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REDUCE OF ENERGY LOSS IN HIGH VOLTAGE NETWORKS AND CHOOSE A WIRE WITH HIGH MECHANICAL STRENGTH FOR NETWORKS

Ergashev Abdurasul Abdumutallib o‘g‘li
Andijan Machine-Building Institute, Uzbekistan
ergashevabdurasul0102@gmail.com

Annotation
We must not allow voltage losses in high-voltage networks to exceed the allowable value in accordance with the rules of PUE and SHNK. Therefore, in order to reduce voltage losses in high-voltage networks and increase the mechanical strength of networks, we will reduce voltage losses by using AC-50 mm overhead lines instead of A-50 mm overhead lines used in networks.
For example: the active resistance of A-50 wire is R = 0.5784 Ohm for each km, the reactive resistance is X = 0.38 Ohm.

Keywords: (PUE)rules device electric installations, mechanical strength, open wire, air network, steel-aluminum wire, temperature, diameter

Technical Characteristics of Wire A-50

The long-term permissible operating temperature of an aluminum bare wire A 50 should not exceed 90 degrees.
The outer diameter of the bare wire A-50 is 9 millimeters.
The estimated mass of the aluminum atmospheric wire A-50 is 135 kilograms per kilometer.
The resistance of wire A-50 to direct current is 0.5784 ohms per kilometer.
The breaking force of the bare wire A-50 is 8198 Newtons.
The actual cross section of the wire core A-50 is 49.5 mm2.
The service life of uninsulated aluminum wire A-50 is at least 45 years.

Wire Design A 50

The core consists of 7 aluminum wires with a diameter of 3 millimeters, twisted into 1 strand.

Application of Wire A-50

Bare aluminum atmospheric wire A-50 is intended for transmission of electrical energy in overhead electrical networks, in an air atmosphere of types I and II,

provided that sulfur dioxide content in the atmosphere is not more than 150 mg / m2 day (1.5 mg / m3) on land in all macroclimatic regions according to GOST 15150-69 version UHL.

Specifications of wire AC-50/8

The long-term maximum operating temperature of the non-insulated steel-aluminum wire AC-50/8 should not exceed 90 degrees.
The breaking force of the steel-aluminum wire AC-50/8 is 17112 Newtons.
The estimated weight of the wire of uninsulated AC-50/8 is 0.195 kilograms per meter.
The outer diameter of the steel-aluminum wire AC-50/8 is 9.6 mm.
Permissible current during operation of the AC-50/8 wire should not exceed 210 Amperes.
The service life of an uninsulated steel-aluminum wire AC-50/8 is at least 45 years.

Wire Construction AC-50/8

1) Bearing core - stainless steel.
2) The core is made of aluminum wires twisted with the correct twist with the direction of twisting of adjacent layers in opposite directions.

Application of Wire AC-50/8

Wire uninsulated steel-aluminum AC-50/8 is designed for installation on overhead power lines.

Steel-aluminum wire cross section AC-50/8.0

AC 50/8.0 brand wire is an uninsulated steel-aluminum wire, the core of which is made of one steel wire, and the rest is made of one layer of aluminum wires. Manufactured using stainless steel and aluminium. The main and only purpose of the AC 50/8.0 wire is suspension on overhead power lines.
The cross-sectional area of the aluminum part of the wire is 50 mm2, the area of the steel part is 8 mm2.

Deciphering the Brand of Wire AC-50 / 8.0

A - conductive conductor made of aluminum;
C - steel core;
50 - section of the aluminum part of the wire, mm2;
8.0 - section of the steel core, mm2.

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Main Technical Characteristics of Wire AC-50/8.0

We presented all the characteristics of the wire necessary for ordering and calculation in the form of a table.

Characteristic name	Meaning	Unit. rev. Meaning
ГОСТ	—	ГОСТ 839-80
OKP wire code AC 50/8.0	—	35 1151
Operating temperature	°C	от -60 до +40
Estimated wire weight	кг/км	194
Weight of one meter of wire	кг/м	0,194
Outer diameter	мм	9,6
Cross-sectional area of the wire by elements	мм²	56,29
Sectional area of the aluminum part	мм²	48,25
Sectional area of the steel part	мм²	8,04
Permissible current	А	210
Service life, not less than	лет	45
Mechanical stress for maximum load	даН/мм²	12,0
Mechanical stress at mean annual temperature	даН/мм²	9,0
Thermal linear expansion coefficient	$1/°C * 10^{-6}$	19,2
Modulus of elasticity E	даН/мм²	8250
Breaking force resistance	Н/мм²	195
Long-term permissible heating temperature of conductors, not more than	°C	+90
Electrical resistivity	Ом*мм²/м	<0,0283
Temperature coefficient of electrical resistance	1/°C	0,00403
Maximum breaking load	даН	1711,2
Electrical resistance of 1 km DC wire	Ом	0,5951

Based on the above data, we calculate the voltage loss of the high-voltage network of PS-Balikchi-110/35/10 kV, 10-kV Guravon feeder A-50 in Balikchi district of Andijan region [5].

$$\Delta U=\frac{S*l*Z}{0.38*0.38}/10 \quad (1)$$

$$Z=\sqrt{R^2+X^2} \quad (2)$$

Here:
S-full power kVA
l- network length 0.1km
Z-full resistance
The active and reactive power coefficients in the networks are as follows: Cosph and Sinph values Cosph = 0.9, Sinph = 0.44

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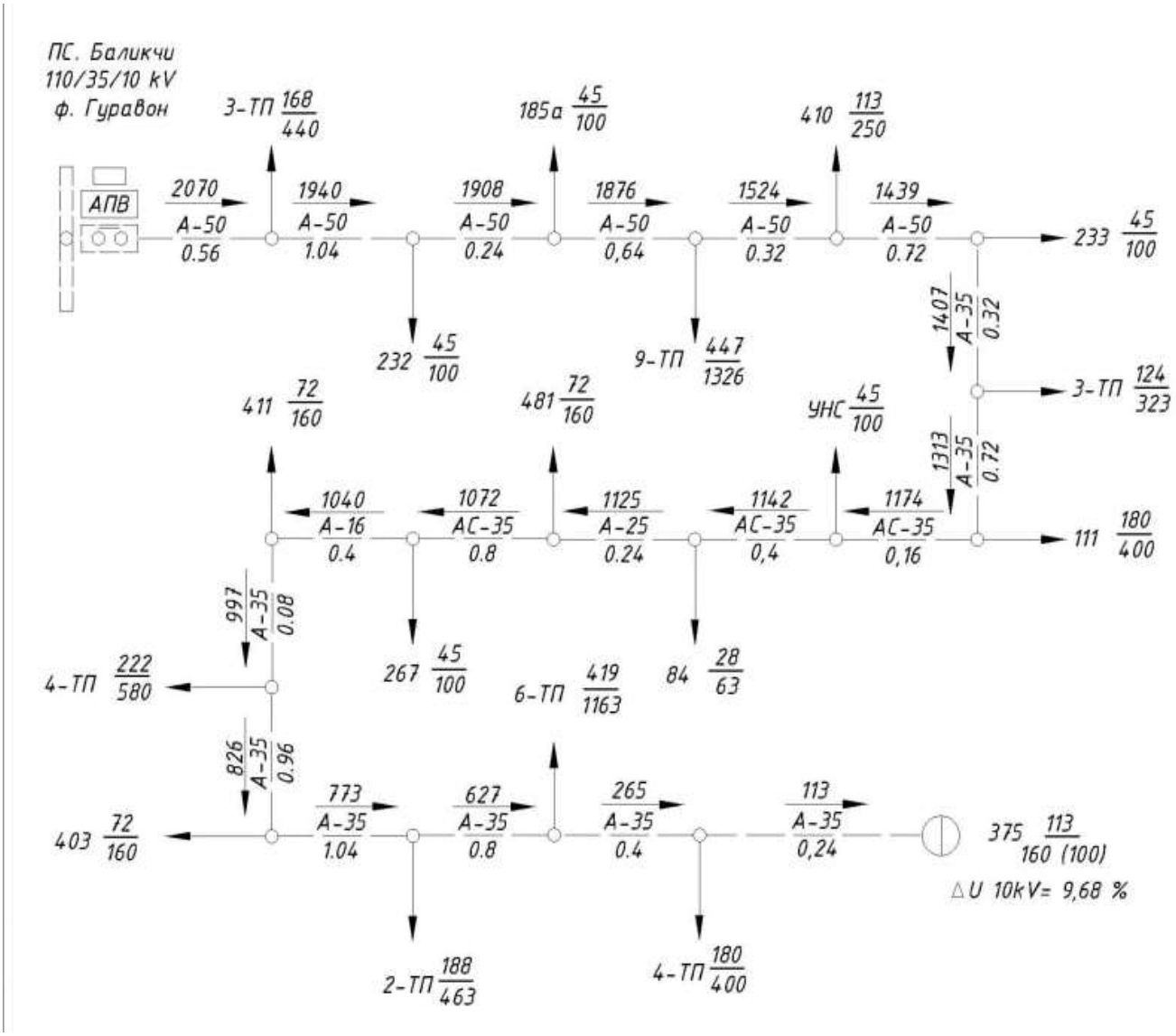
$$Z=\sqrt{R^2+X^2}\ \text{Om} \quad (3)$$

$$S=P/0.9\ \text{kVA} \quad (4)$$

$$R=R_1*0.9\ \text{Om} \quad (5)$$

$$X=X_1*0.44\ \text{Om} \quad (6)$$

Based on the given formulas, the voltage loss in the following circuit is DU10kV = 9.68%



If we use AC-50 wires instead of A-50 wires in the network, we can determine the voltage drop in the network using the above data, where we can see that the voltage drop is DU10kV = 9.79%.

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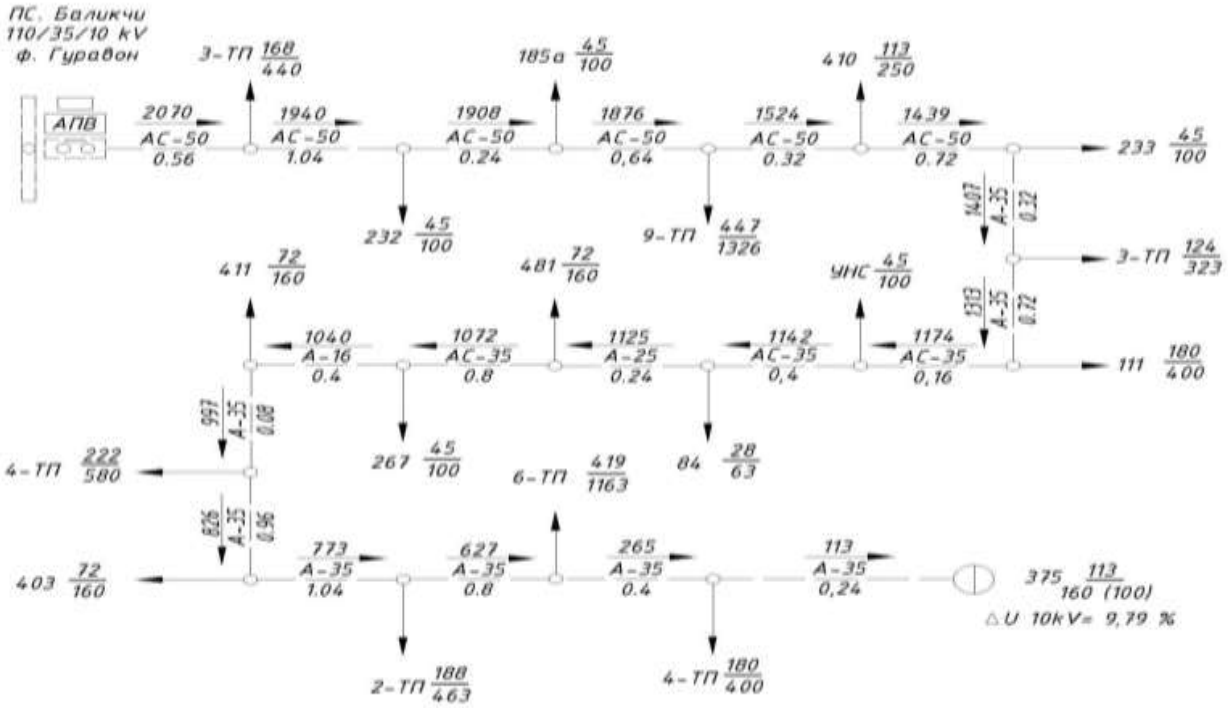

The voltage loss in the supply when using a straight A-50 wire is lower than the mains voltage loss when using an AC-50 wire, but the difference is not significant, but the mechanical strength of the AC-50 wire is A- It differs sharply from the mechanical strength of 50-wire, ie the breaking strength of AC-50/8 steel-aluminum wire is 17112 Newtons, while the breaking strength of A-50 aluminum wire is 8198 Newtons, which means that the mechanical strength of AC-50 wire is more than twice [6].

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