FLUIDS

THERMINOL SKYDROL PYDRAUL SANTOSOL TURBINOL SANTOVAC COOLANOL

This information is prepared for internal use only and should be used with discretion, since it has not been completely evaluated for such considerations as toxicity and patent conflict, except as specifically stated.

Sales Information Bulletin No. 161

DATE: February 12, 1975

SUBJECT: POTENTIAL OF POLYDIMETHYLSILOXANES AS CAPACITOR DIELECTRICS

The attached paper was presented by Dow Corning at the IEEE Winter Meeting in New York, January 30, 1975.

It relates to the use of siloxanes in high voltage power factor correction capacitors. Work with these fluids has been most pronounced in Japan which is the only country in which PCBs have been banned.

In reviewing this paper, it is important to bear in mind 3 points:

1) Dow Corning found Phenyl Methyl Siloxanes had good high voltage properties, but these are so expensive that they are almost completely ruled out on economic grounds.

2) Polydimethylsiloxanes (PDMS) are the most widely known and the least expensive. They are still 2-3 times the cost of Aroclor 1016. They were found to have electrical properties inferior to the Phenyl Methyl type which is what prompted Dow Corning to try and improve electrical characteristics of the cheaper material.

3) The dielectric constant of Siloxanes are low (ca 2.3). Therefore, the size of capacitors and cost will rise sharply unless the electrical stress (i.e., the volts between the plates of the capacitor can be significantly increased. High stress is the only siloxanes make sense and PDMS did not look good.

DSW 196629

A Unit of Monsanto Company 800 No. Lindbergh Blvd., St. Louis, Mo. 63166

Dow Corning claim to have discovered an additive which improves one aspect of high voltage performance of PDMS. Whilst their discovery should not be disregarded, they still have problems.

The introduction places major emphasis on the use of Siloxanes in POLYMER FILM SYSTEMS. To date, no one has practically overcome the following problem.

If you use only plastic film in a capacitor winding you can not completely replace air between the films with liquid. The air pockets are weak points leading to early failure. A major processing breakthrough would be required to meet the plastic only requirement.

The next question is obviously, why can't paper interleaves be used as in present high voltage designs?

1) A solid dielectric is better able to carry stress than a liquid.

2) If one uses a "mixed" dielectric e.g., plastic film/paper and silicone, the stress is distributed in inverse proportion to the dielectric constant.

3) The DK of paper is approximately 6, and silicone 2.3. Therefore, in the layer of paper impregnated with silicone, the electrical stress would be pushed on to the liquid which would break down. So paper in the system prevents the only gain that would make the economics viable, i.e., it limits the stressing of the unit.

In contrast, remember that Aroclor can carry stress as well as PDMS Indeed, you will see from the paper that Aroclor 1016 was their performance target. Also, Aroclor/paper have similar DK and therefore equally share stress. If mixed with plastic film DK~2.0, the stress is heaviest on the plastic film which is best able to carry it. Lastly, the higher DK of Aroclor permits economy in overall capacitor size.

The only impact of silicones to date has been in Japan. They are unlikely to become major capacitor dielectrics whilst the use of Aroclor continues.

Please remain alert to customer interest in siloxane technology and let us know what you hear.

David Wood

/deb
Attachment

DSW 196630