Silicone Rubber Insulation for Surge Arresters

Technology for the Future

Answers for energy.
As power consumption increases worldwide, so does the need for forward-looking and assured technology that will help provide reliability to power systems. Indeed, the future of modern society depends on an efficient and reliable supply of electricity.

High-performance surge arresters play an indispensable role here. The Silicone Rubber (SR) insulation for arrester housing demonstrates excellent pollution layer characteristics.

Silicone Rubber –
The importance of a resistant surface

Neither water nor dirt can cause flashovers, a significant factor in an arrester’s reliability. The hydrophobic properties of the arrester housing made of SR prevent conductive moisture from forming on its surface, even when contamination is substantial.

Surface currents and discharges are ruled out. Even the most severe ambient conditions, such as salt fog in coastal regions or dust-laden air in an industrial area, cannot impair the hydrophobicity of SR.

Siemens have devoted considerable research and development towards ensuring that our Silicone Rubber arresters maintain their insulation characteristics throughout their service life.

Siemens Silicone Rubber (SR) housed surge arresters from the 3EL, 3EQ, 3EB and 3EK families – for use on both medium and high voltage levels – feature SR as insulating material. We decided to use exclusively SR for our polymer-housed arresters because, in our view, it is simply the best and confirmed by several researches. The following characteristics set silicone elastomers apart from other organic insulating material.

For our arresters we use only HTV\(^1\) or LSR\(^2\) silicone elastomers. These materials help maintain the aforementioned properties.

The –Si–O– backbone of SR has a higher bonding energy than the –C–C– backbone of EPDM. SR has a lower carbon proportion than EPDM. Consequently, SR has inherently better chemical and physical resistance, better UV resistance and lower flammability than EPDM. Consider these facts:

- SR is highly stable under influence of ultraviolet radiation (sunlight), ozone and nitrogen oxide – SR beats EPDM based alloy rubbers
- Hydrophobic (water-repellant) surface throughout arrester service life – SR's performance is excellent, whereas EPDM based alloy Rubber lacks this critical requirement

Silicone Rubber: There is no insulating material quite like it

- Reliable long-term hydrophobicity
- Highly UV-resistant
- High dielectric strength
- Flame-retardant
- Long service life
- Roughly 50% lighter than porcelain
- Non-toxic, ecologically sustainable
- Robust, largely unaffected by vandalism

Observed damage characteristics due to natural UV on EPDM insulators

*Chalking\(^3\)*
*Crazing/Cracking\(^3\)*
Hydrophobicity of SR returns after corona discharge – assured and reliable long-term performance
Resistant to arcing much higher for SR
SR Flame-retardancy complies with IEC 60707 and UL94 V-0 (i.e. self-extinguishing, no burning drips, probe does not burn)
Resistant to all customary organic and non-organic cleaning agents and solvents
SR performs well in ambient temperature range of –60 °C to +200 °C, no other polymeric material can beat SR

We invite your attention to the conclusions of the following technical papers comparing performance of SR and EPDM based rubber:

- Aging in outdoor insulating polymers due to UV and high temperature. IEEE CEIDP, 1991
- Worldwide Service Experience with HV Composite Insulators. ELECTRA N° 191, August 2000

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1) HTV: High-temperature vulcanizing
2) LSR: Liquid silicone rubber
3) Schmuck F.: Comparison between HTV-Silicone rubber and EPDM used for polymeric outdoor insulators, SEFAG AG, Malters
4) Straßberger W., Winter H.-J.: Silicone elastomere in der Mittel- und Hochspannungs technik, Wacker-Chemie GmbH, Burghausen