Electrical performance improvement of cross-linked polyethylene cables using inorganic filler.

Sherif **ESSAWI** (1), Loai **NASRAT** (2), Jeanette **ASSAD** (3), Mahmoud **MOSTAFA** (4)

1 Electrical Power Dept. ,Petrojet , Cairo, Egypt,eng.sherifessawi@gmail.com
2 Electrical Power and Machines Eng. Dept, Aswan University, Aswan, Egypt, loaisaad@yahoo.com
3 Polymers and Pigments Dept., National Research Center, Cairo,Egypt, na_jeannette@hotmail.com
4 Electrical Power and Machines Eng. Dept, Ain Shams University, Cairo, Egypt, eng_m.mostafa84@hotmail.com

Today, in all countries in the world that utilize electricity as an efficient source of light and energy, some form of transmission and distribution system exists. Both systems carry electric current, at different voltages and they are connected to each other use underground cables.

Since 1970, the cross-linked Polyethylene (XLPE) insulated power cables have been used worldwide. This insulation possesses very good electrical, mechanical and thermal characteristics in medium and high voltage networks. Due to various advantages, the XLPE insulated cables had vastly displaced the traditional classic paper insulated cables. Many studies and researches have been carried out to improve XLPE characteristics such as dielectric strength. The dielectric strength of an insulating material is the maximum electric field strength that can withstand without experiencing failure of its insulating properties. Therefore, the presenting work has been devoted to study the electrical, thermal properties of XLPE after adding inorganic filler in different percentages and tested under various conditions.

Blends of XLPE with different inorganic filler such as Calcium Carbonate (CaCO3) were prepared with 20%, 30% and 50% weight percentages.

The dielectric strength of blends samples were tested in several temperatures and thermal conditions:

- Different temperatures range (0 ^{0}C, 30 ^{0}C, and 100^{0}C).
- Blends thermally stressed for 24 hrs aging in high temperatures (120^{0}C, 160^{0}C, and 200^{0}C).

The average result of 3 samples of each test were taken to minimize the error, each sample was tested 3 times to insure the results. Samples were in form of disc diameter 5 cm and 1 mm for dielectric strength test.

Thermogravimetric analysis (TGA) test was also performed up to 750^{0}C to determine the thermal stability of the blends.

The results showed that adding inorganic filler to XLPE cables improved their electric and thermal properties.

Key words

XLPE cables; inorganic filler; dielectric strength; TGA; electrical and thermal properties.