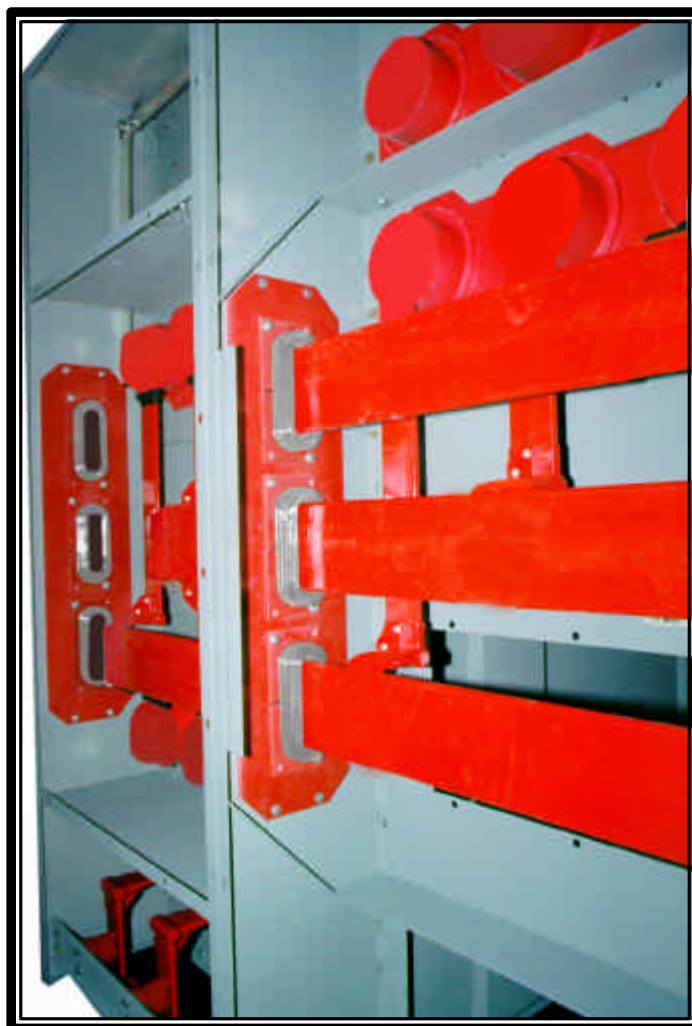


# CYCLOALAPHATIC EPOXY SWITCHGEAR INSULATION

A Proven SUPERIOR Insulation Compared to Porcelain



Switchgear Bus Systems Using Cycloalaphatic Insulators

**For Applications in 5kV through 38kV  
Switchgear and Bus Duct**



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## INTRODUCTION

Of all the many types and formulations of epoxies, Powercon has chosen Cycloalaphatic because of the extensive performance testing conducted on polymers starting and continuing since 1947 first in Europe, and then in the 1960's in the United States. These tests and the subsequent tests and improvements in formulations and manufacturing processes have produced a material Powercon uses that has many superior characteristics to porcelain itself.

Powercon uses the most modern automatic pressure jellation system for manufacturing which is similar to injection molding. This is a much lower pressure process. The two part specially formulated resins are injected into a high temperature mold and allowed to jell while a constant pressure is maintained. All parameters - pressure, temperature, volume, proportion, etc. - are CNC

controlled to provide a void free homogeneous insulator having low internal stresses and superior electrical and mechanical characteristics.

They do not form free carbons when exposed to high temperatures or electrical discharges but produce only gaseous by-products making them ideal as an insulating medium. The ability to mold the material into shapes not possible with porcelain makes it invaluable to designers. For over 30 years this insulation has established its exemplary electrical and mechanical characteristics in the merciless environment of outdoor usage. Some of their superior qualities are listed on Page 3.



Powercon's Facilities for Cycloalaphatic Manufacturing

## CYCLOALAPHATIC EPOXY COMPARED TO PORCELAIN

- ◆ **High Arc Resistance and Dielectric Strength**

Cycloalaphatic epoxies with alumina fillers have track resistances and dielectric strengths greater than porcelain making them ideal insulating materials.

- ◆ **Dielectric Constants is 2/3 of Porcelain**

- ◆ **Higher Resistance to Thermal & Mechanical Shock** than porcelain.

Much stronger. Compression strengths 5 times porcelain.

- ◆ **Porcelain will explode if shocked beyond its Capacity**, whereas epoxy will simply crack and retain its grip on whatever is embedded into it.

- ◆ **Homogeneous Throughout Shape**  
By having the same material throughout the part a chipped or broken skirt of an insulator does not compromise its dielectric capabilities as does porcelain (which is UN-repairable) and can be repaired.

- ◆ **Higher Surface Resistance/Lower Leakage Currents.** Microscopic erosion of surface is not detrimental to its insulating properties.

- ◆ **High Flexural Strength**  
Cycloalaphatic epoxy flexural strength is 16 to 18 times that of glazed porcelain.

- ◆ **High Tensile Strength**

The tensile strength of Cycloalaphatic epoxy is approximately 11 times that of porcelain.

- ◆ **High Tensile and Cantilever Mechanical Strengths**

Epoxy molded parts have high cantilever strengths when compared to porcelain and can withstand higher tensile loading than porcelain. Much better impact strength than porcelain.

- ◆ **High Compression Strength**

The compression strength of Cycloalaphatic epoxy is 4 to 6 times that of glazed porcelain.

- ◆ **Low Specific Weight**

Epoxy can be cast into thin walled sections and equivalent or greater strength than solid case porcelain of the same shape. Cycloalaphatic epoxy weighs 70% less than porcelain.

- ◆ **High Arc resistance**

There are many varieties of epoxy, but Cycloalaphatic varieties with alumina filler and proper hardeners have resistance to arc tracking superior to porcelain.

- ◆ **Small Shrinkage**

The amount of shrinkage is controlled by the type of fillers used with Cycloalaphatic epoxies.

- ◆ **Close Tolerances**

Porcelain tolerances are in the neighborhood of plus or minus .125 inch while epoxy castings can be held to .001 inch.

## EXPERIENCE

Powercon's experience in the utilization of cycloalaphatic bus supports began in 1994 in a 27kV outdoor utility substation. Since then approximately 4000 units of 5kV, 15kV, 27kV and 34kV metal-clad switchgear equipments have been shipped. In addition, several thousand feet of bus duct with 10's of thousands of cycloalaphatic insulators. To date there have been no report of problems with any of these insulators. Most all of the users of these insulators have been public utilities providing reliable electric service throughout the country. Cycloalaphatic epoxies have proven themselves in all types of electrical operating environments and voltages. All major switchgear manufacturers throughout the world use cycloalaphatic epoxies in their products. The list of U.S. Manufacturers include: Powercon, Westinghouse, Cutler-Hammer, Powell Electrical Manufacturing,

Cooper Industries, General Electric, S & C, EEI, Elliott Industries, SqD, Siemens, Ohio Brass, Joslyn Power Products, Central Maloney and ABB to name several. The applications have been in metal-enclosed switchgear, outdoor distribution and transmission insulators and bushings, pad mounted switchgear, metal-clad switchgear, surge arresters, transformers, power circuit breakers and the list goes on and on. The performance of cycloalaphatic epoxies has been outstanding and they have passed the test of time with 30+ years service in all kinds of environments.

The service record of Powercon manufactured cycloalaphatic epoxy is outstanding. Powercon's expertise in switchgear dielectric and insulating systems is among the leading manufacturers in the switchgear industry.

## FACILITIES

Powercon has state-of-the-art pressure-gelation process equipment for processing cycloalaphatic epoxies (See Page 2). We have a substantial compliment of engineers, tool and die makers, and design and manufacture our own molds. Our epoxy plant has been in operation for nearly 15 years, producing parts for our switchgear

and others. These parts include: standoff insulators through 38 kV, disconnect switch pushrods through 38 kV, bus bar supports through 38 kV, and apparatus bushings. Each part is thoroughly inspected and appropriately tested to rigid quality control standards.

