"ESTIMATION OF ELECTRICITY EFFICIENCY IN TRANSMISSION LINES CONDUCTOR MATERIALS"

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ABSTRACT : The increased demand for energy in the world in this research is presented by the most commonly used in electrical power transmission lines through the conductor materials for overhead lines are very popular materials Copper, Aluminum, Steel-cored aluminum, galvanized steel and cadmium copper the estimation of efficiency of the conductor materials and the analysis of electrical and mechanical properties the local conditions. The electrical energy in used as the power transformation overhead lines in used particular conductor materials are perfectly increased the flexibility. In the used standards conductors are power transmission lines there is one central wire and round in this successive layers of wires containing 6, 12, 18, 24, …….wires. The modification an increase life cycle of the power transmission lines are n-layers, the total number of wires is 3n(n+1)+1. The manufacture are standard Conductors, of wires the consecutive layers of wire are twisted or spiraled in opposite directions so that layers are bounded together.

Key words: Conductors Materials for over head lines, Inductance of three overhead lines, Cadmium copper, Steel-Cored Aluminum, Galvanized Steel

1. INTRODUCTION:

The transmission of lines in the electrical energy industries plays a vital role in efficient and stable an energy delivery of power generation in the transmission network. One of the most important reasons for not benefiting from electric power generation is the delay in establishing power transmission lines. The conductors materials are used in accordingly, transportation lines must be planned and implemented simultaneously with the generation sector, which ensures the rational use of the substantial required capital.

The aim is to provide the efficiency increase of the transportation lines with minimal capital and time is decrease to gain the greatest possible economic efficiency. Improving the process of designing and planning an electrical power transmission lines is made of conductor materials applications in manufacturing of wire complex issue due to diverse factors affecting the established costs.

The primary goal of this study is to analysis of the protections higher density of the conductor materials is required in transmission of lines and prepare a cost model of electrical Iraqi projects, including the local required factors related to the implementation costs based on the intensive review of the design areas of power transmission lines and the challenges of erecting and operating these lines.

The possible steps and computation model are established the testing of wire in the electric city in transmitted to the current in the caring conductors to overcome the calculation challenges, where procedures are suitable to the terrain and the local requirements for economic factors in the wire technology copper and silver materials wires in very high density form present the free electrons and current is flow is very high speeds transportation lines.

2. Contraction of Transmission Lines

The transmission-line construction is an arduous and complex task conductor materials wires that requires sufficient diameter of wires is requirements efficiency of considerable effort in the development of a polls distance to implement power transmission lines, which include many individual towers and polls sites at a time.

The methodology binding of wires in the polls of constructing the line differs from other construction methodologies, but the changes from site to site according to the Indian Standard Organization terrain and conditions surrounding it should also be considered. Effective planning and management of electrical in research and conductors of materials are critical in developing and achieving the required quality and in maximizing the economic benefits and with environmental eco-friendly requirements, which reduces environmental damage.

3. Commonly used conductor materials:

Copper, Cadmium copper, Steel-Cored Aluminum, Galvanized Steel all the conductor materials used in electric energy transmission lines in construction in current caring conductor of wires. Mechanical and electrical properties of the conductor materials and physical properties in electrical energy in conductor materials

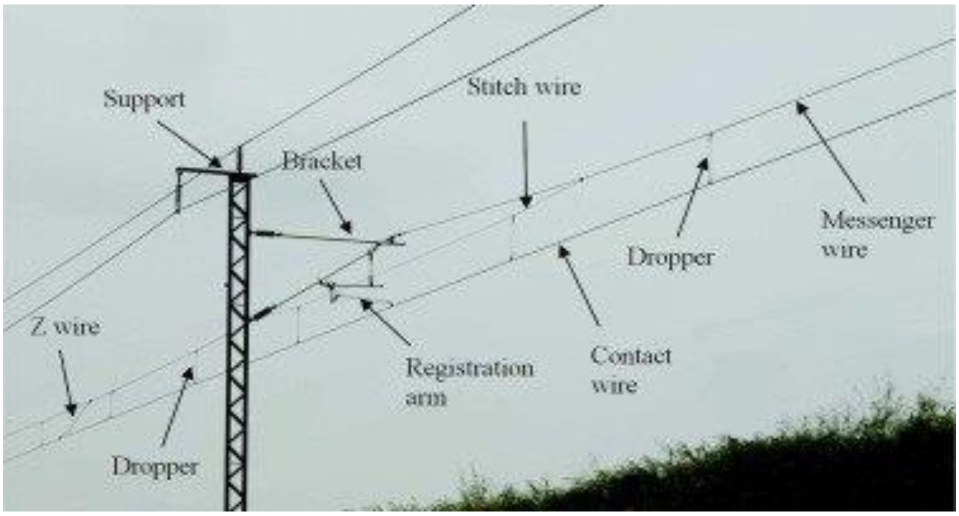

Figure.1: Transmission Lines in Steel-Cored Aluminum

The lines are often heavily loaded because of increased power consumption rate, and the Transmission lines are conductors, which are generally made of copper or aluminum, conductors materials expand when heated.

That the thermal expansion increases the slack between two tower transmission lines structures, causing them to sag.

Table.1: Physical Properties of the conductor materials

Materials	Density g/cm³	Melting Point °C	Thermal Con...... W/MK	Electrical Con..... 1×10⁷/(Ω.m)	Thermal Expansion. 1/1 × 10⁻⁶ °C
Copper	8.960	1085	386	58.7	16.70
Cadmium Copper	8.890	1076	360	90.00	20 To 100
Aluminum	2.720	660.3	237.0	3.770	23.50
Galvanized Steel	7.200	1527	65.00	7.700	50.00
Steel-Cored Aluminum	7.8700 Kg/dm²	660.0	236.00	93.00	23.00

The Physical Properties are presented by the Table No. 1 of the transmission lines conductors materials like i.e. Properties: Copper melting point of 1085.4 +/- 0.2°C, boiling point of Copper material 2567°C, specific gravity of Copper is 8.96 (20°C), with the valence band of energy level of copper of 1 or 2. Copper is reddish colored and takes a bright metallic luster. Other properties of the copper is It is malleable, ductile, and a good conductor of electricity and heat.

Table: 2. Electrical Properties of the conductors' materials

Materials	Resistivity (Ω .m)	Electrical Conductivity
Copper	34×10^{-5}	29×10^{5} /Ω.cm
Cadmium Copper	1.91×10^{-5}	27×10^{5} /Ω.cm
Aluminum	2.8×10^{-5}	33.5×10^{5} /Ω.cm

Galvanized Steel	5.5×10^{-5}	93.3×10^{5}
Steel-Cored Aluminum	1.72×10^{-5}	32.5×10^{5} /Ω.cm

The Electrically Conductor material like that Aluminum is preferred to over the copper as an aluminum conductor is lighter in weight and Wight material and cheaper in cost than copper conductor material of the same resistance. The conductors are not straight wires but strands of wire twisted together to form a single conductor to give it higher tensile strength.

Cadmium Copper alloy of copper 99.0% and 1.0% cadmium a unique combination of high tensile strength and high electrical conductivity for an industry where these properties are generally considered incompatible.

Table: 3. Mechanical Properties of the conductors' materials

Mechanical Properties of the conductor materials are Electricity Transmission lines in Application of higher power

Materials	Tensile Strength Yield (N/mm^2)	Tensile Strength Ultimate(N/mm^2)	Elongation Of Break (A%min)	Vickers Scale HV
Copper	200 - 300	450.00	55.00 %	200.0
Cadmium Copper	33.3.0MPa	210.0Mpa	60.00 %	198.0
Aluminum	100- 200	400.0	12- 25 %	176
Galvanized Steel	470 – 550 MPa	510 -600 MPa	80.00 %	200- 250
Steel-Cored Aluminum	220- 300	500.0	22.00%	200-250

transmission lines minimum mechanical strength requirement for magnet wire may evolve in order to improve formability and prevent excessive stretching of wire during high speed coiling operations.

4. Experimental Testing and Results and Discussions

Measurements of Current, Voltage and efficiency of the electric power transmission lines conductor materials by the help of electrically equipments. Due to the need to increase the transmission of high-speed voice and data signals, the surface quality of copper wire is expected to continue to improve. Demands is increase of the copper wires in the Electricity generation of power system and Electronic Industry in making the Electronic Equipments, wires, cables, and some of domestic articles for better drivability and movement towards "zero" defects in copper conductors are expected to continue. Copper current-carrying is equal to 1.2 times the total volume of the copper.

4.1 The Speed of Electrons in Conductor materials

The Electrons Speed in Conductor materials of an electric power transmission lines depends on the Speed of the electrons in the conductor wire. We con Estimation the speed of the electrons in the transmission lines wires based on the many electrons passes by the section of the wire per second, the density of the electrons in the electric power transmission lines wire, and the cross- sectional area of the wire. By Using the Formula

$$I = \frac{\Delta Q}{\Delta T} = \frac{Q \times N \times A \times V \times \Delta T}{\Delta T} = q \times N \times A \times V \quad \text{.....................} \quad (A)$$

$$V = \frac{I}{Q \times N \times A} \quad \text{.......................................} \quad (B)$$

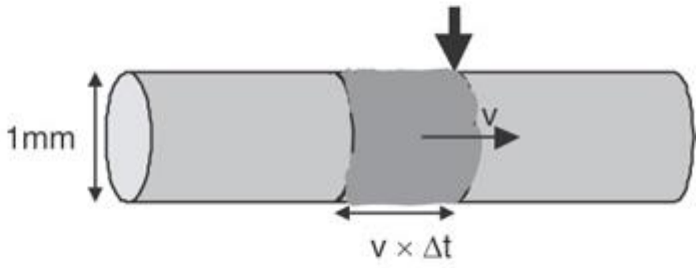

Figure.2: Cross-Sectional Area of the Transmission lines

Figure.2: the cross-sectional area of the transmission lines estimation of electron velocity and speed electrons moving down a wire. The number passing the arrow per second is the current and is related to the velocity and number density of the electrons. From which we can calculate the velocity of the electrons as: where:

I = current passing one point, in Amps

ΔQ = charge flowing in a time interval, in Coulombs

ΔT = time interval,

q = charge of one electron = 1.6×10^{-19} Coulombs,

N = density of free electrons, in $1/m^3$,

A = cross-sectional area of the wire, in m^2, V = speed of the electrons in the wire, in m/sec each copper atom contributes roughly two free electrons that can move through the wire. Atoms of copper are about 1 nm apart. This makes the density of free electrons, n, about $n \sim 10^{27}/m^3$.

4.2Experimental Testing and Results and Discussions

Electrical conductivity is conductor materials a measure of how well a material transport an electric charge and electricity. This is an essential property in electrical wiring systems. Copper has the highest electrical conductivity rating of all non-precious metals: the electrical resistivity of copper = 16.78 (Ω. m) at 20 °C.

Table.4: Analysis an Electric Properties and Efficiency of the an Electric transmission Lines

Conductor Materials	Electrons flow Speed	Voltage (Volt)	Diameter of Wire	Efficiency in (%)
Galvanized Steel	1.92×10^{-5} m/s	600 Volt		85%
Steel-Cored Aluminum	2.42×10^{-5} m/s	710 volt		88%

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6. CONCLUSIONS:

Appliance conductors for domestic applications and instruments are manufactured from bunch-stranded soft wires, which may be tinned for soldering or phase identification. Applications of conductor material and increase the Resistance welding Electrodes, circuit Breaker Switches, stud bases of power transmitters, Electrical Conductor Material, Rod Extensions, Pencil-type, Light Soldering guns, Connectors, Solder less wrapped, Welding Wheels, Trolley Wires. Retaining rings, Roll pins, Lock Washers, Fasteners, shaft, Pump Parts, Non Sparking Safety Tools, Flexible Metal Hose, Welding Equipments, Diaphragms, Bourdon Tubing.

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