

INTER-OFFICIAL

British Insulated Callender's Cables Limited

TO	MR. E.H. REYNOLDS.	FROM	K.W. PLESSNER.
REF.		REF.	KWP/N

30. July 1970.

Compatibility of Polypropylene
with Askarels

The object of our tests is to ascertain the presence of impurities or additives in polypropylene film which might contribute to the loss tangent of a Magvar-type capacitor made from the film.

An extraction test has been used in the past in which 2 g of film were soaked in 100 ml of Aroclor 1242 at elevated temperature and an increase in loss tangent of the liquid indicated the presence of impurities. With the advent of electrical grades of polypropylene film this method has proved insufficiently sensitive because of the small ratio of solid to liquid.

It has been found that a marked increase in loss tangent of the polypropylene film, if somewhat impure, occurs when Aroclor enters the film and swells it. It is thought that high capacitor loss tangents arise in this way rather than by the impurities being leached into the adjacent liquid layers. No doubt this also occurs in a capacitor, but the ions in the liquid are then restricted in their motion and the Garton effect ensures that the losses are small at working stress. The aim of our test is to retain the impurities within the polypropylene and to activate them by the presence of pure Aroclor.

Samples of the polypropylene film roughly 60 mm x 40 mm are suspended over a pool of Aroclor in an evacuated vessel. The vessel is kept at a uniform temperature of 28°C and the equilibrium amount of Aroclor is absorbed from the vapour within a few days. The film is then clamped between two polypropylene blocks in which wells of 29.5 mm diameter had been machined to contain mercury serving as the electrodes. The cell is placed

DSW 323527

inside a reaction vessel heated by an electrical mantle. A breather tube is fitted, filled with granulated zinc to trap the mercury vapour which is evolved. Measurements of capacitance and loss tangent are made over a range of frequencies and temperatures, but the measurements at 50 Hz and 100°C is regarded as the most significant. Typical values at this frequency and temperature are shown in the following table with only rough descriptions of the origin of the film:-

tan δ at 50 Hz, 100°C.

An early Italian film	0.0029
An early French film	0.0017
A later French film	0.00014
A corona treated British film	0.00036
The same, not corona treated	0.00017
Another British make	0.00025
An American film	0.00011
Another sample of the same film	0.00012

The attached graph shows the frequency dependence of loss tangent for a poor quality and a good quality film at 100°C. It will be seen that the 50 Hz value is not necessarily the maximum.

The stabiliser for Aroclor recommended by GE is at least as volatile as Aroclor and will therefore be transferred to the polypropylene film in our vapour impregnation if a pool of stabilised Aroclor is used instead of the pure Aroclor. The effect on the loss tangent measured on two good quality films has been nil.

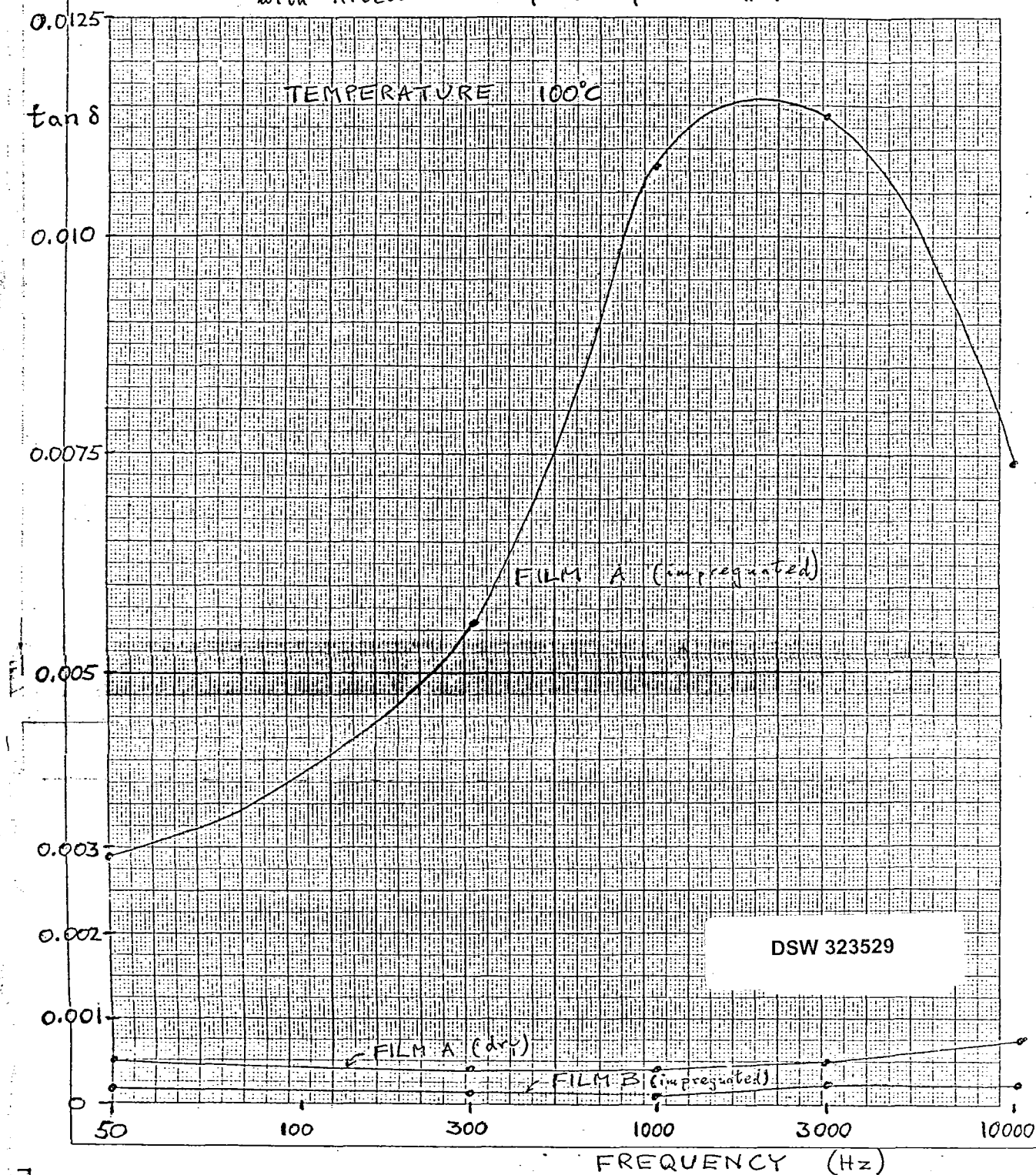
It is not claimed that this compatibility test can replace tests, particularly ageing and lifetests, on capacitor windings.

Encl.

V. V. P. L.

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Loss tangent of polypropylene films impregnated
with Aroclor 1242 by the vapour method



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