



***VISIONARY***



### ***Distribution and Substation Arresters***

- Normal duty, heavy duty and riser pole polymer-housed, metal-oxide surge arresters available for systems 4.16kV through 34.5kV.
- Gapless construction
- Resistant to moisture ingress
- Millions in service worldwide
- RUS listed

### ***Transmission and Distribution Insulators***

- VERI\*LITE™ Deadend Insulators 15kV through 35kV
- HI\*LITE® Line Posts, station posts, suspension lines and transmission insulators for systems 69 - 765kV



### ***Cable Accessories***

- Full 200A 15kV Loadbreak Products
- 600 amp products
- Splices

## Introduction

Ohio Brass' Electric Utility operation ("Ohio Brass") has a rich tradition as a company based on innovation. Ohio Brass continues to thrive on developing new technologies and state-of-the-art power products.

Continually setting new standards, Ohio Brass consistently develops new materials and products for transmission and distribution. We've used our years of background in research, development and manufacturing as a foundation for our ever improving and expanding line of polymer insulator and surge arresters as well as cable accessories.

New products show our commitment to the future. Ohio Brass is a strong, vibrant company with a solid reputation for quality and service in the electric utility market.



This brochure highlights the visionary experience of yesterday and today at Ohio Brass' Electric Utility operation.



The following outline traces some of the major events in the history of the Ohio Brass' Electric Utility operation ("Ohio Brass") and the electric utility industry. A visionary sees obsolete products while they are still in use and develops new products to meet customer needs while setting industry standards for the world.

## Time Line . . .

Electric Utility operation of Ohio Brass founded in Mansfield, Ohio.



**1893** Enters transit market with line material, including insulators, for electric powered trolley lines.

One-piece, cap-and-pin-type porcelain suspension insulator chosen to insulate 110kV Niagara Falls to Toronto, Canada, transmission line.

**1910** Porcelain plant purchased in Barberton, Ohio.

**1915** First high-voltage testing laboratory established at Barberton plant.

**1920** The country's first full-scale outdoor electrical testing facility established at Barberton.



**1922** Canadian porcelain plant established at Niagara Falls, Ontario.

**1932** HiTension News, an Ohio Brass publication about products and services of interest to the electric utility industry begins publication. New line of oil-filled apparatus bushings introduced.

**1934** New high-voltage test laboratory located in Barberton plant. Canadian plant builds new, expanded facilities at Niagara Falls, Ontario.

**1935** Ohio Brass insulators installed on Boulder Dam 287kV line.

**1938** Clamptop concept developed for pin types and line post insulators.

**1946** Ohio Brass begins participation in extra-high-voltage transmission projects.

Non-Magnetic aluminum transmission and distribution clamps introduced.

**1950** Ohio Brass introduces improved protection and durability in first surge arrester design.



**1953** Thorex magnetic gap surge arresters introduced.

**1957** Ohio Brass introduces new condenser bushings with improved spring compression assembly. Dynagap current-limiting gap surge arresters also introduced.

**1962** Development of corona-free hardware eliminates need for expensive corona-control rings on extra-high-voltage transmission lines.

**1964** Ohio Brass begins development of organic insulation for transmission and distribution.

**1966** Canadian operations expand with Pointe Claire, Quebec, plant. Ohio Brass acquires plant in Newell, West Virginia, to expand porcelain production.

**1966-1967** High voltage lab performs electrical tests on 765kV mock tower and full scale towers for A.E.P.

**1968** Dedication of Frank B. Black Research Center, Wadsworth, Ohio, as a modern resource for electric power research.

**1969** Research center begins one of the largest research projects in Ohio Brass' history in cooperation with A.E.P. to "determine the feasibility of transmission of electric power at 1500kV and above."



**1970** Futura-2, extended leakage design, suspension insulator introduced.

**1975** Solid-core porcelain line and station posts introduced through entire production line.

**1976** Lightweight, high strength HI\*LITE® Polymer Insulators introduced after 12 years in development.



# HISTORY

**1978** Electric Utility operation purchased by Harvey Hubbell, Incorporated, Orange, CT. (Now Hubbell Incorporated). MOV arrester element plant constructed in Wadsworth, Ohio.

**1984** HI\*LITE® insulator manufacturing moved to Aiken, SC plant.

**1985** OPTIC\*LITE™, a fiber optic polymer insulator, is introduced. ESP polymer is also introduced. Surge arrester manufacturing move to Aiken, SC plant.

**1986** Multi-million dollar expansion of MOV element plant in Wadsworth, Ohio. Introduction of the first U.S. made polymer-housed distribution arrester, Type PDV-100. HI\*LITE® II polymer suspension insulators are also introduced.

Ohio Brass repositioned by closing of the Barberton and Newell plants and the sale of stock of old "The Ohio Brass Company" basically consisting of the mining and transit product lines.

Electric Utility operations sold to NewCo Ohio Brass, Inc. and name then changed to "The Ohio Brass Company".

**1988** Mansfield headquarters moved to Wadsworth, Ohio. The following products were introduced:

- The Type PDV-65 expands the polymer-housed arrester line.
- PROTECTA\*LITE® concept, a polymer insulator with MOV arrester protection.
- Type PVR, first polymer-housed riser-pole arrester.

**1990** Introduction of VERI\*LITE™ distribution insulators and HI\*LITE® polymer suspension insulators.

**1992** Introduction of 69kV VERI\*LITE™ polymer line post insulators and Series 250 HI\*LITE®XL polymer line post.

**1993** Introduction of Polymer station arrester, PVN. Four Millionth PDV shipped.

**1994** Introduction of Series 300 HI\*LITE® XL polymer line posts. ISO 9002 Registered Aiken & Wadsworth. Hubbell Incorporated acquired The A.B. Chance company and Lapp's Polypace Insulator Line.



**1996** HI\*LITE® XL, a silicone rubber suspension insulator, is introduced.

**1997** Introduction of VERI\*LITE™ polymer suspension insulators.

**1998** Acquired G.E. surge arrester business. The introduction of HI\*LITE® XL, a high leak polymer suspension insulator.

**1999** Acquired Chardon Electrical Components, Inc. Introduction of H1 high voltage gradient MOV distribution blocks and 35/46kV VERI\*LITE™, a polymer post insulator.



**2000** Chardon moved to Aiken, S.C. plant. Introduction of 30K SML HI\*LITE® XL polymer suspension insulators.

**2001** Porcelain arrester assembly moved from Bayamon, Puerto Rico to Vega Baja, Puerto Rico. Introduction of the following products:

- Series 250 HI\*LITE®XL silicone rubber line post.
- 600 Amp SAFE OP® Tap Plug.
- 600 Amp Loadbreak Reducing Tap Plug.
- 600 Amp Insulating Cap.
- 600 Amp Bushing Extender.
- PVIA polymer-house intermediate arrester.

**2002** IIDA MOV block manufacturing moved from Bayamon, P.R. to Aiken, S.C. and Wadsworth, OH plants. Introduction of the following products:

- PVI-LP® polymer-house intermediate arrester.
- PVNA polymer-housed station arresters.
- H3 high voltage gradient MOV station/intermediate blocks.
- PDI silicone rubber distribution deadend insulators.
- F-Neck VERI\*LITE™ polymer line post insulators.
- Y-Clevis VERI\*LITE™ polymer suspension insulators.

**2003** Introduction of 35/46kV VERI\*LITE™ silicone rubber post insulators.

**2004** Under Oil arrester assembly moved from Vega Baja, P.R. to Aiken, S.C. plant.



# RESEARCH

In 1920, after 15 years of performing research in a small building, Ohio Brass' Electric Utility operation ("Ohio Brass") converted a palatial horse barn and pasture yard in Barberton, Ohio into the country's first great indoor-outdoor high-voltage electrical laboratory. Many of today's accepted principles of high-voltage transmission were proven there. This facility was the most capable in the industry, devoted exclusively to problems of insulation and transmission.

Ohio Brass technical papers became industry textbooks. Over the years, Ohio Brass engineers developed the data for the design of lines working at 138kV and 230kV. As the era of refinement became evident in the 1930s, laboratory investigators progressively became quantitative more than qualitative. Lightning, once accepted as "an act of God," was reliably simulated in the laboratory with new equipment and instrumentation.

In 1934 a new facility was built in Barberton, equipped with a world class lightning impulse generator capable of producing a 3-million volt impulse of phenomenally steep wave.

The Ohio Brass team contributed to industry technology development, most notably in ultra-steep wave research related to lightning. They incorporated the findings into an entire line of insulators with an unheard-of immunity to lightning damage.

On October 1, 1947, the Tidd 500kV Test Project was energized and the modern concept of extra-high voltage was born with Ohio Brass as the insulator manufacturer.

By 1963, Ohio Brass had already run full scale tests on 500 - and 765kV transmission.

Named after the founder of the old "The Ohio Brass Company", the Frank B. Black Research Center opened in 1968 and continues today to house the research and development team.

In 1976, following 12 years of development, HI\*LITE® Insulators were introduced, the first commercially successful polymer insulators. Today polymer insulators are constantly replacing heavy, bulky and breakable porcelain and glass insulators.



In 1986, Ohio Brass introduced the first U.S. made polymer-housed arrester. Today Ohio Brass continues to further expand the polymer distribution arrester product line.

By constantly developing and improving materials and products, Ohio Brass will continue to introduce industry "firsts."



MOV Plant Quality Assurance personnel monitor life test results on every batch of metal-oxide blocks produced, ensuring peak protection performance with DY-NAVAR® arresters.



60-Hz flashover test running on a HI\*LITE® Insulator.



Simulated lightning tests at the Frank B. Black Research Center in Wadsworth, Ohio help researchers understand the effects of lightning on electric utility equipment.

# MANUFACTURING

Yesterday's commitment leads to today's quality. Facilities in Wadsworth, Ohio, Vega Baja, PR and Aiken, South Carolina house our manufacturing technology.

Constructed in 1978, the varistor block plant in Wadsworth had a multimillion dollar expansion in 1986 and another in 1994. New technology for polymer-housed distribution arresters led to new equipment needs. Ohio Brass is committed to the industry and the requirement for only state-of-the-art innovation in the 48,000 square-foot MOV element plant. Emphasis on material development, process engineering, and process control coupled with a strong quality assurance program yield high quality, cost competitive MOV elements.

Assembly occurs in our large, modern 357,000 square-foot plant in Aiken where HI\*LITE® Insulators are manufactured and the full line of MOV arresters are assembled and shipped. In addition to assembly operations, rubber injection molding of HI\*LITE® weathersheds and distribution arrester housings are also done in Aiken. Ohio Brass' quality assurance program is ISO 9001:2000 registered.



Assembly of PVN station class arresters



Routine quality control testing of station class arresters.

Assembly of HI\*LITE® Insulators and DYNAVAR® Arresters occurs in our 357,000 square foot facility in Aiken, SC.



Visual inspection of insulator housings.



Varistors are tested for energy absorbing capability and classified prior to packing for shipment to Aiken, SC.



Distribution Varistor pressing incorporating height, weight and density analysis for quality control.



# PRODUCTS

## Introduction

While electric utility products have changed greatly, Ohio Brass is committed to our current HI\*LITE® Insulator and MOV arrester cable accessory lines. In 1976, when we introduced HI\*LITE® Insulators, we saw the great advantages of polymer and advanced our developments to the arrester line.

## Arresters

### Ahead of Their Time

In the 1970s Ohio Brass introduced an automatic pressure relief system on its Multirester II® distribution arrester design. A tensioned diaphragm seal at the lower end of the arrester sensed an increase in pressure and opened ports to exhaust gas caused by excess fault current. The device proved to be ahead of its time. The need for pressure relief in distribution class arresters was not generally recognized. Few power companies considered the benefits worth any extra cost. However, in the mid 1980s, the need for distribution class pressure relief became widely recognized. Other designs with end venting systems became available, sometimes enhanced with arc transfer systems and/or use of internal liners. All of these designs continued to use porcelain housings. The risk of porcelain fragmentation remained. That risk has been reduced with the advent of the PDV arresters with polymer housings — also a development introduced by Ohio Brass.



Polymer lighter weight station class arresters replace porcelain as substations are upgraded.



DYNAVAR® polymer-housed arresters save space in substations and are much lighter weight.

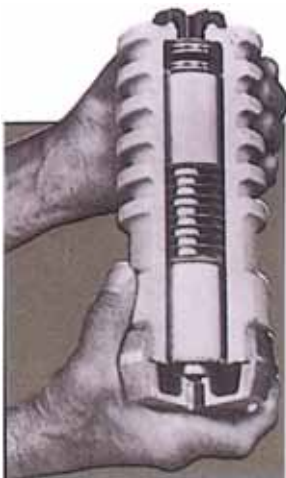


PDV Arrester Flipper Assembly is low-cost alternative.



## Arrester Development

When Ohio Brass' Electric Utility operation ("Ohio Brass") developed the current-limiting gap in 1957, the arrester ceased being merely a lightning protective device and assumed a key role in allowing the lowering of insulation levels for equipment. Millions of dollars have been saved in the ensuing years. The advent of MOV accelerated the rate of savings. PVI and PVN arresters have again increased the savings rate, because the polymer housings reduce the possibility of breakage and increase protection to personnel and equipment.



The Multirester II distribution class design, produced over 20 years ago, introduced an automatic pressure relief system to the industry.



PDV-100, PDV-65, PVR, PVN and PVI are the polymer-housed arresters that have changed the industry with the added safety for equipment and personnel.







# PRODUCTS

## HI\*LITE® and VERI\*LITE™ Insulators



Design proposals for the first cap-and-pins suspension insulator in 1909. Ohio Brass' design, second from right, became the standard for transmission insulation for the next 75 years.



Development: Ohio Brass' Electric Utility operation ("Ohio Brass") began serious development of the HI\*LITE® Insulator in 1964 recognizing potential problems with porcelain insulators at UHV voltages and the solution offered by fiberglass rod-cored insulators. The strength-to-weight ratio of porcelain and glass insulators was becoming a problem as voltages increased. The importance and frequency of deadened towers required reliable insulation.



The requirements of a high-voltage insulator are the same today as they were in early development:

- 1.) Strong
- 2.) Reliable (long time strength)
- 3.) Temperature and contamination resistant
- 4.) Non-conducting under any conditions

Development testing and trials occurred over the years.

The basic design for HI\*LITE® transmission insulator products includes the structural member of fiberglass rod of extremely high mechanical and dielectric strength. The weathersheds are a proprietary compound of rubber using fillers to meet the demands of electrical power transmission. At the interface of the rod and weathersheds, a silicone compound is used. End fittings are directly swagged to the rod at both ends. The weathersheds are axially compressed between the fittings.



Today, engineers are continually improving the design. HI\*LITE® XL incorporates integral stress distribution disc, and mechanically bonded weathersheds under pressure. Ohio Brass Electric Utility operation offers HI\*LITE® XL insulator designs for suspension, deadend, line post, station post, braced line post, horizontal-vcc, and many other special applications.

Introduced commercially in 1976, Ohio Brass' Electric Utility operation set the standards for polymer technology.

Ohio Brass realized the many benefits of polymer at the outset: less weight, ease of construction, and vandalism resistance.

Later, we realized the less obvious benefits HI\*LITE® Insulators provide for the industry: power loss cost savings. The beauty of lines was greatly enhanced with the development of HI\*LITE® Insulators, the first polymer high-voltage insulators.

VERI\*LITE™ Insulators: Ohio Brass VERI\*LITE™ Insulators were developed for distribution and sub-transmission applications, 69 kV and below. The VERI\*LITE™ product line includes the following product families:

- PDI: distribution deadend insulators – 15-35kV
- VLS: suspension insulators, specifically engineered to replace existing strings of porcelain bells – 15-69kV
- Post insulators, equipped for horizontal and vertical mounting – 35-69kV

All VERI\*LITE™ insulators incorporate a bonded rubber design, high mechanical strength, generous leakage distance, and superior electrical performance.

Throughout the world, HI\*LITE® Insulators cover more miles of transmission line than any other polymers.



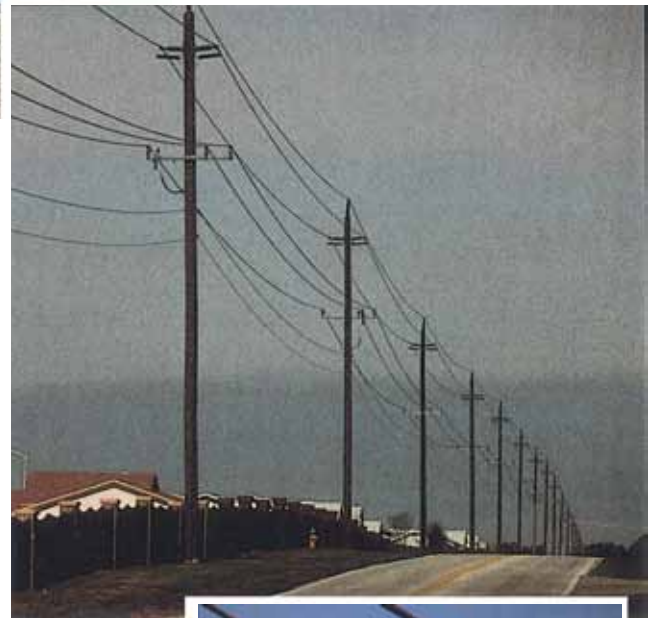
# PRODUCTS

As we continue to improve HI\*LITE® Insulators, we'll continue to search for the best materials and developments to meet the changing applications of the industry.

New Developments: Beginning with the solid base of HI\*LITE® Insulator technology, Ohio Brass is expanding the insulator product line with new design concepts and products.

PROTECTA\*LITE® System: The concept behind this product is to prevent transmission and distribution line insulation from flashing over when subjected to an impulse, thus providing protection from lightning. New unshielded lines constructed with a system comprised of a HI\*LITE® Insulator and a polymer-housed arrester realize:

- reduced construction costs,
- reduced magnetic fields,
- reduced visual impact and
- the ability to provide fewer interruptions than a shielded line. Zero lightning-caused interruptions are possible with a complete system at every structure. Plus suitable for retrofit applications to:
- supplement poorly performing shielded lines,
- protect unshielded lines,
- protect special structures (i.e.. river crossings) and
- reduce structure heights (i.e.. airport locations).



PROTECTA\*LITE® systems for new construction or retrofit with existing insulators.

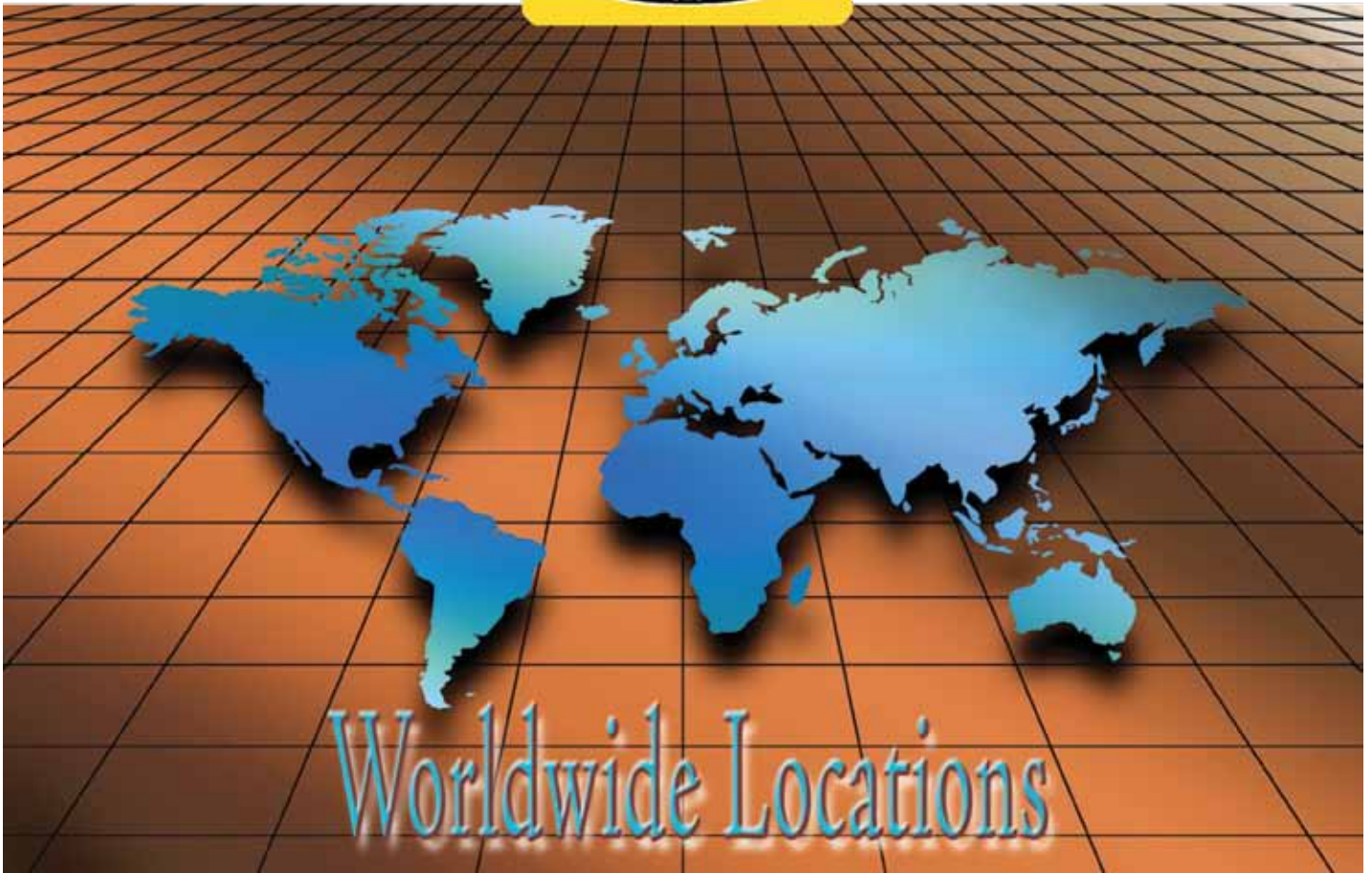
## Full 15/25 kV LB Line

In March of 1999, Hubbell acquired Chardon Electrical Components, Inc., Greenville, TN.

With the addition of Chardon, Hubbell now offers a wide variety of underground cable accessories under the Hubbell brand.



HI\*LITE® line post insulators are an integral part of a Composite Power Corp. 138kV pole at 1994 IEEE ESMO Show.



**Web: <http://www.hubbellpowersystems.com>  
E-mail: [hpsliterature@hps.hubbell.com](mailto:hpsliterature@hps.hubbell.com)**

**UNITED STATES  
CANADA, INTERNATIONAL**

HUBBELL POWER SYSTEMS, INC.  
210 N. Allen Street  
Centralia, Mo 65240-1395  
Phone: 1-573-682-5521  
Fax: 1-573-682-8714  
e-mail: [hpsliterature@hps.hubbell.com](mailto:hpsliterature@hps.hubbell.com)

**MEXICO**

HUBBELL DE MEXICO, S.A. DE C.V.  
Av. Insurgentes Sur #1228, Piso 8  
Col. Tlacoquemacatl Del Valle  
Mexico, D.F. 03200  
Phone: 52-55-9151-9999  
Fax: 52-55-9151-9988  
Website: [hubbell.com.mx](http://hubbell.com.mx)

**BUSHINGS • CONSTRUCTION • INSULATION • PROTECTION • SWITCHING • TOOLS**



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