# Polymeric Composite Insulator11-33KV

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***Abstract*- Polymer: Future material of insulator. It is a sincere effort to furnish as much as possible details on polymeric composite insulator project including the application criteria, concept, types, technical requirements, manufacturing process, raw material required, testing etc.**

**In the transmission & distribution of electrical energy, insulator have the important task of creating a barrier between the live voltage & the ground while providing strong mechanical support, Insulators are used at various location in a power network & their insulation & mechanical characteristics must ensure long lasting barrier. Porcelain & glass type insulators have been used for over 100 years. More recently new composite (polymer) materials were introduced, The insulator are subjected to higher than usual level of one or more accelerating variables such as voltage, temperature & stress.**

## INTRODUCTION

Electrical insulator is very important component in the electric power system. Such as substations, distribution & transmission line. It prevents the loss of electric charge or current from conductor in electric power transmission line .In earlier days insulator were made of ceramic & glass materials. But now a days, polymeric insulator were developed and its improvements in design and manufacturing in the recent years have made them attractive to utilities. An insulator is a material that resists the electric charge. Overhead power transmission lines requires both wires to conduct the electricity & insulators to isolate the wires from the steel towers or utility by which they area supported.

The insulators have been made of ceramic or glass & it have outstanding insulating properties. But disadvantage of this insulator are easily fractured, being heavy, & subject to degradation of their withstand voltage property when polluted. Therefore a desire to develop insulator of using new material that would overcome these drawback. Hence composite insulator developed.

## THEORY

There are three types of insulators.

1. Porcelain insulator
2. Glass insulator
3. Composite insulator

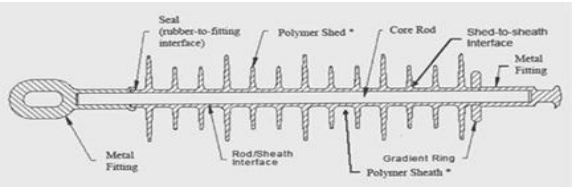
Here we discuss about Composite (Polymer) Insulator.

A composite insulator consist of core material, and fitting, & rubber insulating housing. The core is of FRP (Fibre Reinforced Plastic) to distribute the tensile load. The reinforcing fibre used in FRP is glass. (E or ECR-Epoxy corrosion resistant) & epoxy raising is used for matrix.

The portion of the end fitting to transmit tension to the cable & towers are of forged steel, malleable cast iron, aluminium etc. The rubber housing provides electrical insulation. It covers the FRP rod thereby protecting it from corrosion due to atmospheric exposure. Composite insulators are also known as polymeric or non-ceramic insulator.

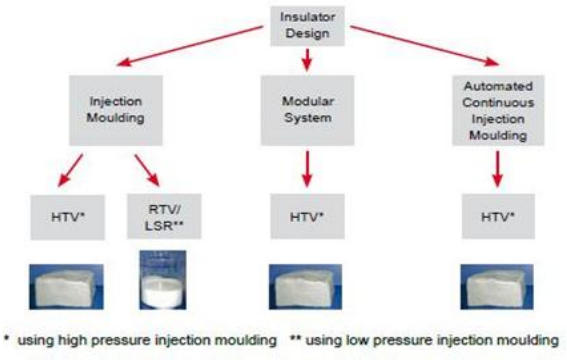
Silicon rubber has superior electrical characters tic & weather resistance properties over a wide range of temperature for use in the housing. It is resistance to oxidation, has low surface energy & resists degradation from ultraviolet radiation. These properties make silicon rubber a good choice for electrical insulator.

Design of Polymer insulator:



## MANUFACTURING PROCESS

Raw material: silicon rubber, FRP rods, & metal end fitting.




## CLASSIFICATION OF TESTS

Based on the purpose of testing, the tests to be performed on polymer insulators are classified in four categories as follows:

1. Design Tests - Design tests are performed to verify the suitability of the manufacturer's design, materials, manufacturing process and technology. When an insulator is submitted to the design tests, the results shall be considered valid for all insulators of the same design that are represented by the tested one. The design tests are performed once. Design tests shall include the following tests: q Material Tests i) Water Penetration Test ii) Tracking and Erosion Test iii) Aging or Accelerated Weathering Test iv) Dry Penetration Test v) Water Diffusion Test vi) Power Arc Test vii) Flammability Test q Mechanical Tests i) Tension Strength Tests ii) Torsion Strength Test iii) Working Cantilever Load iv) Thermal Mechanical Test

2. Type Tests - Type tests verify the main characteristics of the insulators, which depend mainly on its shape and size. They shall be repeated when the design, type, or size of the insulators changes. Three production line insulators of the relevant type shall meet the requirements. The following tests are recommended for this type of testing: i) Low-Frequency Dry Flashover Test ii) Low-Frequency Wet Flashover Test iii) Critical Impulse Flashover Test iv) Radio Influence Test

3. Sample Tests -Sample tests verify other characteristics of the insulator, including those which depend on the quality of the manufacture and on the material used. They are performed on insulators taken at random from a lot offered for acceptance. Sample shall include the following tests: i) Galvanizing Test ii) Tension Strength Test iii) Dye Penetration Test iv) Retest Procedure v) Verification of Dimensions, Markings, and Metal Fittings

4. Routine Tests - Routine tests are conducted to detect and discard insulators with manufacturing defects. They are made on every insulator produced. They include tensile load (50% of S.M.L.) and visual examination tests

## CONCLUSION

The use of polymeric insulators in the electric power sub-stations and distribution & transmission lines is beneficial because of its many advantages such as contamination performance, reduced construction costs, light weight, easy handling, low or no maintenance, vandalism resistance and compact design. Historically, North America has been the leader in the use of composite insulators and this continues to be the case for high voltage application. Most users have a number of composite insulators on trial on their system's highest voltage transmission lines. For some time they have been used in limited numbers where porcelain and glass unit have been unable to fulfil their requirements and better performance can be obtained by using composite insulators. Recently composite insulators have been used on a large scale for several major high voltage transmission line projects. In general, some user appears to be waiting for more in-service data before committing to composite insulators on a large scale. All users appear to agree that the key advantages of composite insulators over ceramic or glass insulators are superior.

## REFERENCES

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