ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 12 , December 2021

The issue of analysis and reduction of electricity consumption in agricultural facilities

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ABSTRACT: To study electricity consumption in agricultural facilities, the causes of voltage dips in remote points of the General power supply system are Considered. A method for minimizing voltage dips in agricultural facilities is proposed.

KEYWORDS*:* agricultural objects, energy consumption structure, voltage failure, electricity consumption, economic efficiency.

I. RELATED WORK

Due to the important role of agriculture in the economy of the Republic of Uzbekistan, the preparation of fodder sources for the production of livestock, poultry and fish farms and ensuring the continuity of processing is an urgent task of agricultural enterprises and their service providers. In particular, the achievement of continuity, reliability, quality and economy in the implementation of electricity supply is important.

II. INTRODUCTION

Studies show that low indicators of electricity quality are due to the share of agricultural power supply systems and electrical equipment. According to the analysis, power supply devices and systems (transformers, power lines, electrical appliances) and electrical equipment (transformers, various types of motors, etc.) used by the consumer are physically and mentally obsolete, have reached the end of their service life. it was found that the service personnel did not meet the requirements of modern technical development. Another factor that reduces the quality of electricity supply is the uneven distribution of load in agricultural enterprises. Addressing the shortcomings listed above requires a study of agricultural electricity consumers.

We know that the electrical load consists of: P active power, Q reactive power, and S full power.

If the line voltage and line current at the point in question of three-phase power lines in symmetrical mode, the quantities that characterize the electrical loads are as follows:

$$S = \sqrt{3}UI \quad (1)$$

$$P = \sqrt{3}UIcos\varphi \quad (2)$$

$$Q = \sqrt{3}UIsin\varphi \quad (3)$$

$$S = \sqrt{P^2 + Q^2} \quad (4)$$

here, φ - the angle between the phase current and voltage vectors.

All electrical appliances consume active power to one degree or another. Reactive power consumers are mainly asynchronous motors and transformers in agricultural enterprises. [1]

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We propose to conditionally study agricultural electricity consumers into 3 groups: population; agricultural production enterprises and other consumers.

a) Population. In recent years, along with the development of infrastructure in rural areas, there has been an increase in electricity consumption. That is, produced in 2020

69021.1 mln. 7012.3 million kWh of electricity. kWh corresponds to the share of the population. These figures show that about 10% of the electricity generated is consumed by households. In order to reduce these electricity costs, the population is advised to use energy-saving devices, and the power supply systems of households are being gradually modernized.

The following table shows the electrical equipment corresponding to the population living in rural areas and the average active capacity they consume:

Table 1.

Electricity consumption of households in rural areas

Electrical devices	The average installed power of the device is W.	Number of devices suitable for 100 families	Installed power suitable for 1 family
Lighting lamps	50	500	250
Irons	2000	90	1800
Air conditioners	1200	50	600
TVs	150	110	165
Refrigerators	300	40	120
Electric hobs and kettles	2500	50	1250
Other devices	500	40	200

b) Agricultural production enterprises. Examples of consumers of agricultural power grids are livestock, fisheries, poultry farms, grain cleaning points, mills, pumping stations, agricultural processing plants and other enterprises providing agricultural services. As a result of the work done to meet the food needs of the population at the expense of local producers, in recent years the number of agricultural enterprises has increased dramatically, and we can see a significant increase in electricity consumption. In 2020 alone, agricultural enterprises will produce 9202.4 mln. kWh of electricity can be seen.

Despite the fact that the purpose, structure, principle of operation of electrical equipment of agricultural enterprises are different, we can conditionally divide them into 2 parts: lighting and heating devices and motors.

We can observe that about 30% of the total electricity consumed by agricultural production enterprises is spent on lighting. We offer two ways to reduce the electricity consumed for lighting: reducing the rated power of lighting devices, optimizing the time of use of the lamp.

Reducing the nominal power of lighting fixtures requires, first and foremost, a transition to efficient electric lights that provide the desired light with low energy consumption. Such sources can be LED lights.

Optimization of lighting times can be achieved through the use of modern control structures of lighting devices, the introduction of lighting adjustment and control.

According to VS Chekryrgin's research, 75-80% of the total engines used in agriculture are engines with a capacity of up to 10 kW. 40% of them are used by agricultural farms, 25% by agronomists and the remaining 35% by subsidiary farms.

Mostly agricultural motors are supplied by small power transformers, but as the starting current is 5-7 times greater than the rated current, we can see that excess electricity is wasted in electric motors, transformers, switching devices, cable lines and other power channels.

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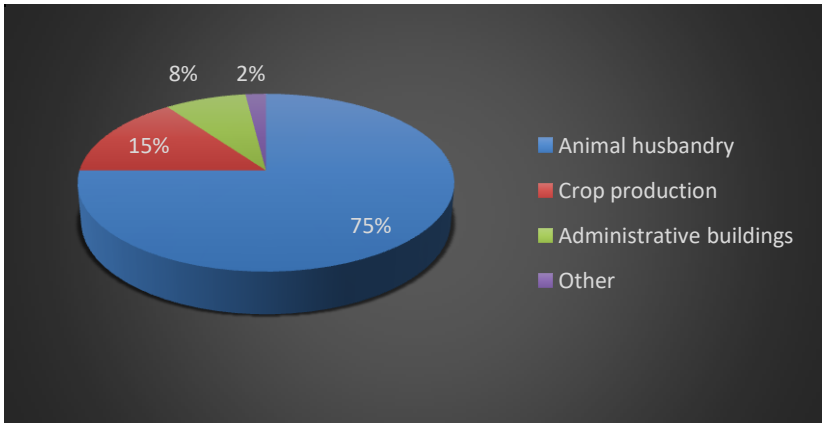
25% of the total electricity used in agricultural production enterprises is consumed by pumping units at pumping stations. Aggregates at pumping stations consist mainly of asynchronous motors. We know that the reactive power consumers in agricultural power grids are mainly asynchronous motors.

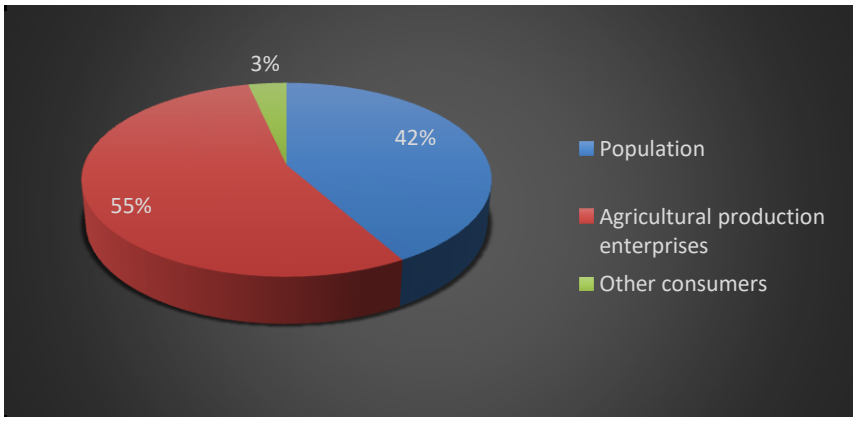
At present, the Ministry of Water Resources has 1693 pumping stations and 5301 pumping units. Most of these pumping stations and units are supplied from rural power grids. They are mainly low voltage, power

Short-circuited rotor asynchronous motors up to 200 kW are used for irrigation purposes.

Consider the state of the power supply system on livestock farms, which are an integral part of agriculture. We can divide the electricity consumers of livestock farms into several groups. The following diagram shows the group distribution of electricity consumed on livestock farms:



c) other consumers. Examples of these consumers are social protection and support facilities (hospitals, kindergartens, schools ...). If we look at the electricity consumption of this category of consumers in 2020, we can see that they are 350.82 million kWh. There is also a peculiarity in the schedule of electrical loads of social facilities. As an example, schools and kindergartens are mainly active consumers. If we look at the load schedules of schools and kindergartens, we can see that electricity consumption is mainly in line with the time of day and that their electricity load is minimal in the evening. The schedule of electrical loads of hospitals is more evenly distributed, as we can see the presence of patients in them both during the day and in the evening, and the performance of this or that operation in them at any time interval.



Percentage of electricity consumption by groups of agricultural electricity consumers

From the above data, it can be seen that a sufficient amount of active and reactive power consumption is

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
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observed in the agricultural power grid. To reduce active power consumption, replace electrical equipment used in agriculture with modern low-power, optimize the life of equipment, periodically conduct energy saving measures among the population, monitor the number of connections in the power grid, modernize existing networks, replace existing power transformers with new ones. can be achieved through a series of measures such as replacement.

III. CONCLUSION

In order to reduce the amount of reactive power consumed in agriculture - it is necessary to use controlled reactive power sources. As a source of reactive power in the power grid can be used static reactive power compensators instead of the usual synchronous compensators and longitudinal and transverse compensators.

The use of static reactive power sources gives us the following:

- stabilizes the required operating mode on the voltage and redistributes reactive power;
- reduces waste;
- significantly reduces vibration in the rotor of a synchronous generator;
- provides a high level of transmission of transmitted power under the conditions of static and dynamic stagnation;
- limits switching over voltages.

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