEANS OF ELECTRIC DRIVE

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Electric drive is the main consumer of electric power produced in the world. More than 65-70% of all over the world generated electric power is converted into mechanical energy in induction motors (Abdullayev, 2021). Thus, it is not surprising that the issues of energy saving are extremely important and are among the main ones today.

The search for energy saving by means of electric drive is one of the most important global tasks notably for Ukraine, since the cost of electricity is constantly

increasing, and with non-efficient electric drive systems the production costs are also increasing that naturally leads to higher costs for the products manufactured by technological complexes.

To begin with, we need to review power quality parameters established by the standards when selecting electric drive systems, especially with their high installed capacity. In particular, it is necessary to consider the entire electrical circuit from the complete transformer substation, where the consumed active and reactive power as well as power quality are controlled, to the actuators of working and transport machines. The optimal implementation of a power modules set such as transformers, reactors, filters, semiconductor converters, braking means etc., ensure minimum power losses, don't violate power quality indicators at the power source and solve all technological problems.

The main methods for saving electric power in automated electric drives of technological units and complexes include the following (Abdullayev, 2021; Kornev, 2017):

- the use of regulated instead of unregulated electric drives. This will make it possible to establish optimal, in terms of energy consumption, conditions for processing the substance when changing the operating modes of technological equipment and physical and mechanical properties of the processed substance. This transition from unregulated to regulated electric drive is the general direction of energy saving, accepted all over the world and giving the greatest effect both in terms of energy saving and in other indicators of technological process;

- the correct choice of the electric motor on capacity. Often the practice of selecting a motor with excessive power leads to a decrease in efficiency and power factor;

- the application of power modules of adjustable electric drives with maximum efficiency and power factor. The electric motors controlled by semiconductor converters, for instance by rectifiers and inverters, by braking modules that provide power recovery from the motor to AC or DC voltage network are the maın ones. Besides, the maximum possible elimination of power losses can be achieved by using

braking resistors;

- the use of filter-compensating devices in electric drive supply circuits in order to increase power factor and reduce influence of higher current harmonics;

- the decrease of losses in motors and power supply networks, decrease of idling time, change of braking type in electric drives with frequent starts and braking. The problem of reactive power compensation traditionally attracts great attention and often even too much attention in domestic practice. Various technical solutions apply switched capacitor banks, synchronous compensators, filter-compensating devices, etc. However, most of these techniques are focused on unregulated electric drive, and sometimes on heavily underloaded electric drive with induction motors with a short-circuited rotor;

- reducing to a minimum the use of rheostat methods of controlling the speed of electric motors;

- the elimination of starting and braking modes of technological units and complexes as a result of using additional mechanisms with adjustable electric drives. This will ensure the combination of movements of the main mechanisms in the technological process and further transfer them into continuous operation modes.

The correct choice of the main electric equipment in the simplest, most mass and energy intensive unregulated electric drive or systems of electric drive ıs very ımportant but not popular way of energy savıng reserve. Energy saving in relation to the simplest uncontrolled most mass electric drive consists in improving the motor selection procedure for a specific technological installation in order to comply with the nominal thermal motor mode during operation. The problem statement is obvious – the motor of underpowered power quickly fails, and the motor of overpowered power converts energy ineffectively, i.e., with high specific losses in the motor itself (low efficiency) and in the supply lines. The solution of the problem is not always elementary, errors are frequent, and since there are millions of simple electric drives, great damage is possible.

European experts believe that the average engine utilization factor (ratio of average power per cycle to rated power) is at the level of 0,6. Experience shows that

in domestic conditions, this factor is usually much lower.

A significant effect in such cases can be achieved by simple replacement of equipment (motors) or introduction of automation systems, but the correct solution of such a problem requires rather high qualification of the personnel. The applied computer programs may be rather effective if they're oriented on a wide range of specialists, connected with electric drive, and support taking rational decisions. The experience of creation of such programs has shown that in spite of high expenses, efficiency of such an approach is rather high: specialists have a powerful, convenient, very easily mastered tool, which allows solving rather complicated tasks quickly.

Taking everything into account, there are many strategies to save energy by means of the electric drive. All we need is to choose the optimal one and put it into practice.

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DIRECTIONS OF MODERN ROBOTICS DEVELOPMENT

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Throughout its existence, humanity has evolved, introducing new technologies to build a comfortable life. For this purpose, robots were designed to help people perform monotonous or dangerous tasks, mainly in industrial areas.

Scientific and technological progress, the emergence of new technologies, the rapid development of robotics and artificial intelligence have made it possible to