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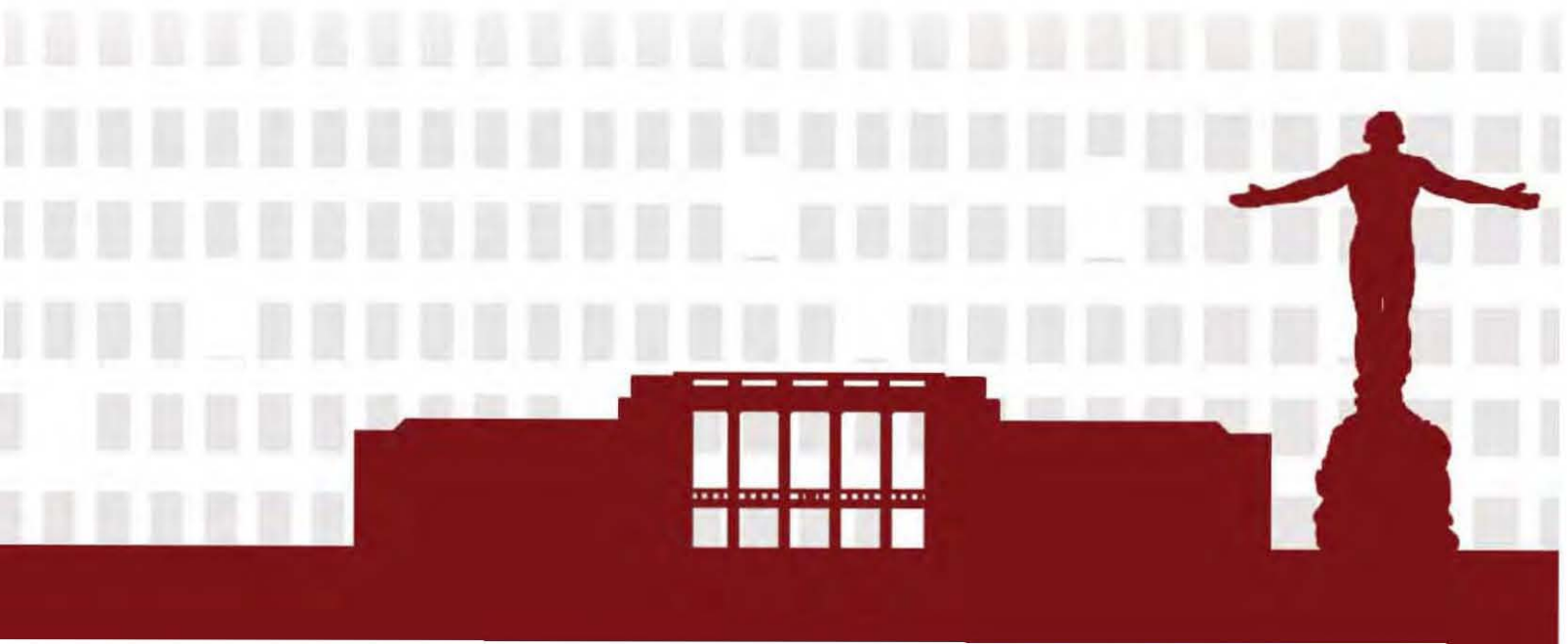

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STUDY OF ELECTRIC FIELD DISTRIBUTION ON RESIN TYPE POLYMER INSULATOR UNDER CONTAMINANT EFFECT

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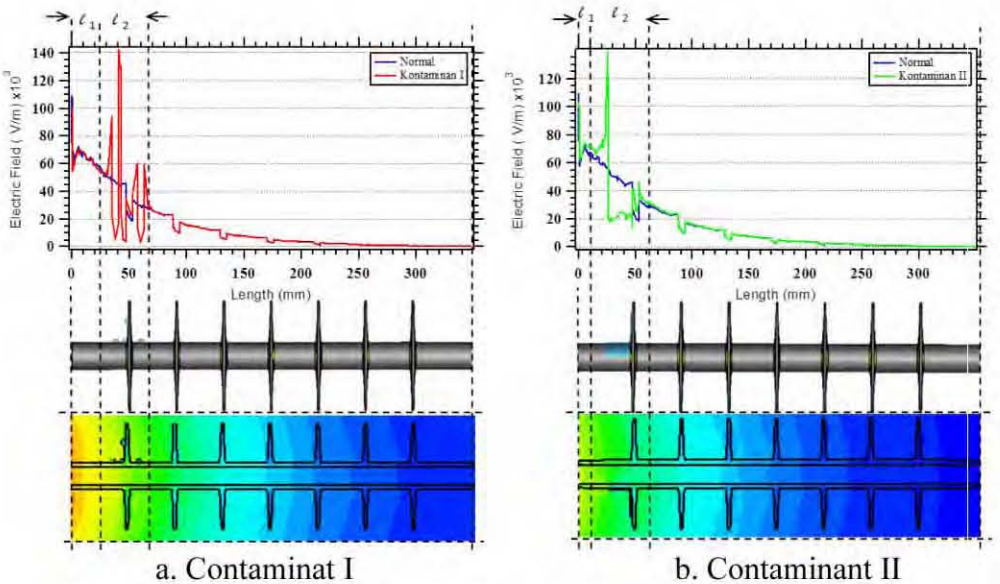
ABSTRACT

Suspension insulator is one of the insulators which are frequently used in the transmission and distribution systems. Recently, material that is commonly used in suspension insulator is polymer. This material has several advantages compared to porcelain and glass, among others, has a lighter density, dielectric properties and better thermal properties [1,2]. Polymer insulator also has a water-resistant properties (hydrophobic), where these properties are not owned by porcelain or glass insulators so that the polymer is more effective when used in areas that have high levels of contaminants such as urban / industrial and coastal [3,4].

Suspension insulator material in construction affects the dielectric strength of the insulator. In addition to insulating materials, dielectric insulating ability is also affected by the level of contaminants and the insulator surface conditions. The more severe levels of contaminants which are attached, it will greatly affect the electric field distribution in the insulator itself.

In this study, the electric field distribution in polymer suspension insulator when exposed to contaminants is investigated. The analyzed suspension insulator has resin core and will be simulated using FEM (Finite Element Method) software. Sea water is used as contaminant and it will be varied considering contact angle (θ). Formed contact angle affect the hydrophobic properties of the insulator material. If the hydrophobic insulator value decreases, the ability of the dielectric insulator was reduced [5]. Therefore, in this study, the contaminant is varied into two types. The first type (contaminant I) is partially wet which has 30o < Ø < 89o while the second type (contaminant II) is fully wet which has 0o < Ø < 30o.

Insulator is modeled in 3D using Computer Simulation Technology (CST) software based on real insulator. The model has resin core, is covered by polymer sheath, and has 35 kV rating. Then, simulation is carried out by comparing the condition of the electric field on insulator where the surface is contaminated by seawater with normal conditions. Moreover, to determine the deeper influence of contaminant, the analysis is carried out in three different places, which is the core part, the surface of the insulator and the fin closest to the working voltage of insulator.



a. Contaminat I b. Contaminant II

Figure 1. Electric field distribution on the surface of insulator

From the conducted analysis, it is known that the contaminants are not much affected the electric field distribution at the core, but became very influential in the distribution of the electric field at the surface of the insulator and the fin closest to the working voltage insulator, as shown in figure 1. From that figure, it can be seen that the electric field rise significantly at contaminant area and then go down exponentially with the length from the working voltage area. In addition, figure 1a show that the electric field rise more frequent than figure 1b. It can be concluded that the contact angle of contaminants affects the characteristics of the distribution of the electric field significantly.

Keywords: Contact Angle, Resin Core Rod, Polymer Suspension Insulator, Sea Water Contaminant

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