STABILANT 22

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Number 31

APPLICATION NOTE

Use of Stabilant 22 on Relays and 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 from tobacco 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 TTL or, worse still, MOSFET circuits, there may not be enough current present to keep the contacts electrically clean; the very low current levels can lead to microphonics, making the contacts vibration sensitive.

Contacts which stay in one condition (ie. 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 contact.

As noted, sometimes conditions exist where the relay or switch construction and/or materials can contribute to a problem in low-current applications. Contact covers molded from hygroscopic plastic such as polycarbonates, can, under conditions of long off-periods (coils un-energized) 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 on internal wire leads on relays can cause problems as most flux removal methods function essentially by massive dilution, and may leave some flux residue in place near or on the contacts.

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

If the moving contacts of a relay are treated to no avail, it may have been overlooked that the relays may 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.

Stabilant 22 has demonstrated its ability to eliminate many of the contact problems in a cost-effective manner as it is a resident treatment. Not only will its presence exclude contamination, but its detergency action will also loosen existing contamination and/or reduce thin-film rectification and microphonic effects from the contact pair.

What precautions must be taken when using Stabilant products?

One consideration is to use as little of the material as needed. 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, one should consider this a temporary measure. The thick film of Stabilant 22 (along with any corrosion by-products) should be cleaned off using isopropyl alcohol (99%), to be replaced with a thinner film of Stabilant as soon as practical. 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 cleaning and re-application of Stabilant 22, as described.

In cases where heavy contamination is initially present, more aggressive solvents may have to be used to remove it, or 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 create capillary action, drawing sufficiently mobile contaminants along with 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. This is more prevalent in relays.

If too much Stabilant is used on a contact, this effect becomes more troublesome and will require cleaning and re-application of the Stabilant film, as described.

Is Stabilant just another contact cleaner?

No. Stabilant 22 is an electrically active material which enhances conductivity within a contact without causing leakage between adjacent contacts. The combination of its electrical effect with its surfactant property and lubricating effect make it unique among contact treatment products.

How much should be used?

Normally, a final film thickness of from 0.25 to 2 mils 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 so that once the isopropyl alcohol evaporates the desired .25 to 2 mil film of Stabilant 22 remains.

Will Stabilant products deteriorate with age or cause any damage?

Our first concern has always been that Stabilant use should not cause any problems when used in a system. We began with lab modeling and accelerated life tests, and delayed the introduction of the material for several years until we were satisfied with field trials showing that real-life conditions did not present any unexpected problems for the use of Stabilants.

Stabilant 22 has been in service in some applications well beyond our published shelf life of 15 years, with customers reporting no sign of reduced effectiveness. The material is non-reactive in most chemical environments in the field. It has a high molecular weight (around 2800) and negligible vapor pressure, and so is not prone to loss by evaporation.

Stabilant 22 will not affect elastomers save for some slight swelling of some materials with the application of Stabilant 22A (diluted with isopropyl alcohol) - the potential for this disappears 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 on cheap resistive-paint-film type potentiometers. We do not recommend Stabilant 22 for switches used for inductive loads where sparking may be present. The decomposition temperature of Stabilant 22 is just over 200°C, not sufficient to withstand the heat of sparking.

Unlike some other contact treatments containing oils, Stabilant 22 will not cross-link when exposed to certain materials 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. Thus, in addition to efficiency, Stabilant 22 is the safest long-term connection treatment available.

NATO CAGE/Supplier Code 38948

15ml Stabilant 22 (Concentrate), NATO Part # 5999-21-909-9981

15ml Stabilant 22A (Isopropanol Diluted), NATO Part # 5999-21-900-6937

15ml Stabilant 22E (Ethanol Diluted), NATO Part # 5999-21-909-9984

The Stabilants are patented. Because the patents cover contacts treated with the material a Point-of-Sale license is granted with each sale of the material.

SAFETY DATA SHEETS ARE AVAILABLE ON REQUEST

NOTICE

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