



Powell Technical Brief #5

Comparison of Porcelain & Cycloaliphatic Epoxy Insulation

July 29, 1990

PowIVac[®] vacuum circuit breakers and metal-clad switchgear use a primary insulation system of cycloaliphatic epoxy. This insulation has given excellent results in the eight years since we first introduced PowIVac[®], but we still have customers who request porcelain.

Powell is far from alone in using cycloaliphatic epoxy insulation. The material has been in common use in Europe for a generation, and other U. S. users include Westinghouse, S&C and Square D. It is especially interesting to see the first two of these companies using cycloaliphatic epoxy. A few years ago, both were strong proponents of porcelain insulation.

Although there are many formulations of cycloaliphatic epoxy and a number of varieties of porcelain, each of which has its own specific qualities and parameters, there are a number of general comparisons which can be made.

First, in the physical area, the following relationships are typical:

- Cycloaliphatic epoxy ("cyclo") weighs less than 70% of porcelain's weight.
- The thermal coefficient of expansion of cyclo is 1/20th that of porcelain.
- The tensile strength of cyclo is about 11 times that of glazed porcelain.
- The compression strength of cyclo is 4 to 6 times that of glazed porcelain.
- The flexural strength of cyclo is 16 to 18 times that of glazed porcelain.
- The Izod impact strength, unnotched, is about the same as glazed porcelain.
- Dimensional and shape control is much easier in cyclos than in porcelain.
- While the reparability of cyclos is limited, porcelain is unreparable.

In the electrical area, you will find:

- The dielectric constant of cyclo is only about two-thirds that of porcelain.
- The temperature class of porcelain is much higher than that of cyclo, but cyclo mixtures with temperature classes of 105 C or 130 C are readily available.
- The track resistance of cyclo is slightly less than that of porcelain.
- The water absorption of cyclo is slightly greater than that of porcelain, but is still in the range of 2/10's of 1%.



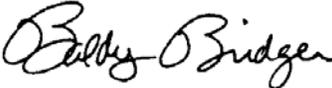
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Finally, cyclo exhibits excellent resistance to common industrial chemicals, is readily washable, and has excellent erosion resistance and weathering properties.

In summary, we believe that the excellent physical properties of cyclo make it the insulating material of choice in spite of some small sacrifice in electrical properties. This is especially true for applications requiring great strength under severe dynamic loading, such as support insulators in circuit breakers and switchgear.



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