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Ohio Brass® insul
the High Win

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A freakish storm with winds up to 150 miles per hour which swept through in July 2001 put our use of Ohio Brass (OB) Hi*Lite® insulators to a unique test. The weather service did not classify the storm as a tornado because there were no reports of a touch down. Just the same, the damage our 14,000-member cooperative endured was considerable.

The wind whipped the lines and broke 69kV transmission poles like matchsticks on a 1 mile section of line about a mile and a half from our headquarters at Huntley. The affected section has ten 75-foot Class 1 Western Red Cedar poles, which were installed only five years ago. By the time the storm finished, these poles were ripped up and tossed on the ground. However, only 40 feet away and parallel to this transmission line, a single phase #6 copper distribution line on 35 class 5 poles was completely untouched. In assessing the storm damage, I was amazed to discover that out of the 30 Ohio Brass Hi*Lite insulators on the downed poles only two needed to be replaced. The only reason those particular two insulators needed replacement was because of torn weather sheds.

It took us two weeks to get up and running. During that time, we had to backfeed the line from another source.

ators withstand
d Test

The Ohio Brass Hi*Lite insulators we use have $2^{1}/_{2}$-inch diameter fiberglass rods and a gain base. Despite the ferocity of the storm, the transmission conductor and trunnion clamps stayed in the insulators, and the insulators remained on the downed poles.

We are impressed with this unusual illustration of the durability of Ohio Brass insulators. We installed them on 16 miles of line in 1996. This remarkable demonstration of the strength of OB insulators strengthens my confidence in the rest of the line. ■

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpscontact@hps.hubbell.com.

Hubbell Emergency Response Team Tackles January Ice Storm

The January 30 ice storm that roared into Oklahoma and Kansas, across western and northern Missouri, and states beyond brought out the best in Hubbell emergency response, our distributor partners and utility customers.

With thousands of consumers without power in Oklahoma, Kansas and Missouri. Hubbell Power Systems (HPS) went into a pre-planned emergency 24/7 work mode that shipped 54 loads to seven states. Late afternoon customer emergency orders were quickly loaded and shipped from multiple Hubbell locations with targeted arrival at most customer locations the following morning. Speed and accuracy in shipments were praised by strapped utilities as products were feverishly pressed into the service of crews.

By “pulling” on emergency stocks inventoried in its 381,562 square foot Distribution Center at Centralia, MO, and by adjusting and accelerating production lines at four geographically dispersed Hubbell plants for direct ships, HPS pulled out all stops to ship more than 425,000 connectors, splices and deadends; 500,000 plus bolts and washers; more than 25,000 polymer insulators and arresters as well as more than 13,000 cutouts and fuse links to name a few of the many items shipped. ■

For the complete story on how Hubbell can help you plan for storm emergencies, contact your account representative or e-mail hpscontact@hps.hubbell.com.

Ohio Brass polymers designed for use in contaminated areas

higher performance than porcelain

Today's high voltage polymer insulators and arresters are better suited than porcelain for service in contaminated areas.

Porcelain disadvantages also include a low strength-to-weight ratio and a brittle nature. Polymer overcomes both of these concerns with light weight and toughness that helps prevent damage during installation or attacks from vandals.

Distribution Insulators

When a contaminated distribution insulator becomes wet, leakage currents begin to flow on the surface. If the leakage currents reach a high enough level, the insulator experiences an external flashover. The rate at which the insulator dries is critical to the performance of the insulator.

Because the leakage current is the same along the insulator length, the current density must be higher at the shank. The heat generated by the leakage current is calculated at 1^2R. Because there is less conducting material at the shank, the resistance is highest at the shank. Therefore, the greater the difference between the insulator's outside diameter and the shank, the faster the insulator dries.

When the shank has dried, the flow of leakage current ceases and the voltage is supported across the dry bands. This prevents the flashover of the insulator.

The high-strength core of the polymer insulator allows for an extremely small shank. Also, the polymer coating can be molded with large, thin weathersheds. The relationship of the outer shed diameter to the core (shank) defines the form factor. It simply is not practical to manufacture porcelain insulators with form factors approaching polymers.

Additionally, the active insulating segment in a porcelain insulator is thin. Under lightning voltage stresses it is possible that this insulation may be punctured. During subsequent contaminated conditions the insulator may suffer a burn down. Polymer insulators with their continuous insulating core do not experience punctures.

Distribution Arresters

In contaminated environments, extra leakage distance is usually required to allow a surge arrester to properly function. For a porcelain arrester this extra leakage distance is usually achieved by adding housing length. The ability of the polymer material to be molded with large diameter, thin weathersheds means that standard polymer arresters may be produced with extra leakage distance. Table 1 summarizes the characteristics of porcelain and polymer distribution arresters.

Intermediate Arresters

To meet the pressure relief requirements of today's substations, the length of porcelain arrester housing must be limited. This is because it takes longer to vent a longer housing. Time allows for build up of internal pressure and a possible explosion of the housing.

One of the main advantages of the polymer arrester is that venting is almost immediate and is out the side of the arrester. This means the housing length is no longer limited by the pressure relief capability. Therefore, high voltage arresters can be one piece housings. The elimination of intermediate metal end fittings dramatically improves the contamination performance of the polymer arrester compared to porcelain. Concerns with uneven pollution problems are eliminated.

If only one of the housings of a multiple unit porcelain arrester is contaminated, the leakage currents flowing across its surface cause the same current to flow through the MOV discs in the other porcelain. It is possible that the leakage current could be sufficient to cause the MOV discs to go into thermal runaway. Table 2 summarizes the results of partial wetting and five hour slurry tests performed on two and three unit porcelain intermediate arresters and their polymer counterparts.

The tests were more severe than the contamination tests of ANSI C62.11 - because three (instead of two) slurry applications were used plus the length of time delay was decreased from 10 minutes to three minutes. The reduction in the time was to minimize the MOV disc cooling during the slurry application period. The testing results show the highest

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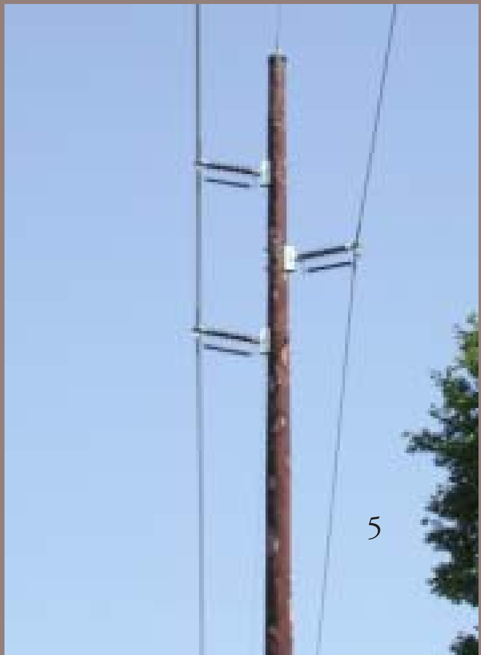

temperature reached was in the two unit 66kV MCOV porcelain-housed intermediate arrester. Neither of the samples of the polymer arresters experienced significant heating during the partial wetting period.

After the conclusion of the partial wetting test, the arresters were tested using the five hour uniform slurry test procedure. This test consists of applying a uniform coating of standard 400 ohm-cm slurry to the test arrester. Within 30 seconds, MCOV is applied for 15 minutes during which time the surface leakage currents cause the surface to dry. Slurry applications are repeated for a total of 20 test cycles. After the 20th test cycle MCOV is applied to the arrester for 30 - 60 minutes to demonstrate thermal stability. Surface leakage currents were measured at the end of the 5th, 10th, 15th and 20th test cycle. Testing results are summarized in Table 2 and demonstrate the polymer housed surge arrester will be able to survive under contaminated conditions. ■

Table 1
Polymer Distribution Arrester Leakage Advantage

MCOV	Standard Porcelain Leakage Distance (in.)	Standard Porcelain Height (in.)	Special Porcelain Leakage Distance (in.)	Special Porcelain Height (in.)	Standard Polymer Leakage Distance (in.)	Standard Polymer Height (in.)
8.4	9.0	9.4	18.3	15.9	15.4	5.5
15.3	18.3	15.9	22.0	20.0	26.0	8.5
22.0	22.0	20.0	29.0	28.9	52.0	17.2

Table 2
Comparison of Contamination Performance of Polymer versus Porcelain Housed Intermediate Class Arrester

			Partial Wetting Test		5 Hour Slurry Test - Maximum Current After Slurry Number			
MCOV (kV)	Housing Material	Housing Leakage Distance (in.)	Max. Current (mA crest)	Max. Disc. Temp. (°C)	5	10	15	20
57	Polymer	81	<1	<38	35	42	44	44
66	Porcelain	54	68	>163	–	–	–	–
84	Polymer	109	<1	<38	50	52	60	60
98	Porcelain	122.4	18	<82	143	160	175	185

Polymer Insulation Weight Advantage

Product	Type	Voltage (kV)	Porcelain Weight (lbs.)	Polymer Weight (lbs.)	Percent Weight Reduction
Insulator	Distribution	15	9.5	2.4	74.7
Arrester	Distribution	15	6.0	3.8	36.7
Post Insulator	Transmission	69	82.5	27.2	67.0
Suspension	Transmission	138	119.0	8.0	93.2
Intermediate Arrester	Substation	69	124.0	28.0	77.4
Station Arrester	Substation	138	280.0	98.9	64.7

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpscontact@hps.hubbell.com

New Arc-Quenching Fuse Tube Liner

Improves product performance

The Synthetic Arc Quenching Fuse T ube replaces the Type C cutout fusetube lined with “bone fiber”. This new fuse tube has a core made from a proprietary formulation, in part, consisting of polyester fiber, epoxy and Aluminum Tri Hydrate (ATH).

The arc extinction

In the presence of an arc, created by the melting of a fuse link, the core of an expulsion fuse is ablated (eroded). The carbon in the organic fragments reacts with water in the arc extinguishing material to form carbon monoxide, hydrogen and other gases. These gases create increased pressure within the fuse tube acting to expel the debris from the fuse tube. With removal of the arcing debris, the dielectric strength inside the fuse tube is re-established, enabling it to extinguish the arc at the next available current zero.

Until now, arc extinction was achieved through use of bone fiber as the arc extinguishing material. One of the characteristics of bone fiber is its tendency to absorb water. It is the absorbed water that helps bone fiber interrupt an arc. The moisture content, and therefore the interrupting ability of bone fiber, is sensitive to ambient humidity. Under normal atmospheric conditions the moisture content of a bone fiber core varies from 2 to 8% by weight. This level of moisture content is adequate to extinguish the arc within the range of interrupting capacity of commercially available cutouts. The variability of the moisture content does, however, contribute to an inconsistent rate of ablation of the bone fiber core during arc interruption.


New fuse tube core made of proprietary formula

Aluminum Tri Hydrate filler is used as the water source in the synthetic arc quenching core. The amount of filler is controlled to provide just the right amount of water for efficient interruption. The epoxy matrix used in the synthetic core has a high resistance to moisture absorption from humidity, particularly when compared with bone fiber. The moisture content, and therefore the interrupting ability of this system, is not affected by ambient humidity.

During the interruption of an arc, polymer fragments are

Bone Fiber

Synthetic Arc Quenching Material

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NOTE: Because we have a policy of continuous product improvement, we reserve the right to change design and specifications without notice.

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