

UNIQUE LIVE INTERFACE

Improves long term performance of polymer insulators

In the design of insulators, interfaces represent potential failure points. As a result, every interface must be carefully considered, and constructed to assure reliability. A critical interface on a polymer insulator is that between the polymer housing and the rod. This interface must be able to withstand high dielectric stress and prevent environmental ingress over the life of the insulator.

In a Hi*Lite insulator, this interface is “live”. Instead of bonding the rubber to the surface of the rod, the interface is vacuum assembled with a high dielectric compound. The vacuum assembly method eliminates air entrapment which could ionize and become conducting under sufficient electrical stress while the silicone compound supplies the necessary dielectric strength.

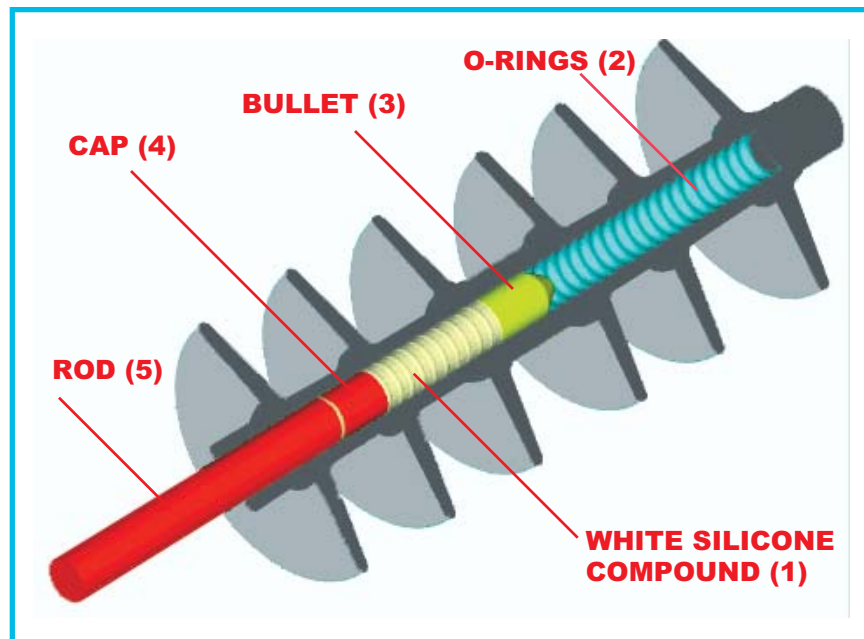
What is the compound?

The compound is a highly filled “silicone grease” (1) exhibiting high dielectric strength properties. The compound is vacuum-processed at the time of manufacture to remove trapped air and moisture. The added fillers increase the compound’s viscosity.

The silicone compound is tested to assure its ability to perform as a dielectric interface. Its dielectric strength must be greater than 300 V/mil to assure electrical integrity. To confirm long term stability, the compound must demonstrate less than 2% evaporation and 1/2% bleed after 24 hours at 200 °C. A penetration test is also performed to confirm the stiffness of the compound is within design parameters.

How does it work?

The actual interface between the rod and the polymer incorporates multiple polymer seals along the smooth surface of the rod. The weathershed housings include five integral o-ring seals (2) per inch of length along the inside diameter which seal to the rod via circumferential force to the rod . These o-ring seals divide the rod/polymer interface into hundreds of small, independently sealed reservoirs which are then filled with the silicone compound. The redundant seals lock the compound in place and assure freedom from moisture and voids. In the unlikely event that an o-ring seal is compromised, the silicone compound will encapsulate any environmental contaminants and the next o-ring seal will continue to perform its function. This redundancy will either slow or stop any progressive damage resulting from environmental ingress.



How is it incorporated?

The installation of the silicone compound in the rod/polymer interface is performed under vacuum. A “bullet” (3) is positioned at the bottom of the weathershed housing, and a vacuum is established from the top. The initial insertion of the silicone compound into the housing forces the bullet forward, completely filling the cross-section of the housing and displacing the air at the bottom end of the housing. A cap (4) on the end of the rod serves to protect the polymer housing. The fiberglass rod (5) is then inserted from the bottom end of the insulator. The rod pushes the silicone compound, which in turn pushes the bullet forward through the evacuated housing. The backward resistance of the bullet to movement imparts hydraulic pressure to the silicone compound, which is shared with the inside diameter of the housing. As the rod moves forward, the silicone compound is trapped in the reservoirs between the internally molded o-rings of the weathershed housing. The applied vacuum assures that only silicone compound can fill the internal o-rings.

As the assembly continues and the silicone compound is depleted, the distance between the bullet and the leading end of the rod decreases. When the bullet and rod exit the upper end of the housing, silicone compound must be present between them. This assures that all of the internal o-rings have been filled with the compound.

Why is this the best method?

The live interface is the best method available today because the design assures that the manufacturing method leaves no voids. Voids at transmission voltage levels are subjected to higher electric field gradients which make insulators vulnerable to partial discharge. Partial discharge activity will lead to further degradation of the interface and eventual electrical or mechanical failure of the insulator. With bonded interface designs, it is imperative that the rubber be completely bonded to the rod making the process difficult to assure the elimination of voids through qualitative measures.

The “live” interface actually offers an ability to perform quality control procedures on the interface material before and during assembly. The simplicity of the assembly process provides repeatability without outside process concerns. These factors ensure the quality of the interface essential to the life of a transmission insulator.

Every Hi*Lite insulator manufactured has the “live” interface. With over a quarter century of manufacturing history and over 1 million transmission insulators in service, there has never been an electrical failure of the “live” interface in a Hi*Lite insulator. It is this unprecedented history that has convinced Ohio Brass to continue this feature of the design.

NOTE: Because Hubbell has a policy of continuous product improvement, we reserve the right to change design and specifications without notice.



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