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CREATION OF EFFECTIVE CABLES AND ITS APPLICATIONS EFFECTIVENESS CALCULATION

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Abstract. *In this article, we aim to put forward an innovative idea that leads to significant economic savings in power transmission and to scientifically prove its advantage. We would like to provide information about changes in the shape of conductors in order to solve the problem of solving the problem of the amount of savings and proving its advantages.*

Keywords: *power source, resistivity of high voltage conductor, electrical conductor.*

Currently, the transmission of electric current from power stations through electrical conductors such as aluminum and copper is widely established. Aluminum material is mainly used in high-voltage power transmission lines. Compared to all conductive materials, aluminum is known to be relatively cheap, light, has good conductivity and many other advantages.

In this article, we aim to put forward an innovative idea that leads to more economic savings in power transmission and scientifically prove its advantage. We would like to provide information about changes in the shape of conductors in order to solve the problem of solving the problem of the amount of savings and proving its advantages. We will consider the currently widely used aluminum material and its electrical conductor form (shown in Figure 1).

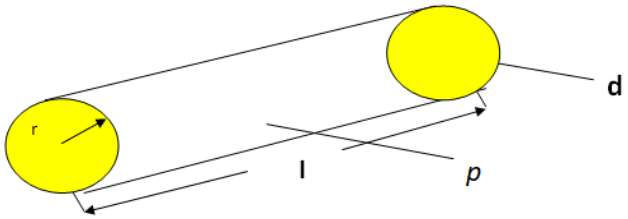

Figure 1. An aluminum conductor with integral r-resistivity

The ones given in the 1st picture given are:

• specific resistance of p-conductor;
• d- the density of the conductor;
• l-conductor length;
• r-conductor cross-sectional radius.

As we know from physics, electric current moves along the surface of the conductor. So why do we need to use solid conductors and why should we use hollow conductors instead? It is necessary to scientifically analyze the positive and negative aspects of this situation, for this we will take a closer look at the following figure 2.

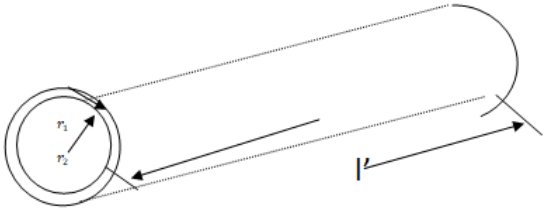

Figure 2. Hollow conductor

l- conductor length

r1- pore radius

r2- outer radius of the conductor

We know from the sources that if the conductors in the first picture above and the conductors in the second picture have the same geometric dimensions, their electrical resistance will be equal. For example: if r= r2 and l=l', the resistors R1 and R2 are equal in this conductor.

$$R_1=\frac{P\,l}{S}=\frac{P\,l}{\pi r^2};\ R_2=\frac{P\,l}{\pi r_2^2}\ ;\ R_1=R_2 \qquad (1)$$

If we make the inside of the conductor porous and use it in transmission lines:

• we save 75% or more of the used aluminum material;

• the mass of the conductors in the columns of the network lines is much lighter.

To understand this more clearly, we need to perform the following calculation. The mass of the cable in Figure 1 above can be determined by the following formula

$$m_2=d(v_2-v_1)=d(\pi r_2^2-\pi r_1^2)l = \pi dl(r_2^2- r_1^2) \qquad (2)$$

An overview of such a cost-effective cable is shown in Figure 3 below.

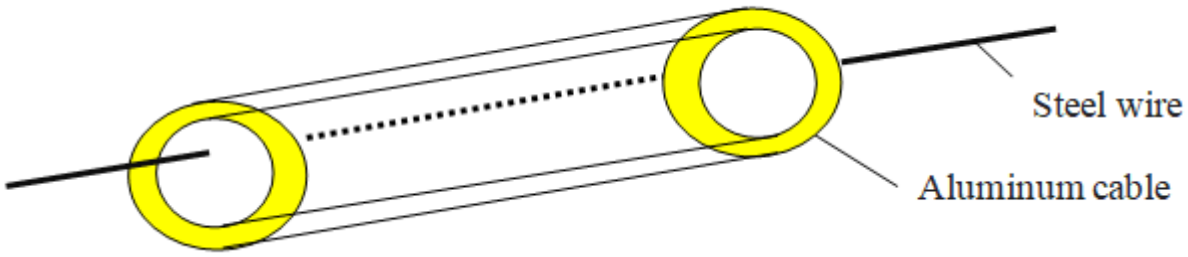

Figure 3: Economical aluminum cable.

And our mass Δm saved as a result of calculations is as follows

$$\Delta m = m_1-m_2= \pi dlr^2- \pi dl(r_2^2-r_1^2) \qquad (3)$$

Here, m1 is the mass of the whole cable; m2- the mass of the porous cable

Since r=r2

$$\Delta m = \pi dlr_1^2 \qquad (4)$$

If we take aluminum as a conductor, d=2700kg/m3. If the internal radius of the cable is r=2 *10-3 m (2 mm) then l=1 meter, for a given length of m

Δm= pdlr_1^2=3.14*2700*1*(2*10-3)2=3.14*2700*4*10-6=34*10-3 kg (5) aluminum can be saved.

The porous aluminum material that we provide has a downside, which is that the strength and flexibility of the conductor is lost. In order to solve this problem, if we pass steel wire inside the conductor (steel is much cheaper than aluminum) as a result, the strength of the aluminum conductor that we provide is increased.

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