STABILANT 22

D.W. ELECTROCHEMICALS LTD.
97 Newkirk Road North, Unit 3
Richmond Hill, Ontario L4C 3G4
CANADA Phone: (905) 508-7500
Fax: (905) 508-7502

Number 28

APPLICATION NOTE

Using Stabilant 22 on RF Enclosure Seals

- *What types of rf seals are in general use?*

The most common seals encountered on RF shielded enclosures are:

a) The finger stock seal:
This type of seals employs a series of thin spring fingers which are generally manufactured as a strip of material. The finger stock is attached to one component of the closure, and makes electrical contact with the other component. There should be sufficient force to ensure that a positive contact is established and maintained, ideally enough pressure so as to exclude oxygen from the joint.

b) The knit or wire braid seal:
Utilizing a compressible element made from either a wire knit or wire braid component resting in or clamped in a groove, this type of RF seal is usually arranged so that the braid is part of the cover and seals against the edge of the sheet metal forming the enclosure.

c) The conductive elastomer seal:
Here a molded or extruded strip of conductive elastomer is used to establish contact between the two parts of the closure.

- *What are some of the problems associated with these rf seals?*

As is the case with most connectors, the two major problems are contamination and corrosion, and the effect they have on RF leakage through the seal. In fact some corrosion products exhibit semi-conductive action and the rectification that takes place in these areas may result in a significant and unacceptable amount of the local RF field being demodulated and re-radiated as either an audio frequency signal, a RF signal or signals at a different frequency or a combination of both.

The problem can be solved by maintaining sufficiently high contact pressure so as to exclude oxygen etc. from the contacting areas, but the pressure required (for example, in an IC socket, approx. 3 oz. pressure per pin is applied laterally) is so high as to make the total closing force unacceptable for all but the smallest of RF enclosures.

The next step is one of securing a seal with acceptable pressures. At times it may seem that there is no hope of maintaining a reasonable continuous seal. In fact in the design stage it may be better to accept the fact that it is not possible to maintain a continuous seal and concentrate the design effort on determining what spacing of excellent contact points would be acceptable, and then designing the seal so that the spring force is concentrated at these points.

We have not overlooked the fact that for many applications involving a low power RF field of very uniform gradient, a capacitative seal may be sufficient. Generally this is the exceptive case. In any event an actual erratic contact here can destroy the value of the seal.

Where environmental conditions are less than ideal, such as the presence of salt, moisture, pollution products, and even cigarette smoke, the problem can range from thin films of material preventing perfect contact, to corrosion-product encrustation of the contacts. Many persons do not realise that (in the absence of ablative effects) the corrosion products may occupy much more space than the metal parts from which they were formed; leading to physical changes causing problems ranging from jamming of the cover to deformation of the seals. Sometimes a very small amount of contamination can result in a major problem; most designers of buildings set up to provide a "reasonable" environment for electronic equipment forget that if you provide openings for people to enter and exit, ventilation systems using outside air sources, etc. there is going to be some entry of outside contamination even if it is only the typical salt-air fog encountered in costal areas.

Another problem is galvanic corrosion. This is caused by the use of dissimilar metals and or dissimilar metal-component finishes on the two surfaces forming the RF seal. Given the presence of *any* moisture, there will be an electrical potential set up between the two surfaces which can eat away one of the surfaces.

It must also be remembered that given an RF field of sufficient gradient, there nay well be a potential difference (albeit it AC) between the various components of the shield system, which will in increase as the RF seal develops problems further aggravating that same problem.

Aluminum cabinets with anodized surfaces can be a major problem because of the fact that the anodizing produces a thin coating of non-conductive aluminum oxide.

Silver plating is more desirable, silver oxide is conductive but some of the other tarnish products are not so conductive and rectification can sometimes occur.

For elastomeric-based seals refer to the following.

- ***Can Stabilant be used to solve these problems?***

While not developed for this situation, the **Stabilants** can be used to good advantage. Because of factors involving formation of corrosion products within contacting areas of low pressure the Stabilants may not stop the problem in the way they do with discreet connectors. At the worst they will reduce the problem to the point where the interval between failures is both extended and more highly predictable. This will allow for a maintenance schedule to be set up for the treating of the RF seal areas.

Consideration must be given to possible galvanic incompatibilities caused by the plating on the woven wire or braided wire if that is the type of seal being used. Solder alloy plated or even tin plated copper or a mix of solder or tin plated copper with solder or tin plated steel wore can be especially troublesome when combined with an aluminum case.

Here there is almost always some hydrolysis and/or etching of the aluminum with the formation of a non-conductive oxide. The **Stabilants** have a strong surfactant action and part of their mode of protection lies in their ability to lift much of the oxide and hold it in suspension. Even a thin film of the concentrate will help in this situation. But the material will have to be periodically cleaned off with a solvent such as isopropanol and the concentrate re-applied. The general limits of protection are about six to nine months in a coastal area with thin films, and from nine month to a year or more with thicker films of the concentrate.

Elastomeric seals often consist of a good compression-set-resistant elastomer compounded with SAF carbon-black, *a very finely* divided carbon-black used almost exclusively for this purpose. We would refer you to our Technical Note # 21 "Compatibility of Stabilant 22 with Elastomers". As the dilute form (**Stabilant 22a**) does contain isopropanol which may increase the swell and degrade the compression-set properties of some elastomers such as Buna S, we would suggest that where there is any doubt as to the compound, the concentrate (**Stabilant 22**) be employed.

A possible problem can occur here which might reduce the initial application of the **Stabilants**. If there is any unsaturated oils present on the metal that is in contact with the elastomer, the curing agent and accelerator used in the elastomer may cause these oils to cross-link (or cure) either making the elastomer stick to the metal, or causing the oil to form a poor-varnish-like coating on the metal's surface. This can even happen with skin oils. The situation can be aggravated where the elastomeric seal has been itself cemented to one component of the closure, as the cement and/or primer for the cement may contain an isocyanate. In the confines of the seal, this isocyanate can promote cross-linking in any unsaturated material present. This is not a problem with the **Stabilants** themselves, but be sure that any residual patina is removed from the metal surface before they are used.

NATO Supplier Code 38948 - 15 mL of S22A has NATO Part # 5999-21-900-6937

The **Stabilants** are patented in Canada - 1987; US Patent number 4696832. World-wide patents applied for. Because the patents cover contacts treated with the material, a Point-of-sale License is granted with each sale of the material.

MATERIAL SAFETY DATA SHEETS ARE AVAILABLE ON REQUEST

NOTICE

This data has been supplied for information purposes only. While to our knowledge it is accurate, users should determine the suitability of the material for their application by running their own tests. Neither D.W. Electrochemicals Ltd., their distributors or their dealers assume any responsibility or liability for damages to equipment and/or consequent damages, how-soever caused, based on the use of this information.