

**HUNTSMAN**

Enriching lives through innovation

## Advanced Materials

### Araldite® HCEP Systems

Hydrophobic epoxy  
for extreme outdoor conditions



POWER FROM 



## Benefits for the manufacturer

- > Extended hydrophobic properties
- > Low leakage currents
- > Superior thermal cycle resistance
- > Enhanced flame retardancy
- > Excellent tracking and erosion resistance
- > Extended insulator life time expectation
- > Construction and insulation material for monolithic insulators
- > Advanced design flexibility
- > Lower cost over lifetime of the insulator

## Exceeding worldwide requirements

Araldite® HCEP Systems are used in outdoor applications worldwide. Electrical equipment manufactured with this material has received key utility approvals, such as EDF, ESKOM and KEPCO. Araldite® HCEP Sys-

tems are proven in extreme situations and have passed one of the most aggressive natural aging tests for outdoor applications: KIPTS (Koeberg Insulator Pollution Test Station) in South Africa.



**Current transformer KOR 50 made with hydrophobic Araldite® CY 5622 – with courtesy of ABB USA**

## Epoxy systems for tough climatic environments

Araldite® HCEP (Hydrophobic Cycloaliphatic Epoxy) Systems have been developed to meet and exceed the stringent requirements of medium to high voltage outdoor applications.

The durable outdoor insulation systems offer high performance and reliability in tough climatic environments combined with the strength of traditional epoxy systems.

## Extended hydrophobic properties

- > Intrinsic hydrophobicity
- > Hydrophobicity transfer
- > Hydrophobicity recovery
- > Long-term stability of hydrophobicity

### Hydrophobicity recovery effect



Hydrophilic surface



Hydrophobic surface

The hydrophobicity recovery effect is the ability of surfaces to recover their initial hydrophobic properties after losses resulting, for example, from electrical aging.

### Hydrophobicity transfer effect



Hydrophilic pollution



Hydrophobic pollution

The hydrophobicity transfer effect is the ability of surfaces to turn hydrophilic pollution into hydrophobic layers.



## ABB selects Araldite® HCEP Systems

### Insulation materials for new ABB outdoor vacuum reclosure OVR

ABB reclosures made of Araldite® HCEP Systems have passed one of the most stringent natural aging tests for outdoor applications: KIPTS in South Africa.

With dry summers, high winds, high exposure to UV radiation, seasonal rainfall and extremely heavy levels of marine and industrial pollution like salt, KIPTS is recognized worldwide as one of the harshest natural aging test sites.

The reclosers made from Araldite® HCEP Systems were tested over one year. Results are:

- > No signs of material erosion, tracking, cracks or punctures
- > No more than one instance of insulation leakage current exceeding 750 mA (only three instances allowed)
- > Heavy to very heavy pollution test passed
- > Testing for use in marine and industrial environments passed



Pole for 15 kV recloser – with  
courtesy of ABB Germany/USA

### Conclusion

“Araldite® HCEP ... – the best commercially available dielectric material for enhanced performance in severely polluted outdoor environments.”

(ABB Review 4/2008)



## Comparison of medium-voltage outdoor insulators

	<b>HCEP</b> Araldite® HCEP Systems	<b>Silicone</b> (composite insulator)	<b>EPDM</b> (composite insulator)	<b>CEP</b> Standard cyclo- aliphatic epoxy	<b>Porcelain</b>
Design versatility	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Weight	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Manufacture process (complexity, duration)	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
In-house production	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Handling	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Intrinsic hydrophobicity	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Hydrophobicity recovery	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Hydrophobicity transfer	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Thermal shock resistance	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Vandalism resistance	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Bird attack resistance	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Number of interfaces	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Flashover probability	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Flashover resistance	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Corona resistance	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Pitting erosion	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Tracking and erosion resistance	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Flame resistance	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Maintenance	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Insulator cost	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Overall insulator life cost	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●

●●●●● excellent  
 ●●●●● very good  
 ●●●●● good  
 ●●●●● medium  
 ●●●●● critical  
 ●●●●● very critical

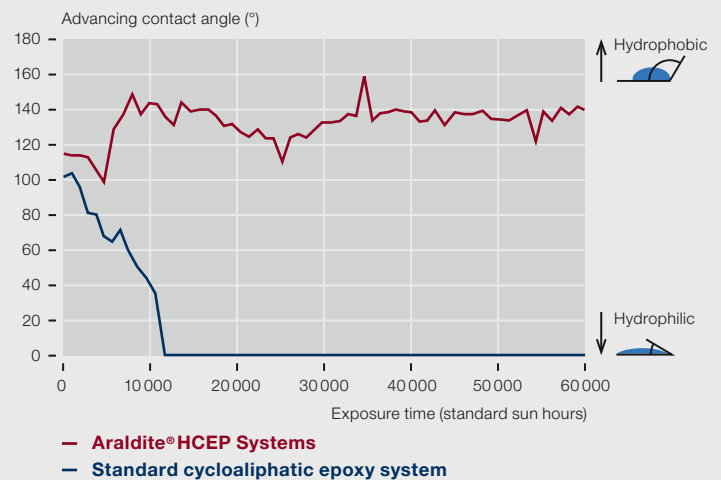
# Track record, tests and approvals

## Track record, tests and approvals

- > Suited for railway tunnel applications (NF standard 16-101 / 16-102)
- > Key utility approvals: EDF, ESKOM, KEPCO
- > Passed KIPTS test (Koeberg Insulator Pollution Test Station) in South Africa
- > Worldwide experience
- > Successfully tested by key institutes:
  - > FETI (Furukawa Electric Institute of Technology), Hungary
  - > FGH Engineering & Testing GmbH, Mannheim, Germany
  - > Technical University Braunschweig, Germany
  - > Utsonomiya University, Japan
- > Featured in key publications from Huntsman, ABB and third parties

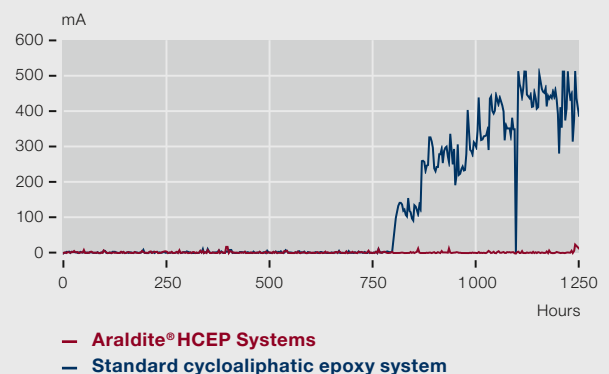
## Accelerated weathering

**Fluorescent UV aging test**  
 Standard cycloaliphatic epoxies lose hydrophobicity after 5000 hours whereas Araldite®HCEP Systems even increase hydrophobicity due to higher roughness (lotus leaf effect). 1000 standard sun hours fluorescent UV correspond to 1 year in nature.



## Lower leakage currents

**1000 hours salt fog test according to IEC 61109: very low leakage currents**  
 During a 1000 hours salt fog test, the Araldite®HCEP Systems show lowest leakage currents in comparison to standard cycloaliphatic epoxy systems. They provide extended insulator lifetime due to lower discharging activity and lower risk for flashovers. (Tested at FETI, Hungary)



## Enhanced thermal cycling resistance

Araldite®HCEP Systems help designers to create applications for lowest temperatures. The

Embedded Pole OP1 – Outdoor from ABB has passed a thermal cycle test down to -80 °C.

## Huntsman Advanced Materials

We are a leading global supplier of synthetic and formulated polymer systems for customers requiring high-performance materials which outperform the properties, functionality and durability of traditional materials. Over 2300 associates at 13 locations worldwide work to fulfill this promise day by day.

More than 9000 companies around the world use Huntsman Advanced Materials technologies in key markets such as adhesives and inks, aerospace, automotive, coatings, construction, electronics, medical, marine, power transmission and distribution, sports equipment and wind power generation.

## Energy Market

Huntsman provides innovative solutions for adhesives, casting, composites and encapsulation along the entire value chain of the energy industry.

From generation, transmission and distribution to consumption and storage, our products and applications guarantee optimized performance and competitiveness for your future success.

Anticipate tomorrow's challenges and let us be your powerful partner towards a sustainable world full of energy.

## Global presence – 13 manufacturing sites



For more information  
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