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Number 30

APPLICATION NOTE

Preventing Computer System Crashes with Stabilant 22

Introducing Stabilant 22

Stabilant 22 is an initially non-conductive block polymer that when used in a thin film within contacts switches to a conductive state under the effect of the electrical field. The field gradient at which this occurs is set such that the material will remain non-conductive between adjacent contacts in a multiple pin connector environment.

Thus, Stabilant 22 provides the connection reliability of a soldered joint without bonding the contacting surfaces together!

Contacts are generally the weakest link in any piece of electrical/electronic equipment whether it be in low current devices found in computers or higher current circuits found in automotive and aviation applications, to name only a few. The use of Stabilant 22 or its isopropanol-diluted form, Stabilant 22A, will make contacts from 10 to 100 times more reliable, eliminating costly service call-backs and ensuring customer satisfaction.

Why do computer and computer systems lock up or crash?

Assuming the software is not at fault, or that you don't have conflicts caused either by the improper installation of programs, misbehaving TSR programs, or even port address, interrupt, or DMA conflicts between expansion boards, the most common problem is poor contacts either in the computer (including the expansion boards) or the keyboard, or in the connectors which attach the computer to its keyboard, printer, scanner, LAN's, or other peripherals.

Can these crashes be prevented?

Yes, most of them can be prevented. As good as connectors are, they are still the weakest link in your computer's operation. There are hundreds of these connections in a typical computer system. Outside of the obvious ones such as the connector that connects the computer to the printer, or LAN connections, the computer itself is full of electromechanical contacts.

These range from the card edge connectors that are used on the various plugin cards, to the numerous types of sockets into which IC's are plugged. The interdependence of the components within the computer is such that the erratic operation of virtually any one of the contacts in any of these connectors can crash or lock-up the computer. What is even more frightening, if the computer doesn't hang up, vital data or the execution of a program sequence may be altered such that key data is overwritten on a disk and thus lost.

What do these crashes cost?

Many users are not aware of the cumulative costs of computer crashes. But consider: if you're a programmer and have been working on a program for an hour when the computer crashes, and you didn't save anything during that time; the crash just cost you an hour's work not to mention the additional time required to readjust your overview of the program on which you were working. If you're developing a program you'll have to call up the previous version, put your brain in reverse, and try to remember just what it was you did during that hour. If you've ever had to do this, then you know just how frustrating it can be. Thus, the loss of that hour's work can cost you a lot more than that hour.

Consider a person processing a batch run of invoices. What was the last invoice that was processed? Did the computer program rewrite the FAT file every time an invoice was processed or was it waiting until the completion of the run to update the directory in the computer? Did your program handle all the interdependent files in an identical manner? Do you even know? Well, if it happened to one of your staff and you have to sort out the mess, you're going to find out the hard way!

Consider someone working on a spreadsheet who didn't save it before the computer crashed, not only would it be frustrating to have to go back and figure out just where they were in its development at the previous save, if any, can you be sure that they will be able to match their previous performance?

As you probably know, when a deadline is hanging over your head, it's human nature to try and speed things up by ignoring some of the details which prevent problems, you get "on a roll" and that's when accidents happen. Gee... forgot to save it did you? Now what will the additional delay and a missed deadline cost you?

What about the hidden costs of client dissatisfaction? Could you have lost a number of jobs because you missed a deadline. Sure, you know why it couldn't be met but does your client understand? Then again, perhaps you couldn't really do your best work because of the pressure or because of the lack of time?

What about an engineer involved in a complex CAD-CAM problem? Can you imagine how he feels when part way through a day of intensive work, his input device freezes leaving several hours work in a non-recoverable state?

Or consider newspaper reporters, working against a deadline. How often have we heard of stories which have gone off into limbo because of a terminal crash?

And then, consider the problems imposed by computer crashes in process control or experimental data acquisition. The disruption in even a fail-safe process control could cost more than the computer; and in data acquisition, the whole experiment might have to be restarted from scratch.

If you're responsible for servicing a system, wouldn't you like to increase the reliability of the equipment in your charge? And if your part of a team marketing complex systems think of how an increased reputation for reliability could aid you in the sale of replacement or even new systems!

Too often, people tolerate problems on the basis that so long as their system is just as reliable as the other parties. then that's all they have to achieve. In fact, we often run across managers who tell us that on the basis of the proceeding philosophy, "They don't have any connector reliability problems at all!" But when we talk to their service personnel, we find out otherwise.

Connector unreliability is like a time-bomb, waiting to go off in the most unexpected places and at the most unexpected times. Very expensive preventative maintenance programs attempt to stop these unexpected events. But some connector problems elude even the most thorough maintenance, perhaps because of the sheer quantity and diversity of the connections in even a simple system.

What can be done to reduce the number of these crashes?

Mainframe computers are usually operated in humidity and temperature controlled rooms using specially filtered and regulated power lines just to obtain reliability. Military computers are designed with special shock-proofed and electrically isolated cases; "Hardened" for use in the field. You probably can't afford the costs of these types of solutions. And you may not realise how vulnerable you are as the complexity of your installation grows; until, one day, it comes to a halt! Often it is at this point that the person responsible for the system is faced with a major re-planning of the system to be sure that the problem does not occur again. At the same time, the system has to be made operational once more as soon as possible! The amount of planning and the re-organization of the system at this point can be very expensive and the term *failsafe* often seem ironic. Usually, the planner finds out that some of the older and often key elements in the system may have to be replaced due to diminishing reliability. Are the equivalent new units compatible? After all, there are probably more nonstandard standards in the computer industry than anywhere else.

If you need reliability, shouldn't you start dealing with the least reliable component in the system? Of course! And that's where our product comes into use; a connector reliability upgrade based on a simple one time treatment of all the connectors in the computer.

What is this treatment?

It involves treatment of all the connectors with a *contact enhancer* called Stabilant 22. The use of Stabilant 22 or its isopropyl alcohol-diluted form. Stabilant 22A will make contacts from 10 to 100 times more reliable in operation, eliminating almost all lockups / crashes caused by connector malfunction. Stabilant 22 is not used repeatedly like a cleaner, instead it is applied to all the contacts and left in place!

What specific types of failures can it prevent?

When applied to socketed memory modules, it will usually prevent the annoying PARITY ERROR or other “bad memory” error messages, not to mention errors that do not even produce useful messages. Used on the connectors of a hard disk drive, it will usually stop intermittent malfunctions in drives that often occur once they warm up. We're sure that you've had error messages indicating that a peripheral device wasn't responding when you know that it was plugged in and turned on. And have you ever considered the slow-down in a LAN or data transfer operation because of the need to resend data that was received incorrectly the first time?

Is it reliable?

Both Stabilant 22 and Stabilant 22A are used in electronics where equipment failure can cost lives! These applications typically include biomedical electronics in hospitals, as well as aircraft navigation and instrument landing systems.

What is its effective life?

If Stabilant material is not lost during the repeated plugging and unplugging of a connector, the coating can last in excess of 10 years – some customers have reported effective use beyond our published shelf life of 15 years. It is notable that Stabilant 22 will not evaporate - the vapor pressure of the material is so low that the material is used in space applications.

Is Stabilant 22 cost effective?

Yes. When you consider how much time can be saved by the use of Stabilant products! When you have to service a computer, consider the time needed to remove the computer's case, to maneuver the computer around to where you can remove the case or undo the port connectors. Have you timed yourself on the replacement of a BIOS ROM for an older computer?

There are about 900 drops in a 15 mL Stabilant 22A service kit, and each drop could save you many minutes of service time. Some of our customers report savings of as much as \$3000 per 15mL bottle of Stabilant 22A due to successful resolution of contact problems and the reduced need to revisit such issues.

Why should we use Stabilant over less expensive alternatives?

While Stabilant 22 may seem expensive (per bottle), each application uses a very small amount of material. It also has a very long useful life once in place. Unlike many other contact treatments, Stabilant 22 will not deteriorate (e.g., becoming varnish-like by crosslinking under the action of contaminants in some connector materials). In most types of service work, the cost of the time involved in removing and replacing an expansion board will be much greater than the cost of the Stabilant used to treat all of the connectors on that board. Here, what is important is that not only will proper connector treatment cure existing contact problems, but will prevent new ones from occurring, eliminating the necessity of repeating the treatment at a later date.

In what sizes is Stabilant available?

Stabilant 22 and 22A are packaged in 15mL, 50mL, 100mL, 250mL, 500mL and 1 Liter containers. (Stabilant 22A is also available in a 0.5mL vial for inclusion with expansion boards) Stabilant products are available in two forms; as a concentrate Stabilant 22, and as an isopropyl alcohol-diluted form called Stabilant 22A. Because of the 4:1 dilution, a given size container of Stabilant 22A will cost about one-fifth the amount of a container of Stabilant 22 for it has only one-fifth the amount of the concentrate in it. A third packaging is available for industrial-bulk users. Stabilant 22S packages the concentrate such that it occupies one-fifth the volume of an otherwise empty container. This saves the added costs of shipping isopropyl alcohol, as well as allowing the end-user to use an alternate diluent of their own choice.

What is the difference in use of the Stabilants?

The concentrate, Stabilant 22 is most useful where the connections are out in the open such as card-edge connectors or where the material is also being used for its lubricating qualities, such as an insertion aid for IC's. Where the connections are not too easy to get at or where the user wishes to apply the material to something such as a socketed IC (without removing the IC from its socket) it is easier to use the alcohol diluted form, Stabilant 22A. The isopropyl alcohol diluent serves only to carry the concentrate into the connector.

Is it available in a spray can?

Not at present. During the initial stages of our market research, we did provide spray cans of the material, but the users found that in most cases they did not speed the application of the material enough to justify the cost of the material that was wasted. In addition, the spray application generally left a film of excess material that had to be cleaned up (for practical reasons as well as for appearance). Remember, very little Stabilant 22 is necessary to treat a contact, so why waste it?

We decided not to use either a CFC propellant or one of the highly flammable mixtures of butane and propane that are often substituted. We may revisit this topic as newer propellant formulations become available, hopefully with zero ozone depletion effect, very low toxicity and of course, user convenience.

Is Stabilant just another contact cleaner?

No, it is important to remember that Stabilant 22 is an electrically active material which is left in place to enhance conductivity within contact pairs without causing leakage between adjacent contacts. This is entirely different from the usage case for electrical/electronic cleaners.

How much should be used?

Normally, a final film thickness of from 1 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 1 to 2 mil film of Stabilant 22 remains.

What is the 15mL service kit?

This was made up at the request of several manufacturers and electronics equipment service organizations who wanted a standard kit of reasonable dimensions that they could purchase and stock in quantity, issuing it to their field service personnel as required. The service kit consists of a 15mL container of Stabilant 22A and some soft-tipped swabs as applicators, all in a small capped tube. The applicators are reusable.

Why would anyone want to buy quantities of the concentrate?

Many manufacturers and larger cable companies prefer to make large volume purchases, diluting the material and issuing it, as required, for specific field service requirements.

Many end users have found that the material cuts their service costs so much that it is more economical to purchase Stabilant 22 in the larger container sizes rather than run any risk of being without the material. The number of different applications tends to increase as users discover the large number of problems that can be solved by the material.

How can I be sure that Stabilant 22 works?

Stabilant 22 passed a number of stringent field tests before being issued NATO supplier (CAGE) and item part numbers.

We could cite the following established applications of Stabilant 22:

- hospitals use it on biomedical electronics to improve reliability of equipment where lives are in the balance.
- broadcasting networks use it to achieve the last measure of reliability in critical network switching applications.
- Stabilant is TSO'd for avionics and navigational aids.
- computer manufactures and field service personnel use it to increase reliability in their products.
- With years of use in consumer and pro audio, users have found the material easy to use and its results impressive.

But we still feel that the best way to find out how well it works is to try it out; samples are available on request.

Can I use Stabilant 22 in other types of equipment?

It can be used in test equipment, laser-printers, scanners, radios, audio systems, intercom systems, satellite systems, telephones...in fact just about everywhere there's a low voltage signal or control connection.

Are Stabilant products hazardous?

Stabilant 22 has caused no skin reaction (sensitization) in tests. In the undiluted form it is non-flammable although if its temperature is raised above 200°C, the decomposition products will burn. If swallowed in small quantities, it can cause some nausea and stomach upset. Stabilant 22 has an LD50 of about 5 grams per kilogram body weight, which is to say, virtually nontoxic. It is not subject to the Toxic Substances Control Act and neither are reportable under SARA Title III.

We advise normal precautions for isopropyl alcohol to be observed when using Stabilant 22A (diluted with 75% alcohol). Our Safety Data Sheets contain further details on each of the Stabilant products and are available by request or on our website.

What is the best way to apply it to a contact?

The 15mL container has a "dropper" type cap that allows Stabilant 22A to be applied directly to such components as socketed IC's, switches, connectors, etc. Some end users prefer to buy larger quantities and use industrial syrettes to apply the material onto connections. Natural bristle brushes or the microbrushes we provide can be used to brush it on card edge connectors. Cards can also have their edge connectors dipped into the dilute material. The material can be silk-screened on key switch pad areas on circuit boards or "offset printed" onto the same areas when protruding components or component pins prevent silk screening.

Since Stabilant 22 is available in diluted form as well as the pure concentrate, it can be readily handled by the numerous types of automatic dispensers available in that marketplace.

Does the action of Stabilant 22 deteriorate with age or cause deterioration?

Our first concern in developing Stabilant 22 was that it should not cause any problems when used in a system. We carried out lab modeling and accelerated life tests. After this, 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 Stabilant (either the concentrate or diluted forms).

Stabilant 22 has been used in some challenging applications for over twelve years now without showing any sign of reduced effectiveness. Since it has a high molecular weight and a very low vapor pressure, it is not prone to evaporation.

Stabilant products do not affect most plastics or other materials found in connectors or circuitry. One exception for fluorosilicone elastomers (some slight swelling of some materials) is only a concern with the alcohol diluted version. Isopropyl alcohol causes this, but the effect is gone once it evaporates completely from the elastomer.

There are a few restrictions, but they are very minor. For example, we don't recommend the use of Stabilants on very low cost resistive paint film type potentiometers. And we don't recommend that Stabilant be used on switches breaking inductive loads where sparking is present; the decomposition temperature of Stabilant 22 is about 220°C, so it could burn off.

Once again let us emphasize the point that unlike some other contact treatments containing oils, Stabilant 22 will not cross-link when exposed to certain materials such as high sulphur brass, in connectors having rubber or thermoset plastics containing catalytic agents, or when used on contacts where such substances are present in the environment. This phenomenon (varnishing) does not occur with Stabilant 22.

Thus, along with their efficiency, Stabilant products are the safest long term connection treatment available.

NATO CAGE/Supplier Code 38948

5mL Stabilant 22 (Concentrate), NATO Stock Number 5999-20-002-1112

15mL Stabilant 22 (Concentrate), NATO Stock Number 5999-21-909-9981

15mL Stabilant 22A (Isopropanol Diluted), NATO Stock Number 5999-21-900-6937

15mL Stabilant 22E (Ethanol Diluted), NATO Stock Number 5999-21-909-9984

Stabilant products 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

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, howsoever caused, based on the use of this information.

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