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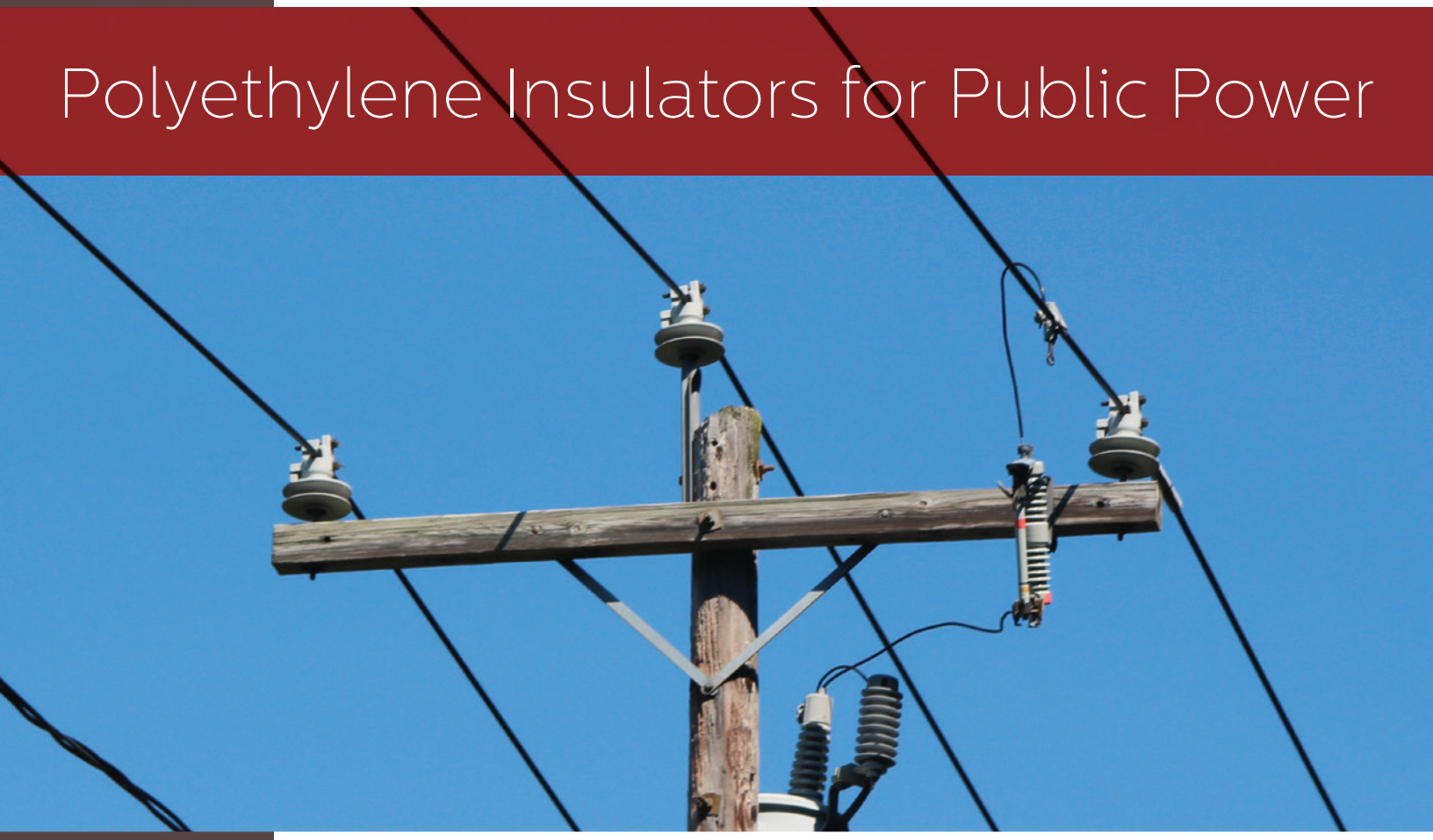
Polyethylene Insulators for Public Power



Lightweight, durable high density polyethylene insulators reliably withstand years of abuse on rural distribution lines

HDPE offers cost savings over ceramics from reduced breakage, simplified installation

There are so many ways that porcelain insulators can be damaged and broken. At a rural electric company, some of the damage comes from surprising sources.

Developed decades ago, porcelain insulators have built a reputation for low cost simplicity when used to attach electrical lines to utility poles. Although porcelain has been around for a long time, durability is the downfall of this fragile material. Costly damage can occur during handling, transportation and installation, as well as in-service when exposed to weather extremes, lightning or vandalism.

For example, utilities report experiencing significant loss of porcelain insulators in transit due to chips, cracks and breakage that occur when insulators are being shipped from the manufacturer or warehouse. Damage can also occur when traveling around in a utility truck

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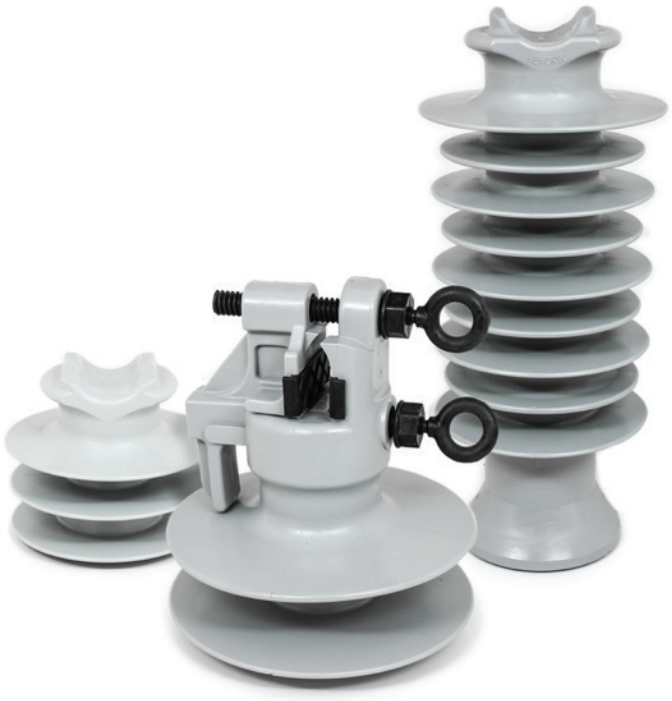
awaiting installation. Breakage is often a problem during installation. Porcelain cannot handle stress and will break if the installer over-tightens to the mounting hardware. A chipped or cracked porcelain insulator can create a safety hazard and unsafe working conditions for line workers by damaging personal protective equipment or causing personal injury.

Loss can also take place during the insulator's service life. Weather is the biggest culprit. During lightning storms, a strike can cause porcelain to track, flash over and/or puncture, impairing the insulator and creating the potential for nuisance outages over time. Extreme weather events such as hurricanes or heavy snow and ice can immediately induce irreparable damage. Trees easily break porcelain insulators when heavy limbs hit the devices. Condensation, extreme temperature variations and poor quality can also result in damage. Even a tiny hairline crack can create a "blue sky" failure under perfectly normal operating conditions. Some utilities report that vandalism due to human acts such as gun enthusiasts using insulators for target practice is also common and costly.

In the early 1960s, Hendrix Molded Products developed and introduced a new type of durable, lightweight insulator made out of high density polyethylene. Hendrix realized porcelain insulators were unsuitable for use with insulated conductors due to the difference in dielectric constants between the porcelain and the polyethylene cable insulation. This incompatibility resulted in the electrical degradation of the cable's jacketing over time. The new polyethylene insulators were compatible with jacketed conductors and caused no damage or erosion to the coating.



Over time, it became clear that Hendrix polyethylene insulators had broader benefits for a wide range of cables including aluminum conductor steel reinforced (ACSR) cable, aluminum and copper bare wire. The new lighter weight insulators provided longer leakage distances, were compatible with all conductor types and were UV and track resistant. This toughness allowed HDPE insulators a field life expectancy greater than the 50 years expected for porcelain insulators.

Awareness and use of polyethylene insulators has increased among utilities over the last 50 years. About 35 years ago the City of Reading, Massachusetts, slowly converted all their distribution systems from porcelain to high density polyethylene. Peter Price, an engineer at the Reading Municipal Light Department (RMLD), explains that the durability, reduced weight and competitive cost of HDPE were important factors that convinced the regional utility, which serves four towns including urban and rural areas, to make the switch. "The polyethylene insulators have proven so reliable and rugged that we don't use porcelain anymore at all on our 15 and 35kV lines. Polyethylene is the only choice here."

Breakage was the biggest problem with porcelain at RMLD, even though porcelain insulators were less expensive than HDPE. "PE insulators perform better. It's that simple. They are not a product we have to think a lot about."

Dennis Jorgensen, power system operations manager for the City of St. George, Utah, tells a similar story. The energy services department at the City of St. George serves 28,000 people in this rugged desert town in southwestern Utah, just north of Las Vegas. Summers are long, hot and dry, with temperatures reaching as high as 118°F.

"We've been using Hendrix polyethylene insulators consistently for several years now on our 15kV distribution lines," says Jorgensen. "They are a back-saver for our crews. Porcelain was so heavy. A weighty, cumbersome porcelain setup can take multiple

line workers to install. High density polyethylene is lightweight; one person can easily install the insulator. That's less costly, takes less time, and there's much lower risk of back injury for our workers."

Jorgensen also reports that Hendrix polyethylene insulators are UV resistant and survive for years without degradation despite constant exposure to desert sun and extremely high temperatures. And while there is little precipitation around St. George, when storms do come through, they are fierce. HDPE insulators have solved the utility's outage problems caused by tracking and flash over from lightning strikes.

"It's a boring story because these new insulators work long-term," explains Jorgensen. "There's nothing exciting that happens once you install them – they are reliable and durable; they hold up to blazing sun and trauma. There are no worries now that we've switched from porcelain, no problems."

New Hampshire Electric Cooperative (NHEC) serves 83,000 homes and businesses in 115 New Hampshire communities. Since 2003, NHEC has been using polyethylene insulators on all their distribution lines. They report great benefits from the PE insulators' lighter weight, durability, longevity and availability.

According to Janie Bowie, head of procurement for NHEC, polyethylene's advantages over porcelain are many. The polyethylene insulators are lighter than porcelain insulators, which means they are easier to store and handle. "With polyethylene, you can throw a bunch of insulators in a box and the package is light enough for one person to carry. They are not fragile, so it's okay if the box bounces around in the back of a truck or is dropped. There's no damage, no loss of inventory."

NHEC is using the polyethylene insulators on all their 15 and 25kV distribution lines. As the coop rebuilds lines, they replace existing porcelain insulators with polyethylene. Polyethylene is the standard on any new lines that are built using either bare wire or covered cable. "It's so easy to get the Hendrix products," continues Bowie. "They are made in the USA – right here in New Hampshire – so availability is never a problem. Here in the Northeast, we have to react quickly to harsh weather and you can't really predict when you're going to need insulators. Hendrix makes it so easy to get the supplies we need."

The rural coop experiences some problems with vandalism. "It's often kids with BB guns who are shooting at the insulators, but any gun can damage or break porcelain. This used to be a real headache. Now because the polyethylene insulators have no problem standing up to a bit of mischief, the frustration and the replacement cost is gone."

For NHEC, installation of polyethylene insulators couldn't be easier. "Their light weight makes it effortless to carry them up poles. No tools are needed for installation. Our line crews simply hand tighten the insulator on the pin and secure the cable to the insulator with bare or covered tie wire depending on the cable," Bowie finished.

Because of all these advantages, many utilities have switched from porcelain to polyethylene insulators in the decades since their invention, often reporting savings in both installation time and personnel costs.

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