

The very Best.



Hybrid Insulators



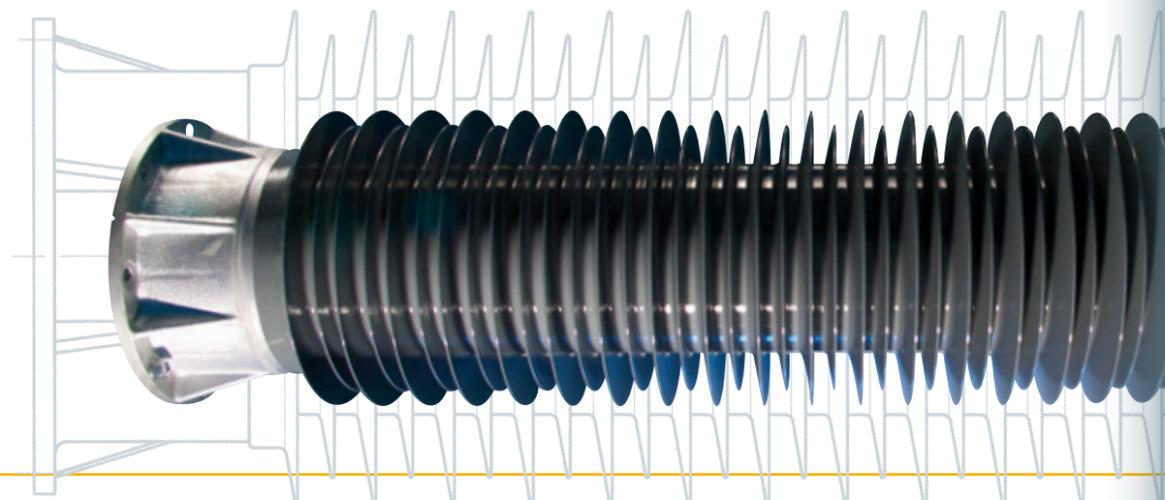
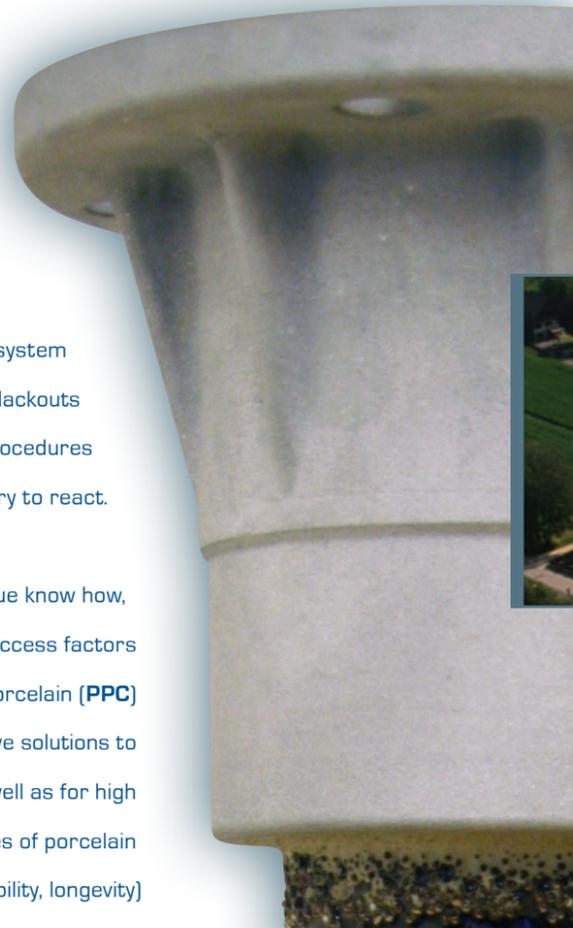
PPC INSULATORS

Hybrid Insulators.

Combining PPC and SEDIVER expertise.

Extreme environmental or high pollution conditions like those encountered in industrial, desert or coastal regions can lead to electrical activity on insulators involving excessive leakage current. The surface condition of an insulator in such areas can subsequently lead to a pollution flashover and ultimately to power system outages. The need for reliable power networks, avoidance of blackouts and substation shutdowns due to frequent maintenance procedures like substation washing led the insulation Industry to react.

Satisfying our customers is our ultimate goal. Unique know how, constant innovation as well as flexibility are the main key success factors in this fast moving world. **SEVES** long-term expertise in porcelain (**PPC**) and composite (**SEDIVER**) technology allows us to provide alternative solutions to customers for High to Ultra High Voltage AC and DC insulation, as well as for high pollution environments: Hybrid insulators, combine the advantages of porcelain (undisputed superiority of high mechanical strength, stability, longevity) with the excellent performance of composite housings to provide an ideal solution for use in highly contaminated situations.



Manufacturing Technology

The conceptual approach of a **PPC** Hybrid Insulator consists of a precisely manufactured porcelain rod onto which a silicone housing is injection molded. The insulators are manufactured entirely in Austria using the extensive **Sediver** expertise for HTV silicone rubber plus **PPC** Insulators know how of Isostatic produced solid core post insulators.

PPC Insulators – Austria



Porcelain Rod

The porcelain core is manufactured with the **PPC** Isostatic process taking advantage of flexible design, tight tolerances and short lead times. Ceramic granulate is pressed into a cylindrical blank at very high pressure. After turning, glazing and firing, the rod is cut to the required length. Hot-dip galvanized fittings made of spheroidal cast iron are then cemented onto the rod.

PROCESS

- › Material Preparation
- › Blank Pressing & Turning
- › Glazing & Firing
- › Cutting & Grinding
- › Assembling with metal fittings

Silicone Rubber Housing

High pressure injection molding at high temperature is required due to the HTV silicone rubbers high viscosity. Injection molding technology used by **SEVES** is set at temperatures above 160°C and a pressure of several hundred bars. The silicone housing is fully bonded to the porcelain solid core, perfectly managing the „triple point“ (fitting-rubber-core). Thanks to the high pressure involved in this operation, the rubber housing adheres directly to the fitting without the need for artificial sealing.

PROCESS

- › Surface preparation
- › Silicone injection molding
- › Insulator Testing

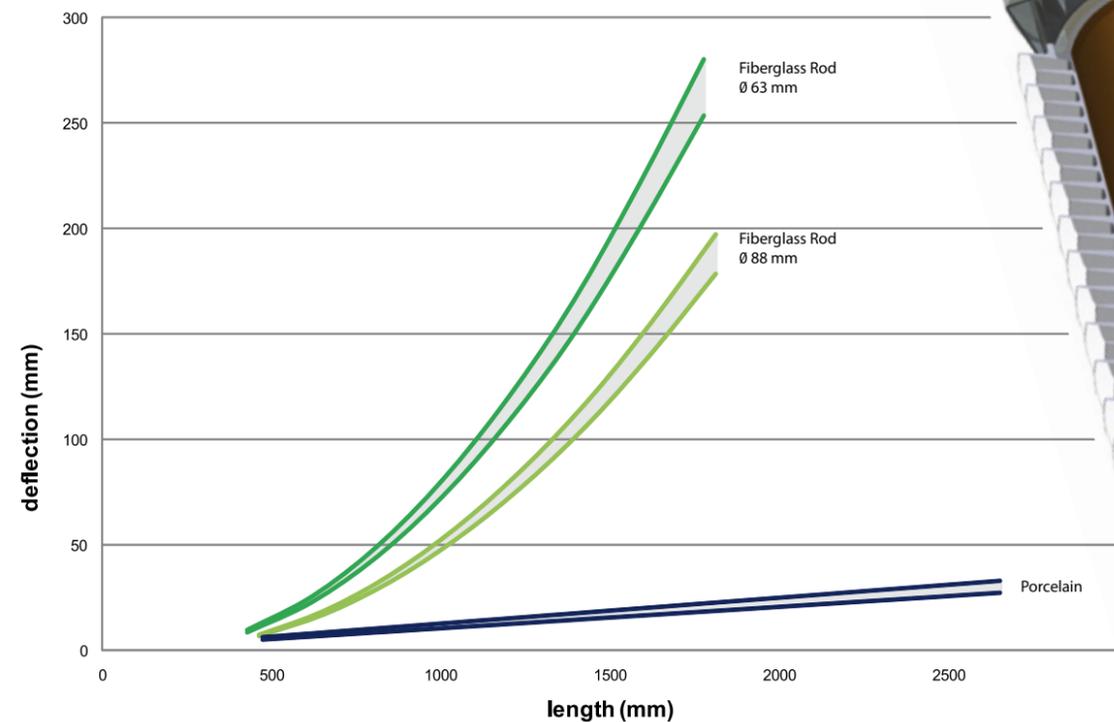
Hybrid Insulators.

Porcelain strength meets hydrophobicity.

Porcelain Rod Rigidity

PPC Hybrid Insulators take advantage of our high mechanical strength porcelain rod, offering unique stability along with long time performance. The porcelain core is made of high-strength aluminum oxide porcelain, C130 according to IEC 60672, avoiding material aging and electro corrosion problems of the insulator rod.

Deflection vs. Insulator Length



Comparison: Fiberglass Rods at MDCL & Porcelain Rods at MFL*

Polymer solid rod station posts are limited in their application to voltage classes around 170 kV because of excessive deflection values as the length increases. The graph above shows deflection values for typical fiberglass rod diameters used for polymer station post insulators at their MDCL value, above which there is a risk of permanent damage of the core. In comparison, the low value of deflection of porcelain cores at minimum failing load values (largely above the MDCL equivalent load) clearly explains why porcelain cores are ideal for such applications.

* MDCL = Max. Design Cantilever load; MFL = Minimum Failing Load Bending



Composite Pollution Performance

Hydrophobicity is widely considered to be the most important factor regarding the insulation behavior of composite insulators. It is well known that under specific pollution events, the hydrophobic property of silicone rubber can be temporarily inhibited. Such conditions will then lead to leakage current formation on the surface of the rubber housing material with the subsequent initiation of possible erosion of the housing itself.

To prevent permanent degradation, high performance silicone rubbers have been designed with specific additives (fillers) to protect the rubber from erosion under these circumstances. These fillers – typically ATH (Alumina Tri Hydrate) fillers – have to be incorporated in the polymer in specific minimum quantities in order to be effective.

The silicone compounds used by SEVES are the result of more than 30 years of composite activity in SEDIVER. The R&D facility based in St Yorre, France has all the required resources and equipments to achieve the best and most effective product. Tracking wheel test, inclined plan test, 1000 H salt fog test, 5000 h multistress test, are among the necessary steps in the selection of the most appropriate solution.

The Hybrid design offered by SEVES uses a specific and superior silicone compound in which the formulation involves an ATH level at least 45% in weight. PPC Hybrid Insulator sheds are characterized by an aerodynamic profile, fully complying with IEC 60815.

Hybrid Insulators.

Best insulation in extreme environments.

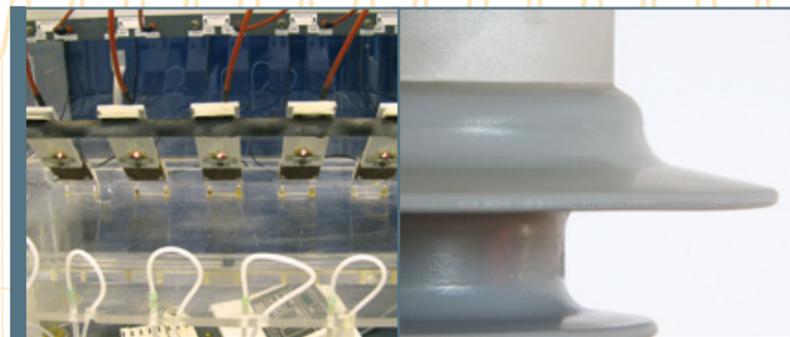
Technology Benchmark

	porcelain	RTV coated porcelain	Composite	Hybrid
Deflection under Bending Load Performance	++	++	-	++
Torsion Strength	++	++	-	++
Compression Strength	++	++	-	++
Product Lifetime	+	-	-	+
Pollution Performance	-	++	++	++
Weight	-	-	++	+
Vandalism	-	-	+	+
Maintenance	-	-	+	+
Reliability	+	+	-	+

Erosion

Experience and laboratory tests have shown that silicone polymer can suffer severe erosion damage under electrical activity resulting from a partial loss of hydrophobicity. In this respect, it is well-documented that Silicone Rubber enriched with ATH-fillers outperforms silicone rubber with low viscosity such as Liquid Silicone Rubbers (LSR).

Inclined Plan Testing



Impenetrable design: silicone fully bonded to the fitting

Tracking

To avoid internal tracking, the silicone needs to be fully bonded to the core. Managing the interface of fitting, porcelain core and silicone rubber is critical („triple point“). Benefiting from more than 30 years of experience, the hybrid technology has inherited the unique attribute of the **SEDIVER** impenetrable design. The silicone rubber housing adheres directly to the fitting and the cementing section without the need for artificial sealing.

Insulator Aging

Hybrid Insulators using a porcelain rod are the right technical solution for highly contaminated and polluted areas. Further, deflection under bending load can be a major problem when using composite posts, but the deflection in Hybrid Insulators is extremely limited due to the high mechanical strength of the ceramic cores.

The Hybrid immunity to adverse external conditions is simply outstanding. The nature of the rubber housing will prevent shed breakage resulting from surrounding mechanical shocks. On the other hand, if for any reason the rubber housing is damaged, the porcelain core does not suffer any of the risks associated with exposed fiberglass rods as used in traditional composite insulators.

Maintenance cost of the Hybrid Insulator is reduced to a minimum thanks to the reduced washing required by the HTV silicone given its excellent pollution performance. Flexibility in designing rod dimensions and creepage distances of **PPC** Hybrid Insulators guarantee full substitution of installed porcelain insulators for all substation applications.

PPC Hybrid Insulators are fully compliant with the requirements of IEC 62217, 60587, 62231, 60168 and 60273.

Buying **PPC** Hybrid insulators goes beyond “buying hydrophobicity”. Our unique design combines the superior mechanical strength of the porcelain core with a strong housing protection. The HTV silicone rubber selected by **SEVES** provides excellent tracking and erosion performance proven by decades of field performance, thus ensuring the best performance for long term applications.

The very Best.



That's what we deliver.

Only a company that develops, produces and delivers products worldwide can provide the optimal solution for your requirements.

The specialists of **PPC** Insulators are dedicated to supplying you with superior advice and global support.

PPC Insulators quality products and service provide time-tested value to fulfill your needs!

Please visit us on the web at www.sevespower.com



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