DOW CORNING

THE USE OF DOW CORNING® Q2-1090 DIELECTRIC LIQUID AS A REPLACEMENT FOR PCB's IN POWER TRANSFORMERS

Q2-1090 Dielectric Liquid is Dow Corning's version of a polydimethylsiloxane fluid qualified for use in electrical applications. The technical feasibility of using silicones in transformers has been shown by over 20 years of experience in military specialty transformers, several year of use on the Japanese National Railway, and use in a number of power transformers in the Midland, Michigan area. In addition, to these actual applications, support for the use of silicones is contained in over 30 years of accumulated data on dielectric properties and compatability with common materials of construction. Concern for fire, explosion, health, and environmental hazards strengthens the rationale for using silicones.

Silicone liquids of the type advocated for this application are much less flammable than typical transformer mineral oils and actually have a higher flash point than many PCB containing transformer liquids. And although these silicone liquids will burn, they have a relatively low heat of combustion, high flash and fire points, and have been shown to be self extinguishing in static pan type burn tests. They appear to offer a level of fire safety greatly superior to mineral oils, and only slightly less than that of PCB based liquids. The silicone liquid suggested for use in transformers has been evaluated by Underwriters Laboratory and has received a flammability classification number.

Simulated transformer explosions involving a PCB based liquid, a silicone liquid, and a mineral oil showed that only the mineral oil continued to burn after the explosion. There was no fire with either the PCB or the silicone.

Following a review of the extensive data, several insurance companies have given their permission to pursue the use of silicone liquids in transformers used by their customers. Because no general policy has been established, the insurers have indicated that they will evaluate each application on an individual basis.

Silicones, often used in small concentrations in the preparation of certain foods, have a very low level of toxicity. The toxicity to mammals, aquatic life, and plants has been investigated. The extremely low toxicity of silicones made it difficult to detect toxic reactions in the test subject. Studies directed towards determining the tendency for silicones to bioconcentrate have been negative. It was not possible to show that bioaccumulation was occuring.

It has often been stated that silicones are persistent because they do not biodegrade. Although, no evidence of biodegradability has been shown, silicones do degrade in the environment. Contact with soils and water causes the liquid to rapidly depolymerize to volatile species. Once airborne these materials are chemically degraded in the presence of ultraviolet lgiht. Known chemistry also suggests the possibility of chemical degradation in water.

The present listed price of silicone fluid is approximately twice the price of PCB liquids; however, the price differential would be expected to decrease as the volume of silicone fluid used increased. The cost of monitoring, controlling, spill cleanups, possible liability and disposal should be much less for silicones. Thus, the total cost of using silicones would probably not be greatly different from the total cost of using PCB's.

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