Stabilant 22 Contact Enhancer Application Notes

App. Note 31 - Relays & Switches

Why do relay and switch contacts become intermittent?

The most common cause of relay and switch contact failure or intermittence is caused by the deposition of contaminant materials which either, by themselves, increase contact resistance, or which cause corrosion of the contact. In the former case we find such contaminants as industrial oils, wood-based resins, tar and nicotine from smokers, and even plasticizers or breakdown products from the plastics used in the fabrication of and/or physical shielding of the relay or switch. (i.e. such things as a clear plastic case). In the latter class would be such things as corrosive by-products of the industrial process in the plant served by the switch or relay, or even in adjacent industrial locations.

Can certain operating conditions aggravate this problem?

Where switches or relays are used at very low currents, such as in TrL or, worse still MOSFET circuits, there may not be enough current present to keep the contact electrically clean; the very low current levels can lead to microphonics, making the contacts vibration sensitive.

Contacts which stay in one condition (i.e. Normally-Closed or Normally-Open) for long periods of time have their own peculiar set of problems. Often normally-closed contacts will exhibit capillary action, drawing-in contaminants. This is more often found in contact pairs where the contacts have a large radius. Normally-open contacts on the other hand can more easily accumulate contaminants on the surface of the con tact.

As noted, sometimes conditions exist where the relay or switch construction and/o materials can contribute to a problem in low-current applications. Contact covers molded from hygroscopic plastic such as polycarbonates, can, under conditions o long off-periods (coils unenergized) pick up moisture from the environment. When this is followed by a prolonged coil-energized state, the heat from the coil can drive the moisture out of the plastic increasing the potential for contact corrosion or degradation.

Excessive use of plasticizers in either the protective cover or the relay or switch body can, under certain circumstances, can cause plasticizer re-deposition on the contact surfaces. Occasionally, the use of solder-fluxes in internally wire-leads on relays can cause problems as most flux removal methods function essentially by massive dilution, and may leave potential migratory flux in place near or on the contacts.

While relay covers are useful in excluding environmental contaminants, unless hermetically sealed, they can, under conditions of thermal cycling, exhibit a "breathing" phenomenon which can cause contaminants to accumulate within the protective cover.

Many times the moving contacts of a relay are treated to no avail, it having been overlooked that the relays may themselves be mounted in sockets which can be just as prone to electromechanical-contact problems as the actual moving contacts.

Can these problems be prevented?

Yes, most cases can be prevented. The usual treatment is a rigorous and consistent cleaning of the contacts. This often fails because of the number of contacts and/or the inaccessibility of the contacts and/or the rate of contamination build-up and/or the lack of available maintenance time makes the process impractical. Then too, the potential problems of solvent use and the environment must also be addressed.

Stabilants have demonstrated their ability to eliminate many of the contact problems in a cost-effective manner as they are a resident treatment. Not only will their presence exclude contamination, their detergency action will loosen existing contamination and/or reduce thin-film rectification and microphonic effects from the contact pair.

What precautions must be taken when using Stabilants?

One general precaution is not to use too much of the material. This is not a case of "if a little is good then a lot is better". While some applications involving heavy existing corrosion may justify the use of thicker films in order to hold removed-corrosion in suspension, this should be considered a temporary measure, this thick film of **Stabilants** should be scheduled for removal (along with the corrosion by-products) at an early moment, to be replaced with a thinner film of**Stabilant.** This also applies to contact pairs where there may be existing hardened contamination in areas of the contact's surface adjacent to the actual point-of-contact.

Under these conditions, the initial use of the **Stabilants** will probably loosen-up the deposited contamination opening up the potential for it to migrate to the actual point-of-contact. If this condition can be presumed to exist, it is wise to schedule a second **Stabilant** treatment consisting of an isopropanol wash-down (to remove the loosened contamination) followed by a re-application of the **Stabilant.**

in cases where heavy contamination is initially present, more aggressive solvents may have to be used to remove it, alternately, two or more cleaning and re-applications of **Stabilants** could serve the same purpose.

What problems can be created by the capillary-effect?

Where contacts are made with radiused surfaces to aid wiping-action-cleaning, the diminishing gap towards the point-of-contact can act as a capillary drawing sufficiently mobile contaminants or even the **Stabilant** film itself into the area immediately adjacent to the actual point-of-contact. This is especially true of contact pairs which, because of the design of the relay or switch, do not actually wipe when they come together. For obvious reasons this is more prevalent in relays.

If too much **Stabilant** is used on a contact, there is a potential for the **Stabilant** t so-completely fill the gap around the point-of-contact that it may overly-cushion the closing contact. If there was excessive surface contamination present before the **Stabilant** was applied, this capillary action could, as noted, carry the suspended contaminant into the actual point-of-contact area.

The remedy is, as stated, the cleaning and re-application of the **Stabilant** film.

Is Stabilant just another contact cleaner?

No, it is important to remember that **Stabilant 22** is an *electrically active* material which enhances conductivity within a contact without causing leakage between adjacent contacts. Thus large quantities of the material do not have to be "hosed" o as is the case with cleaners.

Just how much should be used?

Normally, a final film thickness of from 0.25 to 1mils of the concentrate is all that is necessary. In other words you want just enough to fill up the interstices between the contact's faces. Where you're using **Stabilant 22A** you'll have to use enough s that once the isopropyl alcohol evaporates the desired .25 to 1mil film of **Stabilant 22** remains.

Does the action of Stabilant 22/22A/22E deteriorate with age or do they cause deterioration?

Our first concern has always been that **Stabilants** should not cause any problem when used in a system. Not only did we do lab-modeling and accelerated life tests we delayed the introduction of the material for several years until we satisfied ourselves through field trials that real-life conditions did not show up any unexpected problems for the use of **Stabilants.**

Stabilants have been used in some applications for over fifteen years now without showing any sign of reduced effectiveness. The material has a high molecular weight and a very low vapor pressure, thus it is not prone to evaporation.

The **Stabilants** do not affect elastomers save for some slight swelling of some materials. The diluant employed (isopropyl alcohol) usually is responsible for this problem, although the potential for this is gone as soon as the isopropanol evaporates. Nor are plastics generally affected. There are a few restrictions, but they are very minor. For example we don't recommend the use of **Stabilants** o very low-cost resistive-paint-film type potentiometers. And we don't recommend that **Stabilants** be used on switches breaking inductive loads where sparking is present the decomposition temperature of **Stabilant 22** is about 220Â° Celsius.

Once again let us emphasize the point that unlike some other contact treatment containing oils, **Stabilant 22** will not cross-link when exposed to certain material such as high sulfur brass, in connectors having rubber or thermoset plastics containing accelerants or curing agents, or when used on contacts where cross-link promoting agents are present in the environment. This phenomena of "Varnishing" does no occur with **Stabilant 22.**

Thus, besides their efficiency, the **Stabilants** are the safest long-term connection treatment available anywhere in the world!

Revision 2

Stabilants are a product of Dayton Wright research & development and are made in Canada

NSCM/Cage Code - NATO Supply 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 pending. 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 Application Note is based on customer-supplied information, and D.W. Electrochemicals is publishing it for information purposes only. In the event of a conflict between the instructions supplied by the manufacturer of the equipment on which the Stabilant material was used, and the service procedure employed by our customer, we recommend that the manufacturer be contacted to make sure that warranties will not be voided by the procedures.

While to our knowledge the information is accurate, prospective users of the material should determine the suitability of the Stabilant materials 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 any consequent damages, howsoever caused, based on the use of this information.