PPC INSULATORS

Hybrid Insulators

The very best

www.ppcinsulators.com

Hybrid Station Post Insulators.
Combining expertise.

Extreme environmental or high pollution conditions like those encountered in industrial, desert or coastal regions can lead to electrical activity on insulators such as inception of leakage current. The surface condition of an insulator in such areas can subsequently lead to pollution flashovers and ultimately to power system outages. The need for reliable power networks, avoidance of blackouts and shutdown of substations due to frequent maintenance activities 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. PPC Insulators' long-term expertise in porcelain and composite 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 core (undisputed superiority of high mechanical strength, stability & longevity) with the excellent performance of silicone housings that provide an ideal solution for use in highly contaminated service conditions.

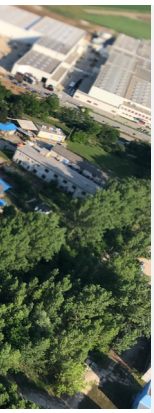
Manufacturing Tecnology

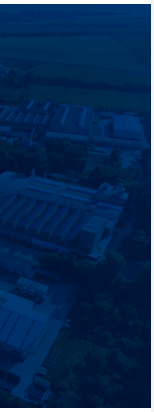
High pressure injection molding at high temperature is required due to the high viscocity of HTV silicone rubber. Injection molding technology used by PPC is set at temperatures above 160°C and a pressure of several hundred bars.

The silicone housing is fully bonded onto the porcelain solid core, perfectly managing the „triple point" (fitting-silicone housing-porcelain core). Thanks to the high pressure involved in this operation, the silicone housing adheres directly onto the fitting without the need for artificial sealing.

Hybrid Insulators.

Porcelain strength meets hydrophobicity.





Porcelain Core

The porcelain core is manufactured with the PPC Isostatic process that takes the advantage of flexible design, tight tolerances and short lead times. Ceramic granulates are pressed into a cylindrical blank at very high pressure. After turning, glazing and firing, the solid core porcelain (without sheds) is cut to the required length. Hot-dip galvanized fittings made of spheroidal cast iron are then cemented onto the porcelain core.

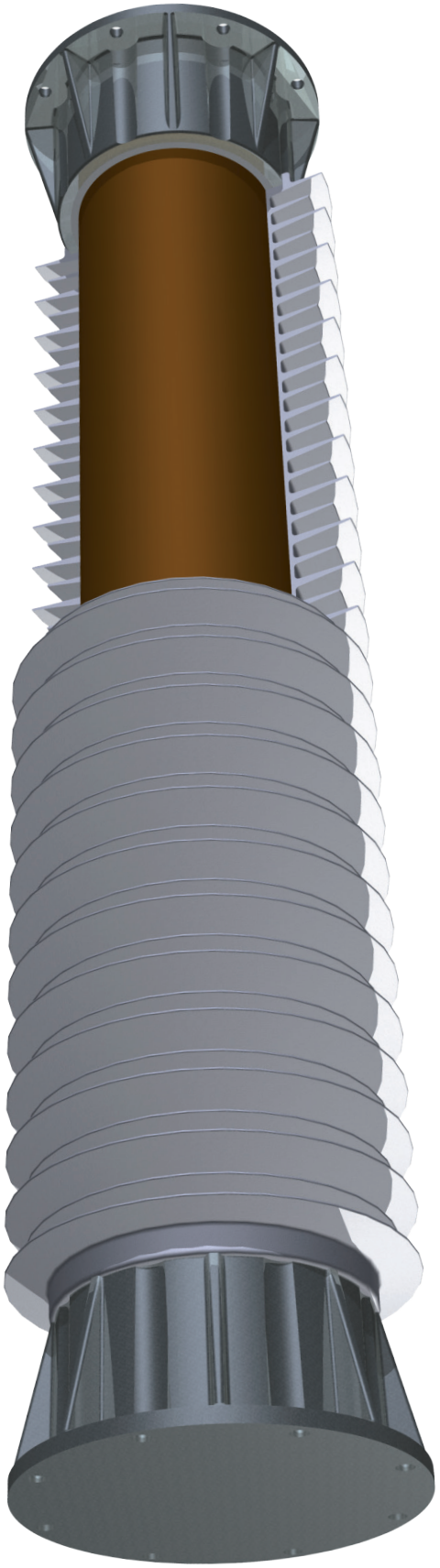
Process

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

Silicone Rubber Housing

Process

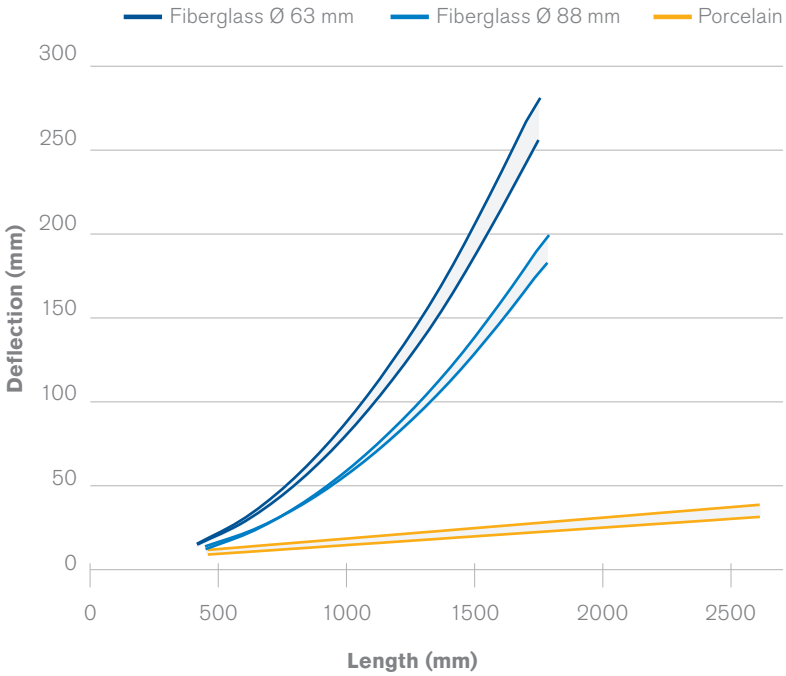
- Surface preparation
- Silicone injection molding
- Insulator testing



Porcelain Core Rigidity

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

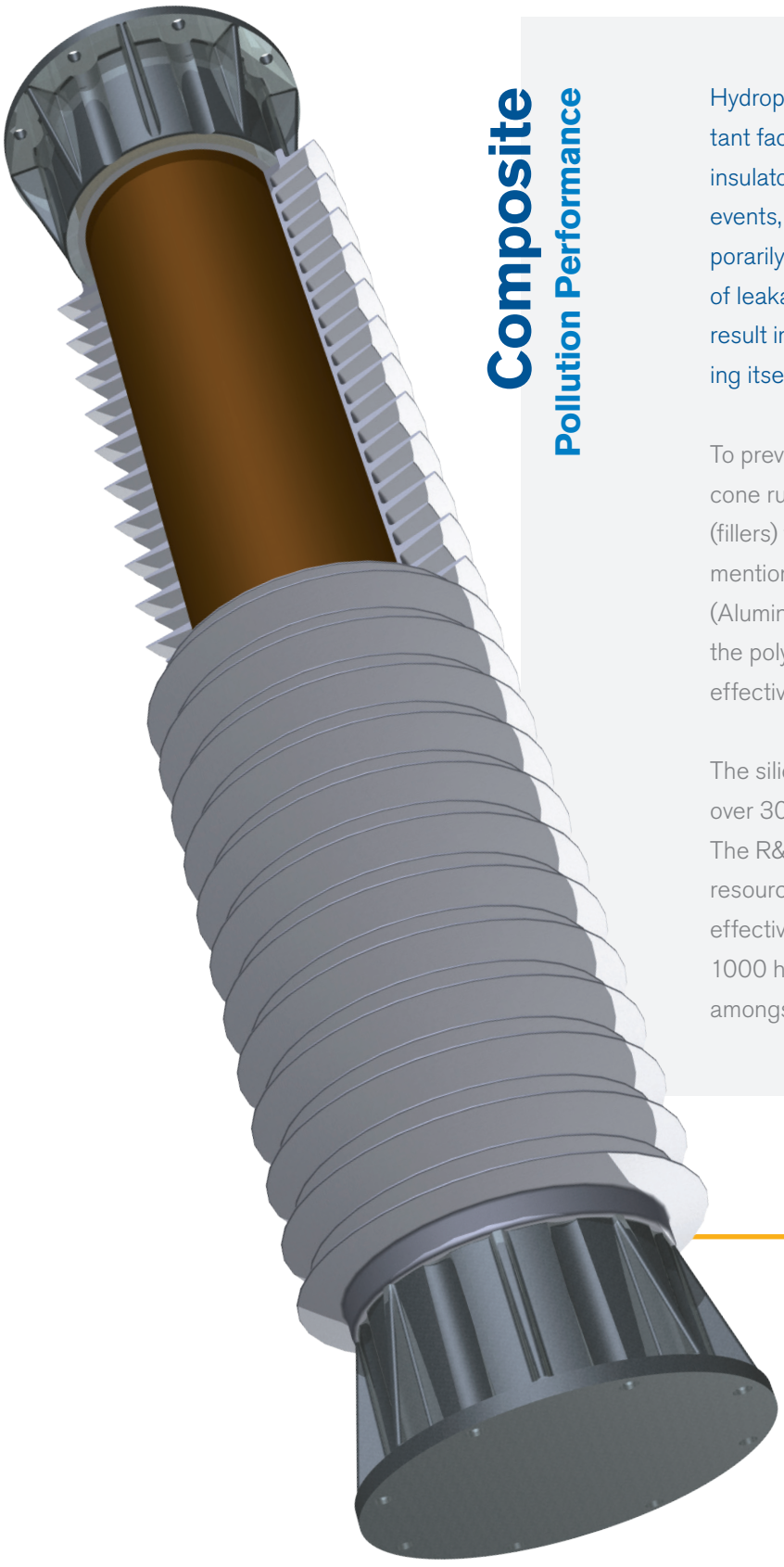
Deflection Performance vs. Insulator Length



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

Polymer station posts are limited in their application to voltage classes, around 170 kV because of excessive deflection with increase in respective lengths. The graph shows deflection values for typical fiberglass rod diameters used for polymer station post insulators at their MDCL value, above which there exists a risk of permanent damage to the core. In comparison, the low deflection of porcelain cores at MFL values (largely above the MDCL equivalent load) clearly explains why solid core porcelain is 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 hydrophobicity of silicone rubber can be temporarily inhibited. Such conditions can lead to development of leakage current on the surface of silicone housing, to result in initiation of possible erosion of the silicone housing itself.

To prevent permanent degradation, high performance silicone rubbers have been designed with specific additives (fillers) to protect the silicone from erosion under above mentioned 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 PPC are the result of over 30 years of expertise in composites at SEDIVER. The R&D facility based in St Yorre, France has all required resources and equipments to achieve the best and most effective product. Tracking wheel test, inclined plan test, 1000 hours salt fog test, 5000 hours multistress test, are amongst the necessary steps in the selection of the most

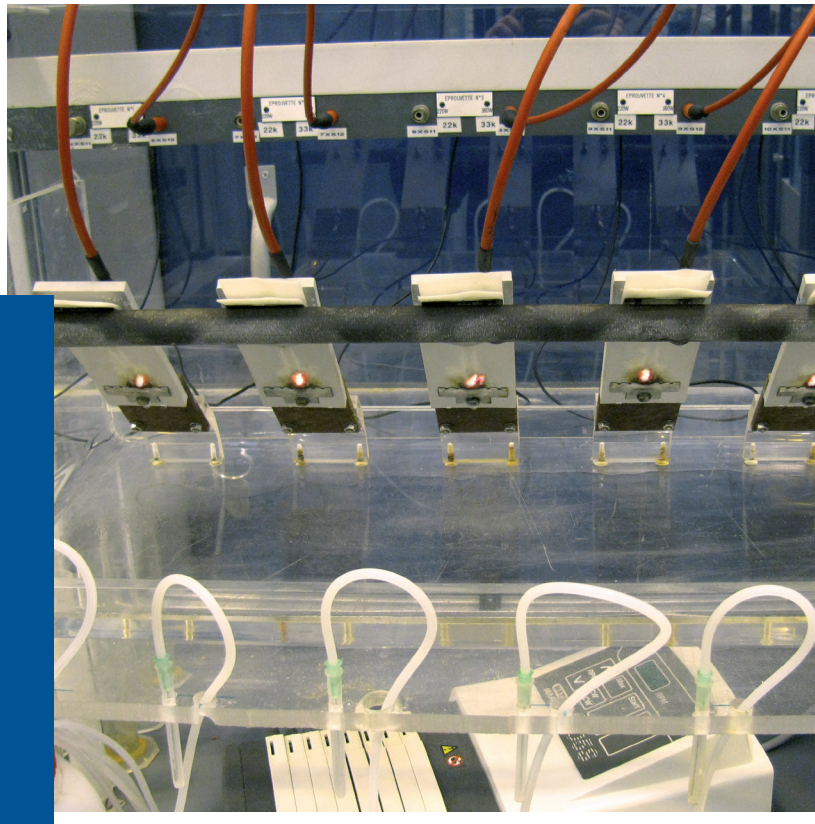
The Hybrid design offered by PPC uses a specific and superior silicone compound in which the formulation involves ATH level at least 45% in weight. The sheds of PPC Hybrid Insulator are characterized by an aerodynamic profile, in accordance with IEC 60815.

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	+	+	-	+

Insulator Aging



Erosion

Experience and laboratory tests have shown that silicone polymer can suffer severe erosion damage under electrical activity that results from partial loss of hydrophobicity. In this respect, it is well-documented that silicone rubber with 45% of ATH-fillers outperforms Liquid Silicone Rubber (LSR) with 05% of ATH-fillers.

Hybrid Insulators with solid core porcelain and silicone housing are the right technical solution for highly contaminated and polluted areas. Further, deflection under bending load can prove critical in case of composite posts, but the deflection in case of Hybrid Insulators is extremely limited due to the high mechanical strength of the ceramic cores.

The immunity of Hybrid Insulators to adverse external conditions is simply outstanding. The nature of the silicone housing prevents the breakage of shed(s) induced by mechanical shocks. On the other hand, if for any reason the silicone housing is damaged, the porcelain core does not suffer any of the risks associated with exposed fiberglass rods as used in traditional composite insulators.

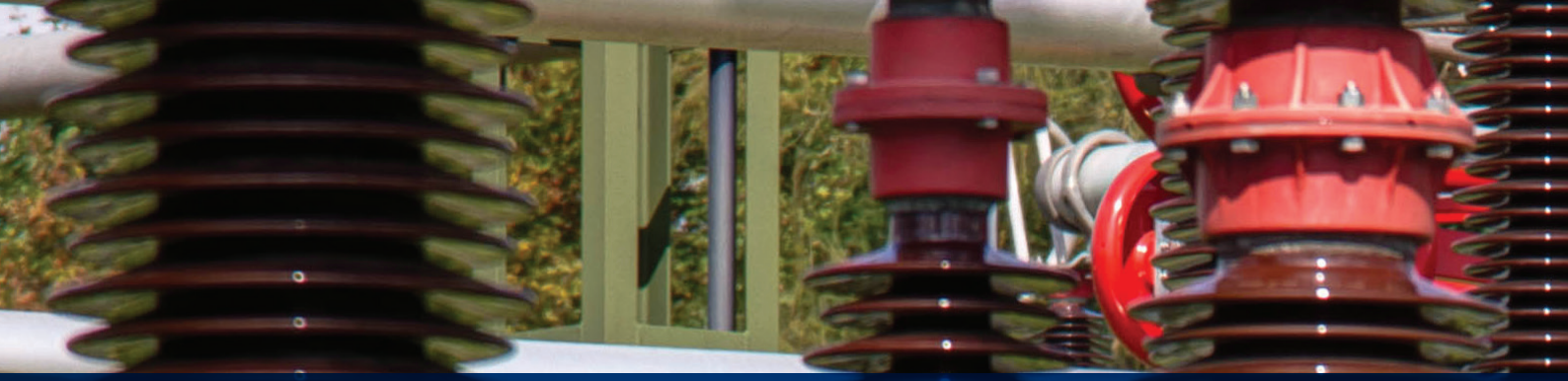
Maintenance costs of Hybrid Insulators are reduced to a minimum, thanks to the reduced washing required by the HTV silicone given its excellent pollution performance. Flexibility in designing core dimensions and creepage distances of PPC Hybrid Insulators guarantee full substitution of installed porcelain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

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

Employing PPC Hybrid Insulators goes beyond “buying hydrophobicity”. Our unique design combines best of both worlds: high-strength mechanical core for superior deflection performance and silicone housing for excellent pollution performance. The HTV silicone rubber employed by PPC provides excellent tracking and erosion performance, thus ensuring best performance for long-term applications.

Tracking

To avoid internal tracking, the silicone housing needs to be fully bonded to the core. Managing the interface of fitting, porcelain core and silicone housing is critical („triple point“). Benefiting from unique know-how and field experience, hybrid technology has inherited the unique attribute of the PPC’s impenetrable design. The silicone housing adheres directly on to the hardware assembly and the cementing section without the need for any artificial sealing.



PPC Insulators is a leading manufacturer of porcelain and hybrid insulators for more than 130 years. We invest our efforts to offer quick, easy and effective solutions to our customers. Our extensive knowledge, expertise, and production technology enables us to produce the best insulator designs to cater up to 1,200 kV AC and 1,100 kV DC system voltages, that positions us at the forefront of techno-industrial achievements. We supply over 40,000 standard insulators from our stock to meet the demands of our customers.

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