Critical corona voltage

For three-phase alternating current line with the location of the conductors at the corners of an equilateral triangle, the **critical corona voltage** is equal to:

$$u_{cr} = 21{,}1 \times m_1 \times m_2 \times \delta \times r \times \ln\frac{D}{r}\ [kV], \qquad (1)$$

where: m_1 – roughness coefficient, taking into account the state of the surface of the conductor. For many wires conductor m_1 = 0,83-0,87;

m_2 – weather factor, taking into account the state of the weather, with dry and clear weather m_2 = 1, in bad weather m_2 = 0,8;

r - the outer radius of the conductor, cm;

D - distance between conductors, cm;

δ - relative density of the air is equal to:

$$\delta = \frac{3{,}93 \times \mathrm{b}}{273 + \vartheta'}, \qquad (2)$$

In the formula (2):

b - barometric pressure, cm/Hg;

ϑ' - temperature, ^{0}C.

For ϑ' = + 25 ^{0}C and b = 76 cm/Hg, δ = 1.

In the most adverse weather conditions (rain storm, heavy fog and so on) the product $m_1 \times m_2$ reduced to a value of 0,55.

Linear critical corona voltage at the location of the line conductors in the corners of an equilateral triangle is:

$$U_{cr} = \sqrt{3} \times 21{,}1 \times m_1 \times m_2 \times \delta \times r \times \ln\frac{D}{r}.$$

Replacing the natural logarithm of a decimal, we get:

$$U_{cr} = 84 \times m_1 \times m_2 \times \delta \times r \times \log\frac{D}{r}.$$

Source: *Glazunov A.A. Electrical networks and systems - Moscow: State Energy Publishing, 1954, p.86-87. (in Russian)*

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